

Comparative Study of Practical Methods for Reducing the Vulnerability of the Earthquake in Iran and the World

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Abstract: Earthquake is known as one of the most destructive natural phenomena that causes a wide range of disasters: irrespective of the economic losses that are inflicted on the city, and in a smaller scale on the citizens, the human losses, and also the psychological problems caused by the death of the relatives, homelessness and insecurity are all known as a crisis caused by earthquake. Since it is impossible to prevent earthquake, we should look for proper approaches to confront this phenomenon. More importantly, surveying the features and the characteristics of the cities should be carried out as the basis of preventive actions towards earthquake because if we suppose the seismic intensity to be equal, it's the urban features and structures that can change a natural phenomenon to a human catastrophe. The present article aims to survey the most significant global and national experiences related to decreasing the vulnerabilities to earthquakes, and also re-defining the set of urban-designing approaches in order to reduce damages of earthquakes. Based on the given data, the research method is qualitative and attributive. The results show that the global experiences put emphasis on city texture, including open spaces, the connection network, and physical structures, while in Iran, irrespective of the studies by the JICA group, most of the assaying and damage-decreasing modeling cases have been performed in terms of single-structures and the social features have been ignored. Finally, we should say that, just in the circumstances that we set the plans of "urban-safety against earthquake" as a goal in all the stages of planning, especially the urban planning programs, we would be able to reduce the vulnerability of the cities toward seismic problems.

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1. Introduction

Against the globalization of organizations and target markets, the institutes have to respond the changes by using strategies suitable in the market and information technology. Today, what seems important in production and service organizations is not to maintain their human resource and machineries, but the way of conducting and controlling such components of the organizations by using strong information structure based on software and hardware grounds. In contemporary industrial societies, information is among the most fundamental elements of the production. Production information, sales information, warehouse information, etc. are all vital resources for the company. Indeed, IT has changed business infrastructures fundamentally. A glance at the related studies in this area shows that the organizations focus on integration of their globalized market strategies and IT infrastructures. Today, preferring national or regional products is an outdated

idea. Nowadays, increasing changes in market strategy, affects the infrastructures of information systems (IS) and information technologies (IT). If the current systems of the organization are not flexible against such changes, some inconsistencies among the business strategies and IT strategies will be inevitable. Now the time for consistency, coordination, and the fit between the business strategy and IT strategy has arrived.

When *material requirement planning* (MRP) systems were extended market due to the changes of market for the first time, they equipped the organizations with the capability of planning the requirements of the production on the basis of future demands, not on the basis of previous data. In other words, market strategy means optimized response to customers' needs in a well-planned framework. Such a strategy can provide a desirable information system. Enterprise resource planning (ERP) systems are now being introduced as a latest management and planning

too which are increasingly developed. ERP systems try to exploit the latest technologies of IT to integrate available subsystems of the companies. In a simpler term, ERP system is a set of coherent plans that are exploited to support main activities of the organization, like production, financial and accounting, sales, marketing, and human resources. ERP achievements go beyond the mere improvement in the current situations; the main goal of ERP is to provide the long-term needs of the organization and to make the organization powerful in different areas of activity.

2. Literature review

2.1. Enterprise resource planning (ERP) systems

Enterprise resource planning system is a sample of integrated information systems. Different definitions have been proposed for ERP among which one can refer to the followings:

A. ERP is a changeable and adjustable information system that can integrate different sections and different information and processes of the company.

B. ERP is a thought, a technology, and a system for a more effective management of all resources in the organization that would lead to the automation and integration of all processes, and subsequently, to increase in efficiency of the organization.

C. ERP is a way of effective planning and controlling all the resources of the organization that are needed for delivering, producing, and responding the needs of the customers in the production, distributive, and service companies.

D. ERP is a technology-based solution that provides the organization's managers with all the organization's resources through an interconnected, precise, and high quality system so that the managers can manage operation and planning process of the organization.

E. Finally, ERP is an integrated system that tries to offer a more effective management over the all processes and integration of all available tasks and parts of an organization in a single computer system so that such a system can meet the needs of mentioned sections. This can be done through computer software that makes it possible to share the information and to connect the relationship of different parts in a single data base. Such a software encompasses some software modules each of which has its own task in the company. Most ERP softwares are very flexible so that the companies can install and use some or all modules of their need.

2.2. Key Factors of Success in Implementing ERP Strategy

Despite the mentioned advantages for ERP implementation, the organizations usually face difficulties in reaching their predefined goals. The studies on 50 European companies show that %92 of the companies who have implemented ERP, are not completely satisfied with the results. Other researches show that %70 of ERP implementation projects have failed to reach the predefined goals. The increase length of implementation time will lead to exhaustion and will reduce the willingness of the implementation. These are the main reasons of ERP implementation projects. One of the reasons for the lengthening of ERP implementation is the lack of readiness in the organizations to implement such systems. Hence, regarding the mentioned problems and the risk of implementing ERP projects, it is necessary to be equipped with encountering and solving probable risks before starting the implementation of ERP systems. Above all, since ERP implementation projects are new in Iran, the subject of identifying key effective factors on the successfulness of the organization in implementing ERP systems is vitally important. One of the barriers in proper evaluation of the organizational readiness in the successful implementation of ERP systems is that the way and quality of dealing with many effective factors will be specified just during the implementation of the ERP projects. Accordingly, it is important to use some models as the guideline of the organization in each step of implementing ERP systems, including the preliminary step of buying related software to the support step. Additionally, such steps can expose the executive managers and decision-makers to the needed capabilities for a successful performance.

Studying the literature review and related studies and researches about the identification and evaluation of key factors of the success in implementing ERP projects lead us to classify the key factors of success in four general groups (organizational, process, technology-related, and human resource-related factors) and 36 specific factors (see table 1).

3. Explaining the problem

Previously, the applied programs of information systems were provided separately and there was no relationship between different pieces of provided information. Such softwares were used by the small companies who could meet their needs easily by such applied programs. In most international institutes the information systems varied from one internal department to another and from one region of their activity to another. The main reason of such difference can be found in their region-based strategy and in the lack of an accepted universal solution. The pressures of globalization forced the organizations to improve the cooperation of national units and their commercial partners. Thus, after a period of time,

when the organizations started re-engineering their business process, they feel the need for different information systems and the need for generating integrated information systems that can use the

softwares of different departments (accounting, production, sale, warehouse, etc.) in an integrated form and can make a suitable connection between different regions.

Table 1. Key factors of the success

Organizational	Sustainable support by leadership and top management
	Strong project management in implementation
	To plan ERP implementation strategy properly and To define the policy and its goals clearly and precisely
	Coordination between ERP and organizational vision, objectives, and strategies
	To identify the resources, costs, and risks of the project
	The fitness between ERP software and organizational culture
	To assign the tasks and responsibilities correctly
	Proper management of the expectations
	To choose a suitable approach and method for implementation
	To devolve the authority and power of decision-making to the team
	To plan a time-schedule for the project
	To make a continuous relationship with the stakeholders outside the organization (like shareholders, customers, providers, supervisors, etc.)
Process-based	To re-engineer the business processes
	The capabilities of leaders and top managers in change management
	The need to customize the system
	Good configuration of ERP system
	To test and troubleshoot the system before implementation
Human resource-related	To train the managers, team members, and employees
	The motivation and participation of the employees in putting ERP
	The active participation of project pioneers
	Continuous relationship between implementation team and the employees of the organization
	The complete confidence between different players of the project
	A strong project team
Technology-related	Inter-department cooperation
	The capability of integrating the system with traditional systems
	The fitness of ERP with the IT infrastructures of the organization
	Information exchange and data analysis
	Current system management
	The validity and authenticity of the data used in the system
	Information architecture
	Choosing suitable ERP package
	Using suitable software and hardware
	Supporting services by the seller of ERP system
	Using suitable version of ERP product
	Problems of multi-locational use
Upgradability with the new scientific findings on ERP	

It is to be noticed that the main philosophy of ERP is to improve the processes, including all processes of the organization. ERP may transform all processes. This system interacts with most employees of any organization as well. In other words, such an attitude requires changes in cultural, human, technical, process, and structural dimensions of all the organization. Hence, its implementation faces specific difficulties, needs considerable resources, and its

success will require a sufficient knowledge about ERP and its characteristics. Although there are lots of studies and researches about ERP and its key characteristics, but unfortunately there is a poor literature in the area of ERP in Iran and such researches cannot meet the needs of professional and scientific society. One of the barriers in proper evaluation of the organizational readiness in the successful implementation of ERP systems is that the

way and quality of dealing with many effective factors will be specified just during the implementation of the ERP projects. Since ERP directly relates to the specific conditions of the implementer and the users, it is necessary to develop researches about ERP concept and the indicators of its successfulness at the national level with especial attention to Iranian organizations. In this research we have studied the key effective factors on implementing ERP strategy in Apadana Ceram Company that is an important manufacturer in tile and ceramic industry.

This research attempts to answer the following questions:

A. What are the key effective organizational factors on implementing ERP strategy in Apadana Ceram Company?

B. What are the key effective process-based factors on implementing ERP strategy in Apadana Ceram Company?

C. What are the key effective technology-related factors on implementing ERP strategy in Apadana Ceram Company?

D. What are the key effective human resource-related factors on implementing ERP strategy in Apadana Ceram Company?

3.1. Objectives

The main objective of this research is "to identify and evaluate the key effective factors on implementing ERP strategy in Apadana Ceram Company". Besides, we will follow some subsidiary in this research. The subsidiary objectives are as follow:

- To explain the definitions, and studying the birth, evolution, challenges, advantages, and disadvantages of ERP systems with regard to the experience of its implementation in other companies.
- To increase the knowledge of Apadana Ceram Company experts about the key effective factors on implementing ERP strategy.
- To rank and prioritize the key effective factors on implementing ERP strategy in Apadana Ceram Company.
- To offer some strategies and suggestions to Apadana Ceram Company and other production companies in order to implement ERP project successfully.

4. Methodology

This is a practical research that has used library resources (including the books, dissertations, related reports, websites, and national and international journals) on ERP and the key effective factors on implementing ERP strategy. Studying the mentioned resources, the researcher first studied the experiences of Iranian and international companies who have implemented mentioned system; then she interviewed the experts, software companies, consultant

companies, and the managers and experts of Apadana Ceram Company to extract the key effective factors on implementing ERP strategy in the mentioned company. Then she classified the factors into 4 groups: organizational key factors; process-based key factors; technology-related key factors; and human resource-related key factors. Then she evaluated and assessed the mentioned key factors in a field study using a questionnaire collected from the experts and managers of Apadana Ceram Company who were involved in ERP project. In order to get sure about the validity and comprehensiveness of the collected data and identified key factors regarding the exclusive conditions of tile and ceramic industry in general and Apadana Ceram Company in particular, the researcher referred to the opinions of the experienced experts and managers of Apadana Ceram Company.

4.1. Statistical population and sample size

The statistical population of this research includes 52 subjects among which 10 subjects are *key users* who have passed all needed training courses and are now the determine the needs and processes of the organization and offer the needed suggestions, 30 subjects are end users who have passed general trainings and are the users of some parts of the software, and 12 subjects are middle-level managers of Apadana Ceram Company who are involved in ERP project.

4.2. Questionnaire

To measure the variables of the research, questionnaire has been used. In this regard, to compile preliminary questionnaire, the researcher did some discovering interviews with the experts in information technology and human resource planning. She also studied the related books, journals, and texts to identify the key factors to be inserted into the questionnaire. Then, to determine the validity of the preliminary questionnaire, it was sent to 10 subjects to find probable errors or unrelated questions. Additionally, the reliability of the questionnaire was calculated using Cronbach's alpha in SPSS software. The obtained Cronbach's alpha was 0.742; thus it can be claimed that the questionnaire is reliable. Then, to consider the corrective suggestions of the experts, the final questionnaire was designed and it named the "questionnaire of studying key effective factors on implementing ERP strategy in Apadana Ceram Company". The final version of the questionnaire then was distributed among 52 subjects of the statistical population. 46 subjects completed the questionnaire and sent it back to the researcher. To measure the attitudes of the respondents about the requirements of successful implementation of ERP systems, the answers were assessed in a 5-point ranking (ordinal) Likert range.

5. Data analysis

Table 2 shows that %43 of the respondents have had PhD degree, %21.7 have had MSc degree, %69.6 have had bachelor degree, %2.2 have had associate's degree, and %2.2 have had high school diploma.

Table 2. Distribution of respondents' educational degree

Latest educational degree	Frequency	%
Lower than high school diploma	0	0.0
High school diploma	1	2.2
Associate's degree	1	2.2
Bachelor	32	69.6
MSc.	10	21.7
PhD.	2	4.3
Total	46	100

The results of the question about the experience of the respondents in working with IT and related practical softwares are summarized in table 3. The results show that %1.9 of the respondents had very low experience, %3.7 had low experience, %31.5 had average experience, %44.4 had good experience, and %18.5 had very good experience.

Table 3. Distribution of respondents' working experience with practical softwares

Level of experience	Frequency	%
Very low	1	1.9
Low	1	3.7
Average	17	31.5
Good	24	44.4
Very good	10	18.5
Total	46	100

The results of the question about the acquaintance of the respondents with ERP concept and its implementation are summarized in table 4. The results show that %4.3 of the respondents were not acquainted with ERP concept, %17.4 were just acquainted with basic and elementary concepts of ERP subject, %47.8 were acquainted with ERP concept at an average level, %23.9 were acquainted with ERP concept at a professional level, and %6.5 had the experience of being involved in ERP implementation process.

The hypotheses of the research are as follow:

Hypothesis 1: Key organizational factors are effective on successful implementation of ERP strategy in Apadana Ceram Company.

Hypothesis 2: Key process-based factors are effective on successful implementation of ERP strategy in Apadana Ceram Company.

Hypothesis 3: Key technology-related factors are effective on successful implementation of ERP strategy in Apadana Ceram Company.

Hypothesis 4: Key human resource-related factors are effective on successful implementation of ERP strategy in Apadana Ceram Company.

The results of the binomial test for each of the hypotheses are summarized in tables 2 to 8.

Table 4. Distribution of respondents' acquaintance with ERP concept

Level of acquaintance with ERP concept	Frequency	%
Not acquainted	1	4.3
Acquainted with basic and elementary concepts	8	17.4
Acquainted at an average level	22	47.8
Acquainted at a professional level	11	23.9
Very good	3	6.5
Experienced in being involved in ERP implementation.	46	100

Table 5. The results of the binomial test for hypothesis 1

Hypothesis	Sig.
Key organizational factors for successful implementation of ERP strategy	
Sustainable support by leadership and top management	0.000
To plan ERP implementation strategy properly and To define the policy and its goals clearly and precisely	0.000
Coordination between ERP and organizational vision, objectives, and strategies	0.000
To identify the resources, costs, and risks of the project	0.000
To choose a suitable approach and method for implementation	0.000
Strong project management in implementation	0.000
The fitness between ERP software and organizational culture	0.000
To assign the tasks and responsibilities correctly	0.000
To devolve the authority and power of decision-making to the team	0.000
To plan a time-schedule for the project	0.000
To make a continuous relationship with the stakeholders outside the organization (like shareholders, customers, providers, supervisors, etc.)	0.000
Proper management of the expectations	0.000

Table 6. The results of the binomial test for hypothesis 2

<i>Hypothesis</i>	<i>Sig.</i>
Key process-based factors for successful implementation of ERP strategy	
To re-engineer the business processes	0.000
The capabilities of leaders and top managers in change management	0.000
The need to customize the system	0.000
To test and troubleshoot the system before implementation	0.000
Good configuration of ERP system	0.000

Table 7. The results of the binomial test for hypothesis 3

<i>Hypothesis</i>	<i>Sig.</i>
Key technology-related factors for successful implementation of ERP strategy	
Using suitable software and hardware	0.000
Supporting services by the seller of ERP system	0.000
The fitness of ERP with the IT infrastructures of the organization	0.000
Choosing suitable ERP package	0.000
Using suitable version of ERP product	0.000
Problems of multi-locational use	0.000
Upgradability with the new scientific findings on ERP	0.000
The capability of integrating the system with traditional systems	0.000
Information exchange and data analysis	0.000
Current system management	0.000
The validity and authenticity of the data used in the system	0.000
Information architecture	0.000

Table 8. The results of the binomial test for hypothesis 4

<i>Hypothesis</i>	<i>Sig.</i>
Key human resource-related factors for successful implementation of ERP strategy	
To train the managers, team members, and employees	0.000
A strong project team	0.000
The motivation and participation of the employees in putting ERP	0.000
The active participation of project pioneers	0.000
Continuous relationship between implementation team and the employees of the organization	0.000
The complete confidence between different players of the project	0.000
Inter-department cooperation	0.000

Since *Sig.* (calculated error) for each of the data sets is less than %5, thus H_0 is rejected and the test results of all hypotheses are accepted and confirmed.

6. Conclusions

Data analysis shows that among the 4 groups of key factors in successful implementation of ERP strategy, "Key human resource-related factors" have the highest effectiveness. The other effective groups are "Key organizational factors", "Key process-based factors", and "Key technology-related factors" respectively.

Regarding the ranking calculated in Friedman Test, the most effective key factors in successful implementation of ERP project for each group are respectively as follow:

"Key organizational factors" group

- 1) Sustainable support by leadership and top management.
- 2) The fitness between ERP software and organizational culture.
- 3) To plan ERP implementation strategy properly and To define the policy and its goals clearly and precisely.
- 4) To choose a suitable approach and method for implementation.
- 5) Coordination between ERP and organizational vision, objectives, and strategies.
- 6) To identify the resources, costs, and risks of the project.
- 7) To make a continuous relationship with the stakeholders outside the organization.
- 8) Strong project management in implementation.
- 9) To devolve the authority and power of decision-making to the team.
- 10) To plan a time-schedule for the project.
- 11) To assign the tasks and responsibilities correctly.
- 12) Proper management of the expectations.

"Key process-based factors" group

- 1) To re-engineer the business processes.
- 2) The capabilities of leaders and top managers in change management.
- 3) To test and troubleshoot the system before implementation.
- 4) The need to customize the system.
- 5) Good configuration of ERP system.

Key technology-related factors" group

- 1) The fitness of ERP with the IT infrastructures of the organization.
- 2) Supporting services by the seller of ERP system.
- 3) Choosing suitable ERP package.

4) The validity and authenticity of the data used in the system.

5) Upgradability with the new scientific findings on ERP.

6) Using suitable version of ERP product.

7) Using suitable software and hardware.

8) Problems of multi-locational use.

9) The capability of integrating the system with traditional systems.

10) Information exchange and data analysis.

11) Information architecture.

12) Current system management.

"Key human resource-related factors"

1) To train the managers, team members, and employees.

2) The motivation and participation of the employees in putting ERP.

3) Continuous relationship between implementation team and the employees of the organization.

4) A strong project team.

5) The complete confidence between different players of the project.

6) The active participation of project pioneers.

7) Inter-department cooperation.

Generally, the message of this study is the necessity of changing the attitudes toward the projects of resource planning of the organization from the technological attitude to the business attitude.

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