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Investigating and developing factors affecting the engineering value of the phase of construction of urban gardens (Case Study Of Iranian Gardener In Tehran)

S. Abarghani, Engineering and Construction Management Student, Faculty of Civil Engineering, University of Eyvanekey, Iran
Saman_abarghani@yahoo.com

A.R. Keshvari, Professor, Faculty of Industrial Management, University of Imam Hosein, Iran.
Negahdasht@yahoo.com

M. Ahmadvand, Instructor, Faculty of Civil Engineering, University of Eyvanekey, Iran.
M.ahmadvand.eyc@gmail.com

H. Eghbali, Instructor, Faculty of Industrial, University of Eyvanekey, Iran.
H.eghbali@eyc.ac.ir

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Abstract

The present study aims to investigate and formulate factors influencing the engineering value of urban construction phases in a Bustan located in Tehran, Iran. First, four main factors of "system management", "characteristics and specifications", "implementing company" and "environmental conditions" were evaluated using questionnaire method among 63 managers and experts, consultant, and contractor of the Iranian Boston Project. Then, factors and criteria were analyzed using descriptive statistics and various tests such as Kolmogorov-Smirnov's Normality Test, Binomial Ratio Test, and Friedman Ranking Test using SPSS software. The results showed that system management with a value of 3.25 has a higher priority than other factors affecting the engineering value of the phase of the construction, and the characteristics of the project with the value of 2.92, the host company with the value of 2.31 and the environmental conditions of the project with the amount of 1.52 are in the order of priority.

Keywords: Effective Factors, Value Engineering, Construction Phase, Construction Projects, Iranian Gardens.

Investigando e desenvolvendo fatores que afetam o valor de engenharia da fase de construção de jardins urbanos (Estudo De Caso Do Jardineiro Iraniano De Tehran)

Resumo

O presente estudo tem como objetivo investigar e formular fatores que influenciam o valor de engenharia das fases de construção urbana em um Bustan localizado em Teerã, no Irã. Primeiro, quatro fatores principais de "gerenciamento do sistema", "características e especificações", "empresa implementadora" e "condições ambientais" foram avaliados pelo método de questionários entre 63 gerentes e especialistas, consultor e empreiteiro do Projeto Iraniano de Boston. Em seguida, os fatores e critérios foram analisados por meio de estatística descritiva e diversos testes, como o Teste de Normalidade de Kolmogorov-Smirnov, Teste de Razão Binomial e Teste de Classificação de Friedman, utilizando o software SPSS. Os resultados mostraram que o gerenciamento do sistema com um valor de 3,25 tem uma prioridade maior do que outros fatores que afetam o valor de engenharia da fase da construção, e as características do projeto com o valor de 2,92, a empresa anfitriã com o valor de 2,31 e as condições ambientais do projeto com o valor de 1,52 estão na ordem de prioridade.

Palavras-chave: Fatores Efetivos, Engenharia de Valor, Fase de Construção, Projetos de Construção, Jardins Iranianos.

Factores de investigación y desarrollo que afectan el valor de ingeniería de la fase de construcción de jardines urbanos (Estudio De Caso De Jardinero Irán En Teherán)

Resumen

El presente estudio tiene como objetivo investigar y formular factores que influyen en el valor de ingeniería de las fases de construcción urbana en un Bustan ubicado en Teherán, Irán. Primero, se evaluaron cuatro factores principales de "gestión del sistema", "características y especificaciones", "empresa implementadora" y "condiciones ambientales" utilizando el método del cuestionario entre 63 gerentes y expertos, consultores y contratistas del Proyecto iraní de Boston. Luego, se analizaron los factores y criterios utilizando estadísticas descriptivas y varias pruebas, como la prueba de normalidad de Kolmogorov-Smirnov, la prueba de relación binomial y la prueba de clasificación de Friedman con el software SPSS. Los resultados mostraron que la administración del sistema con un valor de 3.25 tiene una prioridad más alta que otros factores que afectan el valor de ingeniería de la fase de la construcción, y las características del proyecto con un valor de 2.92, la compañía anfitriona con un valor de 2.31 y Las condiciones ambientales del proyecto con un monto de 1.52 están en el orden de prioridad.

Palabras clave: Factores efectivos, Ingeniería de valor, Fase de construcción, Proyectos de construcción, Jardines iraníes

1. Introduction

One of the characteristics of each country's economic development is the Construction projects of its country, which is considered as the main criterion and indicator of its economic prosperity. Implementation of civil engineering projects requires mechanisms and factors to complete the cycle optimally with the lowest cost and maximum profit, and ultimately by creating value and increasing productivity (Shakeri, Ghorbani, 2005). Optimal management of all the factors and resources of a plan in the 21st century, which mankind faces with a lack of resources and rapid changes in production technology, makes it harder for executives (Pourreza, Zolnourian, Atri, 2013). Reducing costs, carrying out timely and meeting the quality standards in development projects will lead to huge savings in the budget of construction projects and rapid return of capital. To accomplish this, various techniques have been developed, one of these techniques that comprehensively looks at the above objectives is value engineering. value engineering is of an organized program that uses a combination of common sense and technical knowledge to locate and eliminate unnecessary costs of projects.

Considering the environmental situation of cities at the present time, as well as the future of the city and the acceleration of the urbanization process in Iran, revision of the design of urban parks seems very necessary. In the crowded cities of the future population, apartment life will be more prevalent, and the number of those who spend their free time in the courtyard, alongside their favorite pond and garden, will slowly decline. Therefore, future cities should be equipped to meet these needs now. Providing suitable free and green spaces to respond to the socio-psychological needs of future citizens, an effective step for the transformation of urban planning and passive urban planning into a proactive and forward-looking movement will be mitigated (Bahram Soltani, 2005). The research seeks to find the value of value engineering for achieving these goals and reduce the cost of development projects, or in other words, the influential factors of value engineering in increasing value and, ultimately, increasing the productivity of the project and also the obstacles and problems facing the implementation of value engineering.

2. Value engineering

• Value Engineering is a group-based, systematic, functional-oriented, professional-oriented approach used to evaluate and improve the value of a product, design a device, system, or implement industrial, developmental and service projects. (Karimi, Salimi, 2014).
• Value engineering is a systematic process for achieving a function with minimal cost of the cycle that is consistent with performance, reliability, availability, quality, and safety for a particular product. (G. H. Behncke, Maisenbacher, Maurer, 2014)

2-1. The concept of value engineering

The concept of value engineering is systemic thinking and having a different look at the issues. The concept of value engineering is a teamwork with creativity and work schedule. The product of this different look and creative teamwork is to suggest new and new options to reduce costs and maintain or enhance quality.

3- Necessity of value engineering

According to SGI statistics, annually almost 75% of the projects that are defined and implemented are failing and successful, with an annual cost of over $ 145-80 billion paid for them. Today, construction projects are considered as the economic and political pulses of the countries of the world due to the volume of social credits and social sensitivities. In recent decades, this area has been found to be an intangible sense in the developing country. Despite special attention to this area in the form of special rules and regulations, there are still very few projects that are delivered in due time at a desirable cost, with quality and specifications in accordance with expectations.

4- Value engineering goals

The main goal in value engineering is to pay attention to function, not cost nor quality. Because it provides functionality, cost reduction and maintaining or upgrading quality (Karimi, Salimi, 2014). The most important goal in management is to carry out the project at a minimum cost and in due time, with due consideration of predefined qualitative issues. Since engineering value is a systematic and systematic process, with a smart and creative look and on a systematic basis Experiences of managers, employers, contractors, consultants, executive agents and all the factors affecting development projects are used to identify the functions, their impacts and the management of alternative activities to prevent project diversion from the desired objectives. Therefore, the overall goal of value engineering is to improve and increase the productivity of the project and at a more comprehensive look at creating value in the project, which, with a detailed planning of its output and its results, causes the growth of companies in short Will last for a long time.

5- Time to implement and apply value engineering in Iran

The Organization for Management and Planning of the Country (2000), in the direction of referral of work and contracting with value engineering services units, has suggested the most suitable time for starting the value engineering of the work before the implementation of the plan, and after doing about 20-25% of the design work. The organization also proposed the implementation of a pre-operational value engineering study, a number of value studies for small projects, two studies for medium-sized projects and five value studies for large and very large projects. On the other hand, the Organization for Management and Planning of the

Country (2004), in the Value engineering Manual at the time of construction, the time for offering suggested change with a value engineering look would suggest that the contractor, from time to time, from the contract to the delivery, can Propose your changes in the guidelines above. However, one of the most suitable times for offering a change proposal that has a lot of potentials to save on it is the time after contracting and before the start of the operation and simultaneously with the equipping of the workshop. Because there is still no part of the work, and making the change possible with less time and cost. (Organization for Management and Planning, 2013)

6. Advantages and disadvantages of value engineering

6.1 Value Engineering Benefits

Reduced project costs over a lifetime; clarifying the needs of stakeholders and separating requirements from requirements and a clear definition of the needs of the user to improve quality; Increase satisfaction and desirability for the customer, user, and operator; Creating a collaborative organization; being sophisticated; reduce the time of project implementation; Reduce the cost of new investment due to the possibility of using the ideas applicable in similar projects; The familiarity with design factors with functional thinking; Using collective wisdom in solving problems; Providing solutions to the most complex issues and difficulties encountered; Determine the exact risks and find strategies to reduce it; Specify design and spatial options; Specify the methods of construction options; Improve communication between project factors; Promote creative thinking and breakout structure; Promoting general knowledge of the project; Increase the morale of the working group in the organization; Informing the employer about the progress of the project; Expanding the sense of commitment and ownership of project outputs and implementation; The contractor's share in the profit from the implementation of value engineering outside the constraints of contracts; The contractor's reputation as an organization or company; Professional technical development of companies through the application of advanced technology; Reuse the monetary savings resulting from this process within the program or for economic components that are not already budgeted;

6.2 Problems and Issues in the Failure of Value Engineering in Construction Projects

Failure to carry out detailed studies of physical and physical feasibility and planning; Lacking the appropriate time for conducting studies and design; The incorrect relationship between the calculation of consultant engineers' fees and the cost of project implementation; The resistance of the designer and the consultant to the acceptance of the design review with the help of value engineering due to the impression of insulting his professional position; Applying non-expert ideas and wishes of some employers; Attitudes of taste by architectural and structural engineers; use of improper contractual methods; Contractor's lack of confidence in the value engineering process due to unsuccessful experiences. Other cost reduction and cost improvement schemes; Lack of creative people, with sufficient expertise in the various project components; The lack of use of modern building technology; Fathers Bhatia and related issues to some inefficient rules and directives; Frequent changes in executive management; change the macro and macro policies of the country; change in decision making; Delays in development projects; Changes during exploitation; (Pourreza, Zolnourian, Atri, 2013; Tabatabai, 2008).

7- Value Engineering Work Program

7.1.1 General Theory of Value Engineering Process

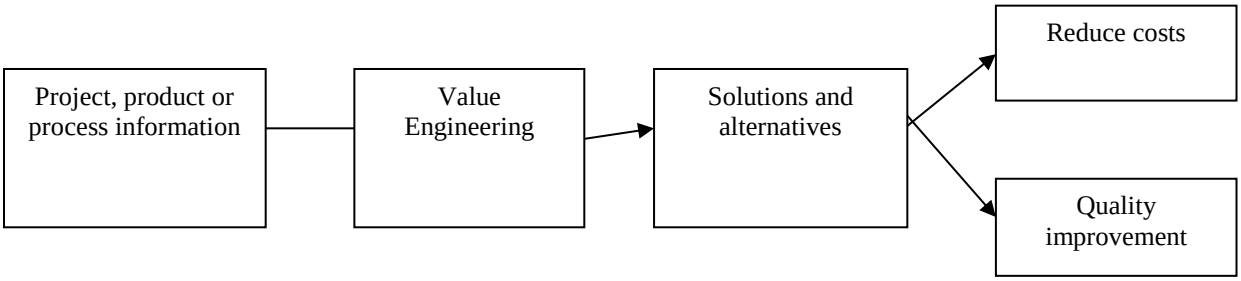


Figure 1: A General Study of Values (Pourreza, Zolnourian, Atri, 2013)

7.2 Preliminary Study or Preliminary Studies

Collecting information on the needs and desires of the employer and the operator; Complete the dataset; Determine the evaluation criteria; Determine the scope of the study; Create models; Determine members of the value engineering team

The desired outcome of the pre-test phase: a clear understanding of senior management requirements, strategic priorities, and how to increase organizational value through improvement.

7-3. Primary study stage or value studies

Phase information or completion of information; Functional Analysis Phase; Creative Phase; Evaluation Phase; Development Phase; Presentation phase

Conclusion: Ensuring understanding of the underlying causes of value choices by management and other key stakeholders. It also creates an interest in determining the performance guarantee.

7.4 Examination or supplementary studies

Run phase; Follow-up activities

Conclusion: The project stakeholders determine which items in the project change as a result of the study of value. These are changes in the initial concept or the basis of a study, which are derived from value options and combined into project development in future plans or product development activities.

3. Research background

3.1 Research background in the country

Nasser Jamali Harsini, Ahad Nazari and Yaser Goldust Jouibari, in 2010, in a paper entitled Application of Value Engineering in Improving Design of Construction Projects under study, a self-service center of Razi University of Kermanshah, provided a list of criteria for assessing construction projects. Then, 20 faculty members from Tehran University of Architecture and Civil Engineering met the defined criteria. Defined criteria: "Energy Saving", "Accessibility", "Employer Requirements", "Plan Performance", "Stability", "Safety", "Beauty," "Human Function," "Extensibility." "," Project execution "," Maintenance capability "," Initial cost "," Life cost "," Environmental protection "and" Optimal use of land "(Jamali Harsini, Nazari, Goldoost Jouibari, 2010).

Mohsen Abutalebi Esfahani and Marjan Mansouri in an article entitled "Investigation and Pathology of the Free Tehran-North Project" with an approach to the role of value engineering in the management of civil engineering projects in 2014, stated that value

engineering included three stages of pre-study, Value study, and complementary studies, and in most projects, the first phase, which is somehow a value engineering engineer, is not as deserving as it is. The researchers have looked at the lack of attention to value engineering in the project and its destructive effects on performance, costs, and timing of the project. The general reasons for failing are the failure to comply with the requirements of the workgroup, the characteristics of the project, due to " Contract issues "(the type and conditions of the contract between the employer and the contractor)," the failure to complete the preliminary studies phase, "" the failure to fully implement the stage of value studies, "and" also the failure to complete the full study phase of the study "(Abutalebi Esfahani, Mansouri 1393).

The history of research abroad Racha, Abotaleb and Algazoli, 2016, in a study entitled Improving the Sustainability Concept in Developing Countries; Impact of Value Engineering and Sustainability Issues on the Value of a Project Case Study of Residential Complex in Egypt have known This article as a good example of the relationship between value engineering and Sustainability and have also shown that if these two categories are studied in parallel, how will they affect the economy and the environment. They incorporate value engineering, which includes both the "initial cost" and "production cycle costs", as a systematic process to improve the value of a project by analyzing its functions. And also stated sustainability, as development that meets the needs of the present without jeopardizing the ability of future generations to meet their needs. A case study of Richmond and his colleagues in Egypt, a luxury residential complex consisting of 1,700 residential units of more than 300 square meters, located in the southwestern part of the great land, Richmond et al. In this paper have shown that the "replacement offer" has been integrated into the value engineering study with sustainability considerations and up to 40 percent of cost savings, while thermal insulation has improved by about 55 percent. (Rachwan, Abotaleb, Elgazouli, 2016).

Florin Benk, Sebastien Maisin Bacher, and Mike Maurer in their 2014 article entitled "Extensive Model for Combined Value Engineering" - A case study of the manufacturing company after reviewing the objectives of costing and value engineering to support the optimization of value and cost of products. By pointing out that these issues are being used in manufacturing companies to increase the competitive ability of these companies by improving the ratio of cost to value and reducing costs or improving value, first paid attention to general methods on target costing And engineering value. Florin Benky and colleagues, in addition, that has known companies in the current competitive world of production processes, require "more expertise" and "presence in the supply chain network" as effective factors that challenge

manufacturing companies, has stated the purpose of his paper as a model based on the main model for combining value engineering, which is associated with manufacturing processes and supply chain network, which are related both to target costing and to value engineering (which lack a comprehensive model), the expression They give. (Behncke, Maisenbacher, Maurer, 2014)

Ali Bravi, Susantunu, Miraj, Bravi, Rahman, and Hussein in an article in 2014 entitled "Increasing Value for Liquidity in the Development of Large Infrastructure Projects Using Value Engineering Case Study An Infrastructure Project in Indonesia" has identified infrastructure development as an important economic stimulus for the country, and in their paper studied two major infrastructure projects in Indonesia, a vibrant macroeconomic and macroeconomic country that has an economic growth of 6% in 2012, and the potential of several ways to develop. 1) The Swandah Bridge, which connects Sumatra and the islands of Java, thus integrating economic integration between these two islands. 2) Sukarno Hata Airport as a public transport vehicle that is expected to make it easier for the airport and airport to transport human and goods in the Jakarta region.

Research by Bravi and colleagues highlights the value creation of projects by developing other measures and assessing the material value of projects, that has been done using quantitative and qualitative approaches through a questionnaire (online and offline) and group discussion as a survey tool, and the functional structure analysis system diagram has been used as an ideation tool for illustrating project performance based on a variety of perspectives, including benchmarking, expert judgment, and others. In addition, they used the Shareholder Opinion Questionnaire to identify the ideas contained in the System Function Analysis Chart. The analysis of their production costs confirmed that with additional measures, an increase in the liquidity value of the related projects would be achieved, and at the end, while declaring that the value engineering for the development of projects with the achievement of the desired quality, "the use of advanced technology and achievement Innovative Ideas "produces optimal results and also the use of value engineering in large infrastructure projects (such as the Strait Sonda Bridge and the Pierreti tunnel) for value-added projects, suggested that more research should be conducted on "private-government cooperation" and "Detailed engineering design" to enhance the feasibility of the project (Berawi, Susantono, Miraj, Boy Berawi, Zetha Rahman, Gunawan, Husin, 2014).

4- Introduction and recognition of the project under study

4.1. The description and purpose of the project under study

The Great Iranian Garden is an eco-museum that is alive and active to get acquainted with the land of Iran and it is indigenous, historical, religious, and traditional culture. The purpose of this park is to create a suitable place with historical, cultural and recreational use in the southern region. The city of Tehran, inspired by Iranian and Islamic architectural and gardening practices, creates a charming and beautiful space for use and raising the awareness of citizens from Iran and Iranians.

4.2. Project location

Iran Garden Project, Land located in Tehran's 19th District. From the north to Shaghayegh Boulevard, from the south to Azadegan Highway, from the east to Shahid shokri Brothers and the Science and Nature Shrine and from the West to the Azadegan Highway.

Figure 2: The main arteries of the city

4.3 Construction of the Great Iranian Garden

The contract for the construction of the first stage of Iranian gardens, which includes construction works, facilities, landscaping and site facilities, is of the 3rd-factor type (employer, consultant, and contractor) and construction of it has been as a design and implementation simultaneously. Estimated initial and approximate labor is 115,448,208,573 rials and the initial

amount of the above agreement is 155,903,673,557 rials, including all legal deductions and related coefficients. The contract is also subject to moderation, and a total of 63 employers, consultants, and contractors from the technical, expert and managerial levels are involved in the construction of Phase I of this project.

4.4 Value Engineering of the project of Iranian Garden

In the discussion of value engineering at the stage of designing Iranian garden, what can be considered as effective factors in this field can be deduced as follows:

1- Budget and cost; 2. Time; 3. Quality; 4. Easy and convenient access; 5. Tourism attraction; 6. Beauty; 7. Compliance with laws and regulations; 8- Sustainability and environmental protection; 9. Public culture;10 - Providing educational space; 11. Operating separately from components; 12. Public welfare; 13. Optimal use of existing status; 14. Safety and security; 15. Environmental conditions; 16. Innovation;

Figure 3: A view of the Iranian Gardens (intersection of Azadegan Highway and Shaghayegh Blvd)

Figure 4: Proposed Concept Model of Effective factors and criteria on Values Engineering

5. Methodology of research

5.1. Method of conducting research

Since the results of this research can be applied in practice, this research is of a practical and descriptive-survey method in terms of its nature and objectives.

5.2 Statistical community and sample number

The statistical population of this research is the managers, experts, and engineers involved in the project of Iran's garden in Tehran, which includes the Employer (Tehran Garden of Greenhouses and Urban Environment), consultant (Park Consulting Engineers Company) and Contractor (Abidar Building Civil Company) Is about 63 people.

5.3. Statistical sampling and sampling method

In the present study, considering the limited size of the population in the study, 63 individuals are used in the total number, meaning that the sample size is 63 equals to the population (n = N).

5.4. Methods and tools for data collection

Tools used in this research are:

• Study and use of existing information and documents (books, articles, dissertations, etc.)

• Interview

• Questionnaire

5..5 Information Analysis Method

SPSS and EXCEL software is used for analyzing and analyzing information.

6. Descriptive findings

Based on the results, the distribution of the respondents' image according to the gender variable shows that 81% of the respondents were male and 19% were female.

According to the age variable, 9.5% of respondents aged 25-30 years old, 28.6% between 31 and 35 years old, 19% between 36 to 40 years, 6.3% between 41 to 45 years, and 36.5% over 45 years.

Regarding the variables of the educational level, it shows that 6.3% of the respondents were undergraduates, 46% were bachelors, 44.4% were masters and 3.2% were Ph.D.

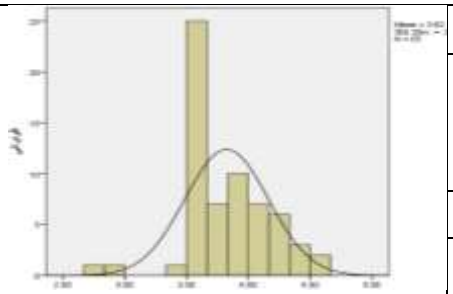
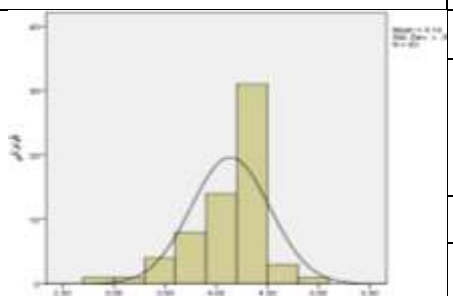
According to the job level variable, showed that the occupational level was 39.7% of the respondents, 28.6% of the master's degree and 31.7% of the manager.

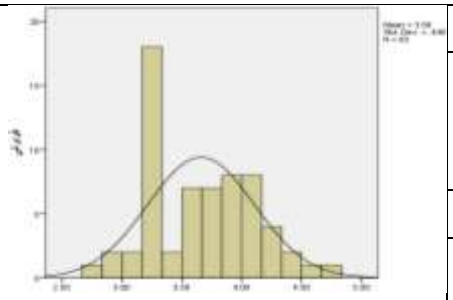
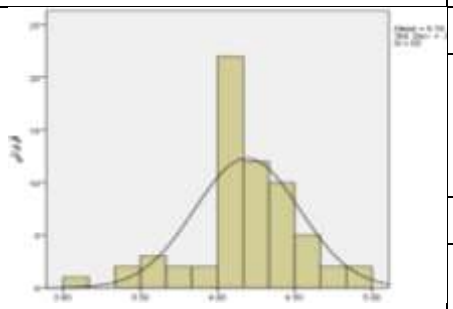
According to the history variable, a record of 4.8% of respondents was less than 5 years old, 20.6% between 6 to 10 years, 31.7% between 11 and 15 years, 6.3% between 16 to 20 years, 9.5% between 21 and 25 years And 27% more than 25 years old.

Analysis of the findings

Indicators and statistical charts

Table 1
Indicators and Statistical Charts

	63	Valid	Number of respondents	Company type Rank and qualification Workshop management Manpower affordability Machinery and equipment Safety and Health	**Entrepreneur**
	0	Unanswered			
	3.8235	Average	Statistical indicators		
	0.33831	Standard deviation			
	1.83	variation range			
	2.71	minimum			
	4.54	maximum			
	63	Valid	Number of respondents	Type and complexity Size and magnitude contract type geographical location Financial condition	**Feature and profile of the project**
	0	Unanswered			
	4.1317	Average	Statistical indicators		
	0.38398	Standard deviation			
	2.07	variation range			
	2.93	minimum			
	5	maximum			

	63	Valid	Number of respondents	Atmospheric conditions and weather Resources around the project Environment and Landscape Terms and Conditions Political and social conditions Economic conditions	**Project environment conditions**
	0	Unanswered			
	3.6594	Average	Statistical indicators		
	0.44564	Standard deviation			
	1.88	variation range			
	2.79	minimum			
	4.68	maximum			
	63	Valid	Number of respondents	Time Management Range management Integration management Cost management Stakeholder management human resource Management Quality management Communication management supply Management risk management	**System management**
	0	Unanswered			
	4.1916	Average	Statistical indicators		
	0.34058	Standard deviation			
	1.85	variation range			
	3.07	minimum			
	4.92	maximum			

The average score of respondents to the scale of the company is 3.823, the average score of the respondents to the scale of the feature and profile of the project is 4.137, the average score of the respondents to the scale of the project environment 3.659, the average score of respondents to the system management scale 4.191, which is higher than the average score of 3, It means that the respondents believe that the indicators mentioned above for the scale of "Entrepreneur", "Project characteristics and specifications", "Environmental conditions" and "System management" are more than moderate in the value engineering of the "construction phase" of the Iranian garden Project.

Measuring the Normality of Variables

Table 2
Clomogroup-Smirnov test to measure the normality variables

System management	Project environment conditions	Feature and project specifications	Entrepreneur	factors / option	
63	63	63	63	**number**	
4.1916	3.6594	4.1376	3.8235	**average**	**parameters**
0.34058	0.44564	0.38398	0.33831	Standard deviation	
0.219	0.170	0.141	0.162	**absolute value**	**The biggest differences**
0.083	0.170	0.141	0.155	**Positive value**	
-0.219	-0.100	-0.129	-0.162	**Negative value**	
0.219	0.170	0.141	0.162	**Test statistic**	
0.0009	0.0009	0.0039	0.0009	**Significant level**	

After performing the test, considering that the significance level of all factors is less than 0.05, in this case, it can be said that the distribution of none of the factors is not normal.

Testing the research hypotheses

• Testing of the first hypothesis: The components presented for an entrepreneur is effective on value engineering of the "construction phase" of the Iranian garden project.

Table 3
Ratio test (binomial) to measure the difference between the entrepreneur's groups

A significant two-way	Expected ratio	Ratio observed	N	Categories	Criteria	
0.000	0.50	0.10 0.90 1	6 57 63	< = 3 >3	Group 1 Group 2 total	**Company type**
0.000	0.50	0.79 0.21 1	50 13 63	< = 3 >3	Group 1 Group 2 total	**Rank and qualification**
0.000	0.50	0.03 0.97 1	2 61 63	< = 3 >3	Group 1 Group 2 total	**Workshop management**
0.000	0.50	0.03 0.97 1	2 61 63	< = 3 >3	Group 1 Group 2 total	**Manpower**
0.000	0.50	0.06 0.94 1	4 59 63	< = 3 >3	Group 1 Group 2 total	**affordability**
0.000	0.50	0.02 0.98 1	1 62 63	< = 3 >3	Group 1 Group 2 total	**Machinery and equipment**
0.314	0.50	0.43 0.57 1	27 36 63	< = 3 >3	Group 1 Group 2 total	**Safety and Health**
0.000	0.50	0.03 0.97 1	2 61 63	< = 3 >3	Group 1 Group 2 total	entrepreneur

• Examination of the second hypothesis: The components presented for the features and characteristics of the project are influential in the value engineering of the "construction phase" of the Iranian garden Project.

Table 4
Ratio test (binomial) to measure the difference between feature groups and project specifications

A significant two-way	Expected ratio	Ratio observed	N	Categories	Criteria	
0.000	0.50	0.22 0.78 1	14 49 63	< = 3 >3	Group 1 Group 2 total	**Type and complexity**
0.000	0.50	0.08 0.92 1	5 58 63	< = 3 >3	Group 1 Group 2 total	**Size and magnitude**
0.000	0.50	0.05 0.95 1	3 60 63	< = 3 >3	Group 1 Group 2 total	**contract type**
0.000	0.50	0.25 0.75 1	16 47 63	< = 3 >3	Group 1 Group 2 total	**geographical location**
0.000	0.50	0.03 0.97 1	2 61 63	< = 3 >3	Group 1 Group 2 total	**Financial condition**
0.000	0.50	0.03 0.97 1	2 61 63	< = 3 >3	Group 1 Group 2 total	**Feature and project specifications**

• Testing the third hypothesis: The components presented for project environmental conditions affect the value engineering of the "construction phase" of the Iranian garden Project.

Table 5
Binomial Ratio Test to Measure the Different Groups of Environmental Conditions

A significant two-way	Expected ratio	Ratio observed	N	Categories	Criteria	
0.450	0.50	0.56 0.44 1	35 28 63	< = 3 >3	Group 1 Group 2 total	**Atmospheric and climatic conditions**
0.000	0.50	0.06 0.94 1	4 59 63	< = 3 >3	Group 1 Group 2 total	**Around sources**
0.000	0.50	0.16 0.84 1	10 53 63	< = 3 >3	Group 1 Group 2 total	**Environment and scenery**
0.000	0.50	0.13 0.87 1	8 55 63	< = 3 >3	Group 1 Group 2 total	**Rules and Regulations**
0.000	0.50	0.10 0.90 1	6 57 63	< = 3 >3	Group 1 Group 2 total	**Political and social conditions**
0.000	0.50	0.11 0.89 1	7 56 63	< = 3 >3	Group 1 Group 2 total	**Economic conditions**
0.000	0.50	0.05 0.95 1	3 60 63	< = 3 >3	Group 1 Group 2 total	**Project environment conditions**

• Examination of the fourth hypothesis: The components presented for system management are influential in the value engineering of the "construction phase" of the Iranian garden project.

Table 6

Ratio test (binomial) to measure the difference between system management groups

A significant two-way	Expected ratio	Ratio observed	N	Categories	Criteria	
0.000	0.50	0	0	< = 3	Group 1	**Time**
		1	63	>3	Group 2	**management**
		1	63		total	**nt**
0.000	0.50	0.02	1	< = 3	Group 1	**Range**
		0.98	62	>3	Group 2	**management**
		1	63		total	**nt**
0.000	0.50	0.03	2	< = 3	Group 1	**Integration**
		0.97	61	>3	Group 2	**management**
		1	63		total	**nt**
0.000	0.50	0.02	1	< = 3	Group 1	**Cost**
		0.98	62	>3	Group 2	**management**
		1	63		total	**nt**
0.000	0.50	0.17	11	< = 3	Group 1	**Stakeholder**
		0.83	52	>3	Group 2	**management**
		1	63		total	**nt**
0.000	0.50	0	0	< = 3	Group 1	**Human resources management**
		1	63	>3	Group 2	
		1	63		total	
0.000	0.50	0.02	1	< = 3	Group 1	**Quality**
		0.98	62	>3	Group 2	**management**
		1	63		total	**nt**
0.000	0.50	0.03	2	< = 3	Group 1	**Communication management**
		0.97	61	>3	Group 2	
		1	63		total	
0.000	0.50	0.03	2	< = 3	Group 1	**Procurement Management**
		0.97	61	>3	Group 2	
		1	63		total	
0.000	0.50	0.06	4	< = 3	Group 1	**risk**
		0.94	59	>3	Group 2	**management**

		1	63		total	**nt**
0.000	0.50	0	0	< = 3	Group 1	**System**
		1	63	>3	Group 2	**manageme**
		1	63		total	**nt**

The results of the tests indicate that the significance calculated for the explanation of the effect of the entrepreneurs, the characteristics and specifications of the project, the environmental conditions, system management in value engineering, the "construction phase" of the Iranian garden project is significantly smaller than the alpha level of 0.05. This means that between the two groups of respondents, the first group (those who believe that these criteria in the value engineering of the "construction phase" of the Iranian garden Project are very low) and the second group (those who believed that these criteria are very important in value engineering of the "construction phase" of the Iranian garden Project, is very significant.) there is significant difference.

• Examination of the fifth hypothesis: The extent of the impact of value engineering aspects of the "construction phase" of the Iranian garden Project is different from each other.

Table 7

Friedman test to measure the difference in factor rank

63	**Number**
66.262	**Chi-square**
3	**Freedom degree**
0.000	**Significant**

The results of the above table indicate that the significance level (0.000) is smaller than the significance level at alpha 0.01, therefore, with 99% confidence, it can be said that the impact of dimensions on the value engineering of the "construction phase" of the Iranian garden Project Is different from each other.

12-4 Priority and ranking of variables

• Priority and ranking factors

Table 8
Difference in the median rank of factors

Median rank	factor
3.25	**System management**
2.92	**Project characteristics and specifications**
2.31	**entrepreneur**
1.52	**Project environment conditions**

• Priority and ranking of criteria

Table 9
Ranking System Management Criteria

Average rating	Significant	Criterion		Average rating	Significant	factor
6.57	0.000	**risk management**		3.25	0.000	**System management**
6.55		**Human resources management**				
6.33		**Time Management**				
6.32		**Cost management**				
6.06		**Quality management**				
5.89		**Range management**				
5.44		**Supply Management**				
5.19		**Integration management**				
3.47		**Communication management**				
3.18		**Stakeholder management**				

Table 10
Ranking of the criteria and characteristics of the project

Average rating	Significant	Criterion	Average rating	Significant	factor
3.90	0.000	**Financial condition**	2.92	0.000	**Feature and project specifications**
3.44		**contract type**			
3.08		**Type and complexity**			
2.56		**Size and magnitude**			
2.01		**geographical location**			

Table 11
Ranking of the entrepreneur's Criteria

Average rating	Significant	Criterion	Average rating	Significant	factor
5.59	0.000	**Affordability**	2.31	0.000	Entrepreneur
5.21		**Manpower**			
4.46		**Equipment**			
4.41		**Company type**			
4.15		**Workshop management**			
2.92		**Safety and Health**			
1.25		**Rank and qualification**			

Table 12
Ranking criteria for project environmental conditions

Average rating	Significant	Criterion	Average rating	Significant	Aspect
4.40	0.000	**Rules and Regulations**	1.52	0.000	Project environmental conditions
4.10		**Environment and vision**			
4.06		**Political and social conditions**			
3.80		**Around sources**			
2.83		**Economic conditions**			
1.82		**Atmospheric conditions**			

7. Summary and conclusion

In line with the mission of urban development, Tehran's urban management has been trying to raise the quality of life and increase urban welfare by creating various types of urban gardens in different regions, especially in deprived areas - the Iranian urban fountain in the southwest of Tehran.

Based on the analysis of the information and data obtained from the questionnaire from all the managers and experts involved in the project (including the organization of gardens and green space in Tehran as an employer, Parsekov Consulting Engineers Co. as consultant And Haniyeh Abidar civil Company as a contractor) based on statistical standards, shows that all factors, criteria, and indicators considered for this research have been effective in value engineering of the construction phase of the project. Comparison of the average of ratings at level 1 the final detailed model that is the operating level by using Friedman test shows that the impact of each factor of system management, the characteristics of the project, the environmental conditions, and the entrepreneur have a significant difference. So that the highest average rating (3.25) is dedicated to system management. The characteristics of the project with an average rating of 2.92, the entrepreneur with an average rating of 2.31 and environmental conditions with an average rating of 1.52 are in the order of priority.

The results of the binomial test of the components presented for the system management factor, the characteristics and specifications of the project, the host company and the environmental conditions in the value engineering of the "construction phase" of the Iranian garden project indicate that the assumed components with a high level of certainty are effective. The analysis of the presented components using the Friedman test on the value engineering of the "construction phase" of the Iranian garden Project indicates that:

• System management:

Of the 10 criteria presented, the risk management criterion with an average rating of 6.57 has the highest importance and the criterion of stakeholder management with an average rating of 3.18, has had the least importance in influencing the above factor. Also, HR management, time management, cost management, and quality management with the average rating of 6 after risk management have the highest impact. Range management, logistics management, integration management with an average rating of 5 to 6 are in the next priority.

Communications management with an average rating of 3.47 plus a stakeholder management has had the lowest impact on other criteria.

• Feature and project specifications:

Of the 5 criteria presented, the criteria for the financial condition of the project with a mean of 3.90 have the highest importance and the geographic location of the project with an average of 2.01 has been the least important factor in influencing the above factor. Also, the type of contract and the type and complexity of the project with the average rating of 3 after the financial condition of the project have had the most effect. The size and magnitude of the project, with a mean score of 2.56, along with the geographic location of the project, had the least effect compared to other criteria.

• Entrepreneur:

Among the seven criteria presented, the financial performance criteria of an entrepreneur with an average rating of 5.59 has the highest importance and the rank and qualification rating of the entrepreneur with an average rating of 1.25 has had the least importance in influencing the above factor. Also, the manpower of entrepreneur with a mean of 5.21, equipment and machinery of the entrepreneur with an average rating of 4.46, the type of entrepreneur with an average rating of 4.41 and the workshop management of entrepreneur with an average rating of 4.15 are in the next priority. Safety and health of the entrepreneur, with an average rating of 2.92, along with the rank and authority of the entrepreneur, have had the least effect on other criteria.

• Environmental conditions of the project:

Of the 6 criteria presented, the criterion of rules and regulations with an average rating of 4.40 has the highest importance and criteria for climate and climate with a mean score of 1.82, have the least importance in influencing the above factor. In other words, the impact of criteria related to the environmental conditions of the project is different. Also, the environmental and landscape criteria with the average rating of 4.10 in the second place, the social and political criteria with the average rating of 4.06 in the third place, the criterion of the around sources of the project with an average rating of 3.80 in the fourth place and the criterion of economic conditions with an average rating of 2.83 is in the next position.

Suggestions

The application of the results of this study can also help to improve the efficiency of the implementation phase processes and the construction of other development projects, which, in order of priority of impact, suggestions of each of the factors are presented as follows. :

A) System management

The main criteria for this factor, which should be addressed to them in order to achieve the above goal, are proposed in priority terms as follows: Observe and implement the risk management criteria; Compliance with and implementation of human resource management benchmark; Observe and run-time management; Observe and implement cost management; Compliance with and implementation of quality management;

B) Project features and specifications

The important criteria for this factor, which should be addressed to them, are proposed in priority terms as follows: a project finance criterion that comes with financing, timely allocation, an injection of funds and audit; the criterion of the type of project contract that is in line with the payment methods and responsibilities of the parties to the treaty; the criterion of the type and complexity of the project that is associated with the considered new and innovative nature of the project and the amount of innovation and technologies; the criterion of the size and magnitude of the project that is related to the volume of construction operations, the area and the estimated rate of the project's rials; the criterion of the geographic location of the project, which is associated with the location and how it is accessed.

C) Entrepreneur

It is recommended to work with leading engineering companies in value engineering. The presence and activity of a powerful and knowledgeable company in the phase of construction of the project is one of the important pillars of project progress, which, in addition to performing the tasks assigned in accordance with the contract, can be used to make value in the shortcomings and defects before or at the time of implementation. One of the important

criteria in respect to this factor is paying attention to the financial power of the entrepreneur, which is associated with the amount of economic knowledge and its turnover, and also the next priority is the criterion of human resources that is associated with the level of expertise, capabilities and personnel experience optimizing number of workforces and also paying attention to the principle of employee merit.

D) Environmental conditions

It is recommended that managers pay attention and interest to criteria of the environmental conditions governing the project in making decisions and by planning, examining, monitoring, and minimize the effects of changes from the governing environment the project. For example, an important criterion of rules and regulations that are linked to the degree of transparency and non-contradiction in the rules and regulations of the organizations associated with the project, and if such cases are found, it can be reported to the managers of the organization Through the refinement, consolidation, and integration of rules, and helped to facilitate construction-related issues in future projects.

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