

Analytical Study of Challenges and Barriers of Creation of Value through Information Systems in Management and Construction Processes of Projects by Contracting Firms in Tehran

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ABSTRACT

Now, information system of project management is an essential part of any project, which consists of tools and techniques that are used to collect, synthesize, integrate and distribute outputs of the project management process. Project management whether inside the country or across the world in dealing with the increasing volume of information, and following it, the complexity of the decision-making, has found that manual non-integrated systems, and even in some cases non-specialist, based on the importance of information and information systems are not capable to create value. In other words, these systems often cause that most of managers are drowned in an eddy of information in sensitive conditions and cannot take the appropriate decisions and cause the organization is driven toward the loss of opportunities to create new values. Study the problems related to the use of information systems, exploitation and the correct use in order to create value is important for the organization or firm; because in this way the creation of value will be easier for these firms and at the lower levels of projects. The present study investigates the analytical challenges and barriers of creation of value through information systems in management and construction processes of projects by contracting firms in Tehran based on a descriptive-survey method using questionnaire, one-sample test, chi-square and AHP model by SPSS software version 21. The results show the significance of tests, and the problems and constraints are classified based on their significance that the institutional, human and environmental factors are the most important barriers respectively.

KEYWORDS: challenges and barriers, creation of value, information system, management and construction, contracting firms of Tehran.

INTRODUCTION

Successful managers are those who can better manage and use the information to make on-time, effective and problem-solving decisions. In fact, the fate of works is tied up with decision-makings and if decisions are not taken based on the accurate principles, the system becomes unstable. In decision-maker's components and conditions, including the deduction of adequate and accurate information and utilizing the experiences and advice of knowledgeable experts, enough attention must be paid (Aliakbari and Mahdipoor, 2010). Today, most organizations are looking for selecting and implementing appropriate model or approach to improve the quality of their products and services, and ultimately to create value for all stakeholders, but in spite of expanding enormous costs, due to the lack of integrated business processes that covers all levels of the organization, have not been successful (Talaie and Jabalameli, 2007).

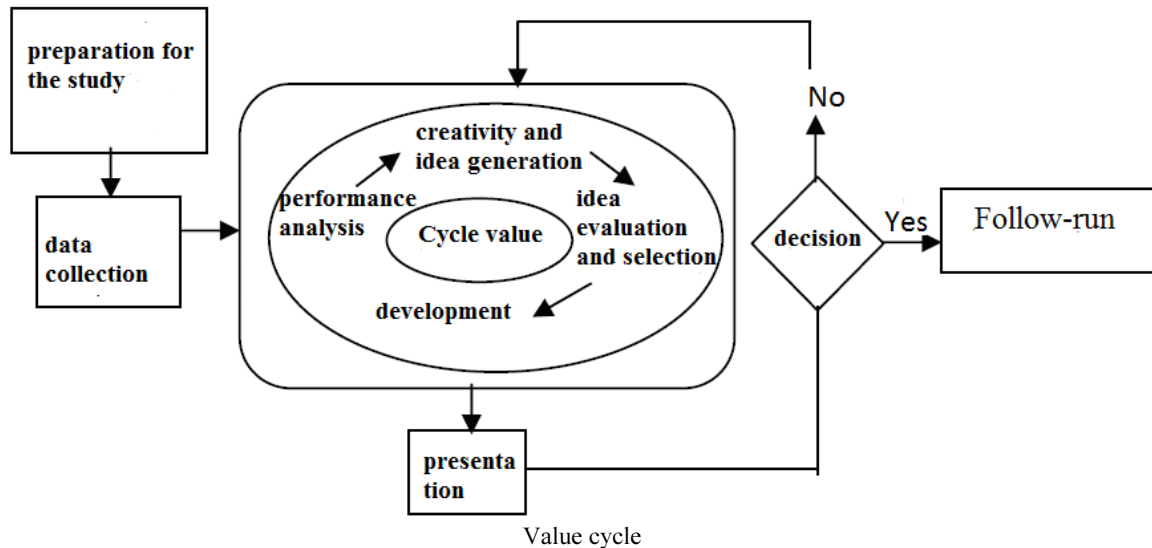
Information system is a set of elements that are related with each other that collect data and information, manipulate and distribute them, and provide feedback to achieve a goal (Banaeyan, 2008: 147). Organizational information system is an information system to study the information which relates to that organization. Organizational information systems are used in three fields which include performing operations, controlling operations and decision making in organizations. Organizational information systems can be performed manually or by computer, or synthetically by computer and manually (Omidvar, 2006: 2).

Creation of value can be used by relying on teamwork, collection wisdom and flexibility of its work program, alongside many other project management processes to improve their results; therefore, it is particularly concerned. In this tool, it is tried much attention be paid to issues of cost, time and the need, and reach them to an optimum level. The more the needs are important and worthy, the more effective the use of creation of value will be. But more precisely, the fields which enjoy the following criteria have more talent to benefit from the value:

- High cost;
- The high number of components;
- The existence of complex parts and systems;

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- Long period of time from initial design;
- Mass production (repetition of operation frequency);
- Variable environment;
- The importance of customer satisfaction;
- Exclusive items;



The barriers of the creation of value in information systems

The integration approach in information systems often means taking a strategic approach towards reform, because the integration of the objectives of the reforms, information and technology need a continuous and integrated activity in areas of organizations and at level of high rank managers. Integration is an approach with the greatest likelihood of creating potential benefits to reform the information age; however, this approach enjoys the minimum generality. Some of the reasons for the lack of fortune by public sector organizations towards the integration approach include the following:

Factors that hinder the development of the “denial” approach include insufficient knowledge and skills, lack of financial resources, lack of accountability by public officials, suspicion towards the success of IT, and the weakness of infrastructures

Factors that encourage continuing the worship approach including the notion of IT as a decisive solution for the reforms in the public sector, pressures from the external organizations, rapid changes and continuous innovations in the field of IT and managers’ imitational attitudes.

Other limiting factors of the integration approach include technical barriers, barriers related to knowledge and skills, barriers related to the quantity and quality of data and structural and cultural barriers (Hicks, 2000).

The main problem in this research is that the creation of value through information systems in management and construction of projects in contracting firms in Tehran is faced with which type of difficulties and obstacles? And, what are the roles of organizational, human and environmental factors in lack of value creation through information systems in management and construction of projects in contracting firms in Tehran?

The main question of the research

What are the barriers and problems of the creation of value through information systems in management and construction of projects in contracting firms in Tehran?

Sub-questions

1. What are the role of environmental factors in hindering the creation of value through information systems in management and construction of projects in contracting firms in Tehran?
2. What are the role of human factors in hindering the creation of value through information systems in management and construction of projects in contracting firms in Tehran?
3. What are the role of organizational factors in hindering the creation of value through information systems in management and construction of projects in contracting firms in Tehran?

Background of the research

Hassanzadeh (2005), in a research entitled “the study and comparison of the performance of Bhutan firm before and after the implementation of project-based information systems”, investigated the performance of Bhutan firm before and after the implementation of the plan and found that there is a positive relationship between the two variables of information systems of the firm and performance of the firm, and automation has caused the performance of the firm to be improved.

Tavakolizadeh Davoodi (1996) studied the effect of training how to use computer databases on the accuracy coefficient of information retrieval at the search time and found that training users how to use computer databases has a relative association with reducing the search time.

Ghazizadeh Fard (1996), in his doctoral dissertation entitled “designing and explaining the model of studying and analysis of the human barriers in establishment and use of management information system”, identified the barriers in the form of four sections that are manpower, lack of connection among information systems, systems without content, and systems without management.

Kazemi et al (2008), in a research entitled “the study of barriers in establishment of e-government in Iranian governmental organizations” investigated the six categories of barriers including administrative barriers, organizational barriers, technical barriers, human barriers, financial barriers and environmental barriers. The results of this study showed that, except for financial and technical factors, the other factors act as barriers to the deployment of e-government in Iranian governmental organizations.

Kia (2007) in a research studied the barriers and strategies of establishment of electronic city in the view of experts in the field of information and communication technology and classified them in five categories that the results showed that the administrative, educational, economic, technical, political and cultural barriers are placed in ranks one to five respectively.

Farhangi et al (2010), in a study entitled “the study of barriers of the effective use of information and communications technology in order to improve accountability to stakeholders in Iranian firms of mining industry” investigated the social barriers, infrastructural barriers, digital interval, law barriers, information security barriers and change management as the main barriers to the effective use of information and communication technology. The results showed that the components of the social barriers, infrastructural barriers, digital interval and legal barriers create the maximum deterrence respectively and information security and change management create minimum deterrence respectively.

Badragheh (2010), in his doctoral dissertation entitled “the implications and challenges of implementing a management information system”, studied the factors affecting the use of management information system and ranked them from one to six as managerial factors, cultural-organizational factors, learning-teaching factors, technical factors, human factors and economic factors respectively.

Khosrovpour (1999), in a study investigated the factors influencing the success of the organizations' information systems, that the results indicated that the knowledge of managers and users is an important factor in this field.

Batangar (1991) in a study found that the lack of skillful human resources in information system, and also lack of professional managerial experts are considered as the critical challenges in management information systems in developing countries.

McLain and Dillon (1992), in a study, suggest that the criteria for assessing the quality of information systems are classified into six main categories including system quality, information quality, system applications, user satisfaction, impact on individuals and impact on the organization.

Igbaria and Ivari (1997), in a research, investigated the occupational diversity as an important factor in the success of information systems. According to these researchers, the more the occupational diversity, the more it is necessary to change the basic properties of the system because of occurring unexpected events, that this issue requires user's participation.

RESEARCH METHOD

In this study, in order to achieve a clear idea on analysis of the challenges and barriers to the creation of value through information systems and research principles, the descriptive-library method has been used. The purpose of the research is to study the challenges and obstacles in creating value analytically through information systems in processes of management and construction in contracting firms in Tehran. The present research is an applied one in terms of objective and a descriptive-survey one in terms of nature and methodology. The field and survey data were collected through researcher-made questionnaire. The population consists of professionals, academic experts, general managers, project managers and quality managers and the experienced experts in a number of contracting firms in Tehran, which include 93 individuals, and based on Cochran formula, the sample size was selected as 73 individuals. The validity of the questionnaire was confirmed by experts, and its reliability was obtained equal to 0.91

according to Cronbach formula. To study hypotheses, one-sample test and Chi-square using SPSS software and AHP model using EXPERT CHOICE 11 software were used.

$$N = \frac{\frac{t^2 pq}{d^2}}{1 + \frac{1}{n} \left(\frac{t^2 pq}{d^2} - 1 \right)}$$

$$N = \frac{\frac{(1.96)^2 (0.95)(0.05)}{(0.05)^2}}{1 + \frac{1}{90} \left(\frac{(1.96)^2 (0.95)(0.05)}{(0.05)^2} - 1 \right)} = 73$$

It should be noted that the data collected in this study are as follows: first, the related literature was collected through internet and reviewed, and then the population was selected and the questionnaires was distributed. Finally, the samples were examined as a field study that the results are discussed as following.

Findings

The first hypothesis testing

Environmental factors act as a barrier in the creation of value through information systems in management and construction of projects in contracting firms in Tehran.

According to the scores obtained from the sample and performing one-sample t-test, the results are summarized in following tables. As it can be seen, p-value, i.e, the significance is equal to 0.000, that is less than the value of α ($\alpha = 0.05$); so the null hypothesis which states that the mean of the variable of environmental factors equals to 3 is not approved. From one hand, the two numbers shown in the column related to 95 percent confidence interval of mean difference does not include zero. Therefore, this shows that the null hypothesis is rejected. Positivity of upper and lower limits of this interval also indicates that the mean of environmental factors according to the mean of community which is 3.23, equals to 3. The overall result will be explained in this way that the condition of environmental factors, according to the mean of the studied population which is 3.23, is relatively high. The two other hypotheses are tested in this way.

Table 1

Variables	No.	Mean	Standard deviation	Standard deviation from the mean
	73	3.23	0.514	0.060
The rate of prevention of creating value by environmental factors	t-value	Degree of freedom	Significance level	Difference from mean
	3.847	72	0.000	0.23

Therefore, the results show that the mean of significance of items (0.000) is less than 0.05 which suggests that the hypothesis is confirmed.

The second hypothesis

Human factors act as a barrier in creation of value through information systems in management and construction of projects in contracting firms in Tehran.

Table 2

Variables	No.	Mean	Standard deviation	Standard deviation from the mean
	73	3.32	0.371	0.043
The rate of prevention of creating value by human factors	t-value	Degree of freedom	Significance level	Difference from mean
	7.356	72	0.000	0.32

Therefore, the results show that the mean of significance of items (0.000) is less than 0.05 which suggests that the hypothesis is confirmed.

The third hypothesis

Organizational factors act as a barrier in creation of value through information systems in management and construction of projects in contracting firms in Tehran.

Table 3

Variables	No.	Mean	Standard deviation	Standard deviation from the mean
	73	3.19	0.362	0.042
The rate of prevention of creating value by organizational factors	t-value	Degree of freedom	Significance level	Difference from mean
	4.449	72	0.000	0.19

According to the significance level given in the table above which is equal to 0.000 and its comparison with allowable error rate of 0.05 with 95% confidence, we can conclude that, in the view of respondents, the organizational factors with mean of 3.19 moderate in creating value through information systems at more than intermediate level in construction management of projects in contracting firms in Tehran.

Based on the results obtained from the analysis of the significance of each of the environmental, organizational and human factors, human and organizational factors are more significant than environmental factors, and organizational factors, in comparison with other indicators, enjoy higher significance, and therefore in this classification, the organizational factor is placed at the first priority and the environmental factor is placed at the last priority.

Prioritization of barriers to the creation of value

To prioritize the components preventing the creation of value through information systems in management and construction of project in contracting firms, i.e., the three main environmental, human and organizational components, Friedman test was used. The results of this test are summarized in the following table:

Table 4. Test Statistics^a

N	73
Chi-Square	53.510
df	3
Asymp. Sig	0.000

^a Friedman Test

Since the significance value is less than 5%, the ranking of the independent variables is different.

Table 5

Factors	Mean of ranks	Chi-square value	df	Sig
Environmental factors	1.86	53.510	3	0.000
Human factors	1.99			
Organizational factors	2.15			

1. Organizational
2. Human
3. Environmental

The analytic hierarchy process for paired comparison

One of the factors of decision making method by AHP parameters is the multiple analytic hierarchy process AHP, which the use of this method requires the following four steps:

Step one. Modeling: in this step, the problem and purpose of decision-making are formed as a hierarchy of elements of decision that are associated with each other. The decision elements include decision making index and the options of decision.

Step two. The preferential judgment or paired comparisons: comparisons between different options of decision making are done based on each index and the importance of each index is determined by doing paired comparisons.

Step three. Calculation of relative weights, weight and the importance of the elements are determined in comparison with each other by a set of numerical calculations.

Step four. Integration of relative weights and calculation of final weight: this step is done in order to rank the alternatives. In the method of AHP, there is as a subject under the title of "system adaptation". The rate of adaptation is a mechanism that determines the rate of adaptation of comparisons. This mechanism indicates that how

much we can trust the priorities in tables. Experience has shown that, if the adaptation rate is less than 0.1, adaptation of comparisons can be accepted; otherwise, the comparisons must be done again (Mehrgan, 2004).

Prioritization and ranking (AHP)

AHP method is a technique which is used for solving multi-criterion decision-making problems with a hierarchical structure. To do AHP method, it is required that we specify our criteria and alternatives a structural hierarchy, i.e., we must specify what criteria and sub-criteria we have considered to rank the alternatives. Then the paired questionnaire for comparison including all scales, sub-scales and items must be designed. In the questionnaire for the paired combining binary comparison, all scales (criteria) and options (alternatives) should be considered (of course, according to the hierarchical structure of the problem!). So, if the number of criteria and alternatives is much, it causes the number of paired comparisons increases that this leads to long questionnaire and respondents may be mistaken in comparisons or due to impatience, comparisons are not done with high accuracy, and inconsistency rate increases. For this purpose in order to achieve better results and more specific assessment in the present study, a limited number of indicators criteria were used. Therefore, the number of parameters and options must be to the extent that the number of paired comparisons in the questionnaire seems reasonable. The next point is that the AHP method is a method which is based on experts' opinion, that is, the paired comparative questionnaire should be administered to the experts and specialists who are dominant on all aspects and criteria of the problem. In some cases it is likely, there are not more than 3 or 5 experts in the sample, however, there is not any problem in this respect, and the obtained results are completely significant and scientific, because the questionnaire have been completed by experts, and there is no need to have a high volume of samples. The remarkable point is that, the reason for using AHP method in this study is the rate of accuracy of the results, because the obtained results are based on opinions of academic experts and scholars in this field, and its advantage than other analytical models, such as TOPSIS and taxonomy, is its high precision because of the accurate weighting and the expert-based results.

Since, the number of barriers avoiding creation of value, that have been surveyed and approved in the table above, is much, by utilizing the experts' consultation and opinions and based on obtained data from the above tables including the mean of each proposition, the following criteria were considered as the main criteria for prioritization and ranking of the factors.

Environmental factors

- Non-existence or being less active the forums
- Lack of measurement standard for the quality of information systems
- Lack of holding appropriate training courses for post-graduates
- Non-appropriate use of media
- Non-evaluation of environmental aspects

Human factors

- Lack of necessary precision in collecting information
- Non-satisfaction of individuals' welfare state
- Lack of experience of managers and absence of appropriate technocracy
- Non-participation of managers and staff
- Non-awareness of managers and users precisely from what they want

Organizational

- Technology and structural problems in consulting firms
- Inappropriate and incorrect implementation of system in constructional projects
- Lack of human resources with two professional areas of computer and management
- The absence or lack of appropriate controls on the employees working in this field
- Unfavorable condition of teaching and training the experts

To analyze the data collected from the AHP questionnaire of the survey that was developed by a set of seven experts who had sufficient information and experience in the field, the following results were obtained. In addition, to analyze data collected, the Geopel 26.07.2014 software was used.

Table 6. Environmental components

Rank	Environmental variable	Weight
1	Non-existence or being less active the forums	42.3%
2	Lack of measurement standard for the quality of information systems	21.4%
3	Lack of holding appropriate training courses for post-graduates	14.9%
5	Non-appropriate use of media	9.1%
4	Non-evaluation of environmental aspects	12.3%

Based on the results of AHP data analysis, as it can be seen in the table above, experts and specialists of the field allocated the maximum weight to the component of "non-existence or being less active the forums" and the minimum weight to the component of "non-appropriate use of media" and the components of "lack of measurement

standard for the quality of information systems” and “non-holding appropriate training courses for post-graduates” and “non-evaluation of environmental aspects” are placed at following priorities respectively.

Table 7. Human factors

Rank	Human variable	Weight
1	Lack of necessary precision in collecting information	29%
2	Non-satisfaction of individuals' welfare state	21.4%
3	Lack of experience of managers and absence of appropriate technocracy	19.8%
5	Non-participation of managers and staff	14.2%
4	Non-awareness of managers and users precisely from what they want	15.5%

Based on the results of AHP data analysis, as it can be seen in the table above, experts and specialists of the field allocated the maximum weight to the component of “lack of necessary precision in collecting information” and the minimum weight to the component of “non-participation of managers and staff” and the components of “non-satisfaction of individuals' welfare state”, “lack of experience of managers and absence of appropriate technocracy” and “non-awareness of managers and users precisely from what they want” are placed at following priorities respectively.

Table 8. Organizational components

Rank	Organizational variable	Weight
1	Technology and structural problems in consulting firms	24.9%
3	Inappropriate and incorrect implementation of system in constructional projects	18.1%
2	Lack of human resources with two professional areas of computer and management	23.7%
5	the absence or lack of appropriate controls on the employees working in this field	17.8%
4	Unfavorable condition of teaching and training the experts	15.6%

Based on the results of AHP data analysis, as it can be seen in the table above, experts and specialists of the field allocated the maximum weight to the component of “technology and structural problems in consulting firms” and the minimum weight to the component of “unfavorable condition of teaching and training the experts” and the components of “lack of human resources with two professional areas of computer and management”, “Inappropriate and incorrect implementation of system in constructional projects” and “lack of proper control on the activities of staff” are placed at following priorities respectively.

Overall, the results indicate the superiority of the organizational factor with allocated weight of 20.20 from the mean of weights compared to the human factor (19.8%), and environmental factor (20%). So in this field, organizational factors are the most important barrier in creating value through information systems, and environmental factors and human factors are at next ranks respectively.

Conclusion

IT is considered as a tool to empower the most important factor in increasing the efficiency and effectiveness of the organization, and the different industries have taken important steps for the use of these technologies to maintain their survival in today's competitive environment and to enhance their consequences of using them.

Several factors affect the creation of value in information systems in contracting firms, which in this research, the environmental, human and organizational factors have studied that the results in two phases of prioritization based on AHP model and the level of significance and effectiveness in the lack of efficacy in creating value through information systems indicate that in the phase of significance and based on the mean of significance for each of the items of the questionnaire, the organizational factor is more significant and is placed at the first place; the human factor is at second place and the third place is allocated to environmental factor.

Furthermore, based on the AHP ranking model, the superiority of the organizational factor with weight of 20.20 is evident in comparison with human factor with weight of 19.8%, and environmental factor with weight of 20. Therefore, in this part, the organizational factors are the most important factors in preventing the creation of value through information systems, and the environmental and human factors are at following places.

In general, all human, environmental and organizational factors prevent the creation of value through information systems in management and construction of projects in contracting firms in Tehran, and basic precautions should be taken in this area to be able to achieve the positive and effective role of these factors in creation of value.

Suggestions

- Efforts must be done to create value and to achieve the expected results for shareholders, stakeholders and customers through the development and greater efficiency.
- Considering important the views and expectations of the client to create value.
- Internal processes for production and giving customer the service purposefully must be studied and analyzed.
- The potential competences in culture, technology and staff must be considered for creation of added value, and according to it, various plans must be designed and these capacities should be considered on the environmental, organizational and humane advantages.
- Targeting on the strength of systems, with continuous promotion of complete information related to all vital information systems and capturing the market and customer needs, in order to retain existing customers, along with attracting new customers and markets.
- Creating balance in the goals of information systems and information technology with business and organizational needs.

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