The Necessity of Using Value Engineering and the Investigation of its Success Factors in Civil Plans

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Abstract:
Value engineering is an accepted technology in industrial communities regarding construction and industry management to reduce the costs, improving quality and performance of products industry, services and civil. The application of value engineering is not restricted only to design and project construction and it is including operation. The present study discussed about the role and using value engineering in civil plan construction management to have general attitude to its position in industry of constructing technical and civil plans and also the increasing tendency of activists and managers by this method is also considered. By library studies, research and applying value engineering items in civil plans, it was attempted to investigate the value engineering performance and its role in civil plans and the success factors of value engineering are expressed.

Keywords: Value Engineering, Construction Management, Civil Projects, Success Factors.

1. Introduction

The globalized world and comprehensive economic conditions formed a new type of competition as it is not compared with the past period. In this period, the real price is determined by global competitive market not the fixed costs of inefficient management, full of wastes. Under these conditions, value engineering is organized by organized and creative techniques to analyze the functions leading to the product or service and fulfills the goals of civil plans by less cost and high quality. Value engineering makes prices as competitive and improve the quality reduced the wastes and made using potential opportunities as possible. Creating innovative and creative items, saving time and en energy, simplification of methods, eliminating the unnecessary times and adding required elements for improvement, satisfaction of consumer, improving the appearance are the main factors of value engineering and they are done during design, operation, maintenance and evaluation stages and are not restricted only to operational stage and execution.

Project managers should use value engineering and by its mechanisms can collect information, analyze the important functions and create new ideas to improve quality and reduce the costs and by developing it, perform the processes better. There are many challenges for civil plans managers. Resistance to change, difficulty of alternatives, shortage of coherent team and creative team, weakness of innovation and using common methods, the lack of linking the results of value engineering with materialistic and spiritual benefits of organization members and the lack of exact and clear criteria for evaluation of results are the problems of value engineering user organizations.

The present study evaluated the requirements of application, key success factors in value engineering based on the researches and classified based on process-based approach.

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2. Study Methodology

The study method is descriptive and analytical and by using library and document data regarding recovery of value engineering in civil plans, we can respond the study hypothesis. The study hypothesis attempted to prove this issue that whether by using key success factors in value engineering, we can reduce performance time, reduction of costs and increasing productivity in project?

3. What is value engineering? [1]

Value engineering is an organized attempt that is done with the aim of investigating and analysis of plan activities in design, operation and maintenance. This investigation is done by experiences, innovations and creativities of experts to analyze systems function, factors, equipment, and facilities to achieve predicted functions with the lowest cost by improving quality and reliability and efficiency. In other words, value engineering is a set of some technical methods for review and analysis of work components and using creativities and systematic analysis methods for optimization of plan.

By another view, value engineering is the most effective evaluation method and efficient method to reduce the unnecessary costs and selection of optimal methods of plan. Value engineering besides using the main authorities of a plan applies the thought of experts and authorities regarding the review of plans with the goal of reducing the executive costs, reduction of time and improvement of work quality.

In value engineering, it is assumed that by the costs of each plan can be minimized by comparing the probable choices in each activity and selection of optimal choice by keeping quality and efficiency.

4. The role and position of value engineering in civil projects

The analysis of value engineering is an innovative attitude by fulfilling its goal identifies unnecessary costs. It means that the costs not fulfilling the applied features, life and appearance for customers, should be identified and eliminated [1]. ALfones Del Isola book regarding value engineering presented some guidance regarding potential saving as followings [2]:

- Budget 1-3%
- In great loans, 5-10%
- In regions with high costs 15-25%

Fulfilling this potential saving needs systematic and innovative attitude. The estimations of improvement costs regarding life service, compared with the estimations of capital and construction costs are not considerable. Some of the important elements in the analysis of project life service costs and they should be saved are as:

- Maintenance costs
- Energy costs and utilities
- Financing cost
- Unpredicted future income growth
- Scheduling the future development

There are various available specialized tools in analysis of general issues in value engineering as:

- The current value analysis
- Effectiveness analysis
- Breakeven analysis
- Liquidity and return rate analysis

All of them are useful economic tools for value engineering.

5. Achievements of u sing value engineering [3]

Value engineering plays important role in achieving permanent goals and provides the ground for coordination and communication. In other words, it can be said we can manage both aspects of changes and costs and this requires permanent profitability in business.

Indeed, value engineering by the following conditions in organizations makes them compete in national and international fields.

5-1- Reduction of costs and increasing profit

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5-2- Quality improvement
5-3- Increasing market share
5-4- Saving project time
5-5- Effective use of resources

6. Value engineering process

Value engineering process is a logical and systematic process in which a group of various specializations or interdisciplinary groups are applied for the following goals:

6-1- Selecting a suitable project for analysis based on the dedicated time

6-2- The study of calculation of current value by justification of functions, needs and goals

6-3- Evaluation of new choices to estimate or improving quality or reduction of costs for the components with low value

6-4- Consistency of new choices with the best performance of them [4]

Before value engineering is raised as technique, it is based on professional culture. Creativity is not applied by law and we should at first identify the real value of creativity as a culture for creativity preparation. We can establish creativity by value engineering technique [4]:

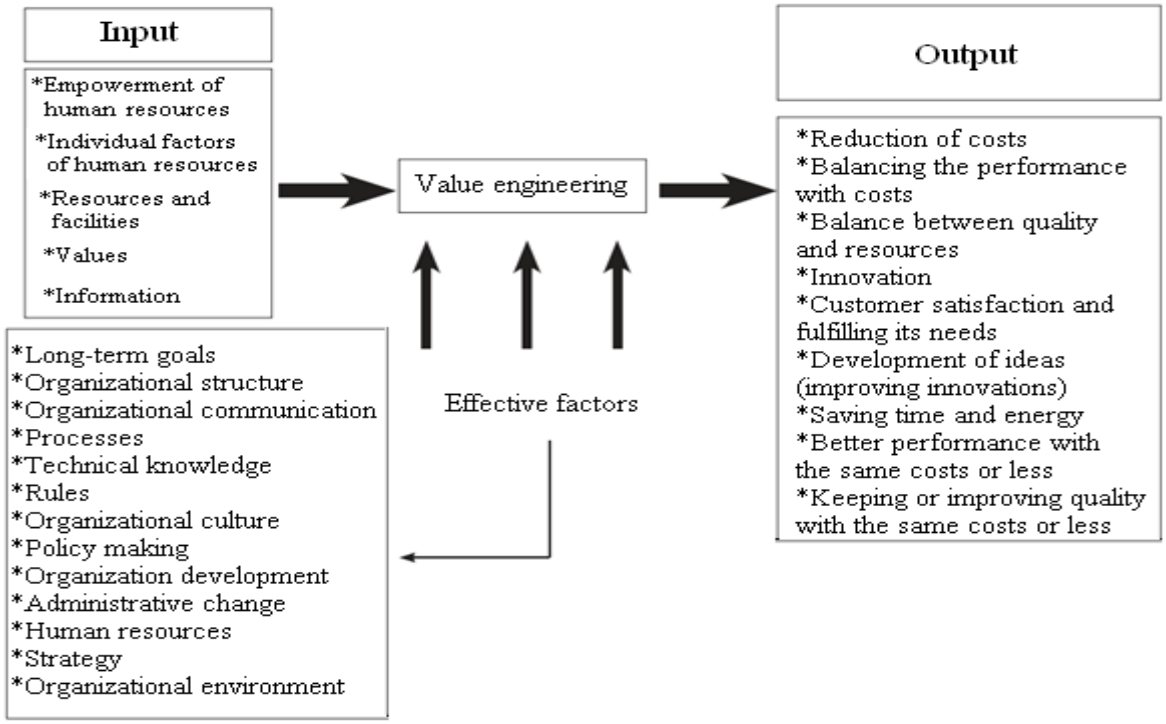

Fig. 1. Value Engineering Process Model

7. The necessity of value engineering [8]

The conditions in which value engineering are necessary include the shortage of initial information, technology progress and improving the standards, changing the rules, regulations, changing technical features, using thoughts and skills of growth, creativity, changes in employer needs or customer, qualitative and quantitative changes of resources, the changes of environmental conditions, habits, behaviors and desires, honest but initial beliefs.

Improving quality and reduction of costs and time in performing the plan via value engineering is not due to the lack of study or carelessness in technical and economic investigations in studies

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or determining technical features but these factors are also effective. Each of the mentioned factors namely creativity and innovation and technological progresses and improving standards level during the plan, project and operation by value engineering can improve quality and reduction of time and cost. The main aspects of value engineering are other methods of solving routine engineering issues including function analysis, specific creative attempt to formulate some choices for design, the lack of reduction of efficiency, dedicating costs for each function. Among other techniques applied for issues only value engineering attitude requires experience and analysis of function via creative thinking techniques.

8. The time of using value engineering

The work scope of value engineering depends upon the size and complexity of project. The highest return amount is done when we are in the first stage of project life. We can say that in the initial phase of design, value engineering is very effective as the theories are like concepts. The employer and designer have high flexibility in their decisions and the changes have less effect on project scheduling. During this stage, employer and consultant investigate the project budget and value engineering studies can be effective on identification of costs elements before final budget approving. The value engineering studies of construction projects are done when about 30% of the design is performed. In other words, incomplete design should be completed based on value engineering [5]. Generally, in a standard definition and based on Figure 2, before taking important decisions in design, value engineering is recommended and it has the highest effect on costs.

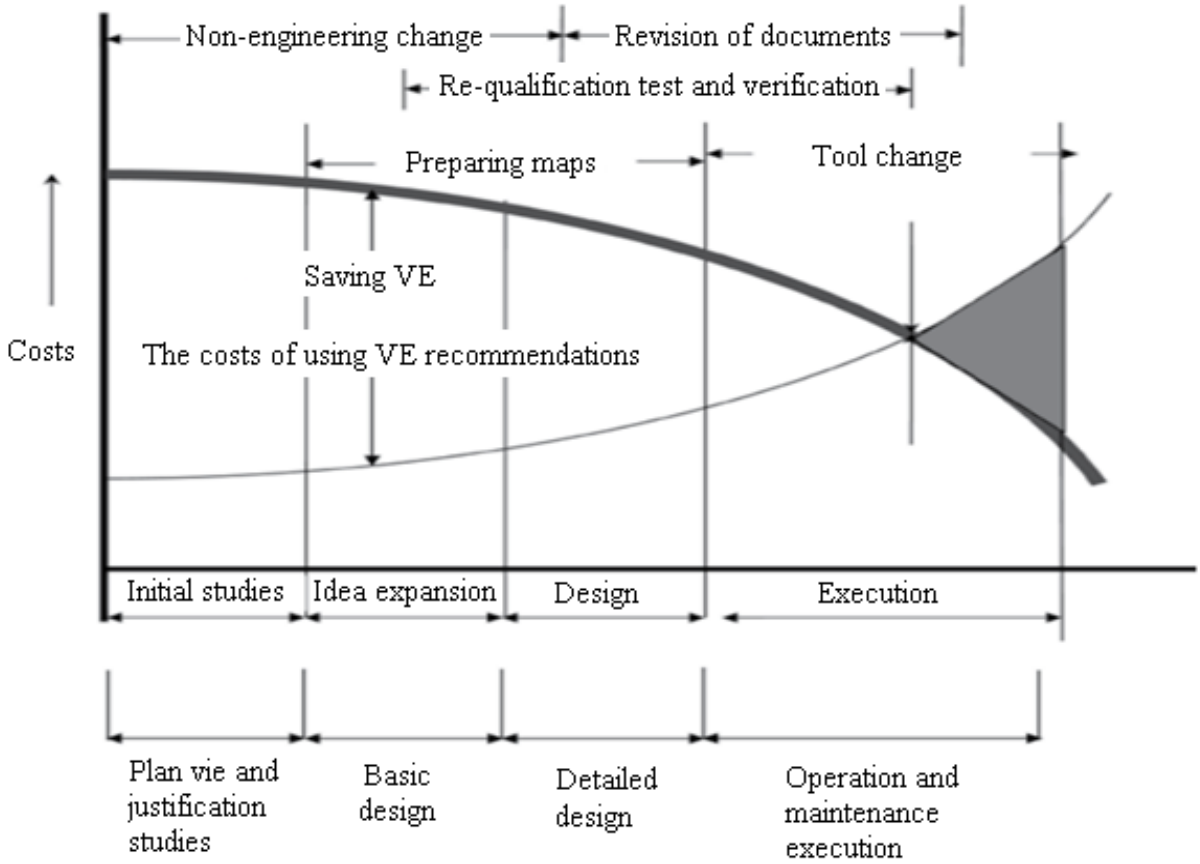

Fig. 2. The role of value engineering in reduction of civil plan costs [6]

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Indeed, saving of costs is reduced from the beginning of project to the end of construction as less saving is considered for operation and maintenance period (Figure 3) [7].

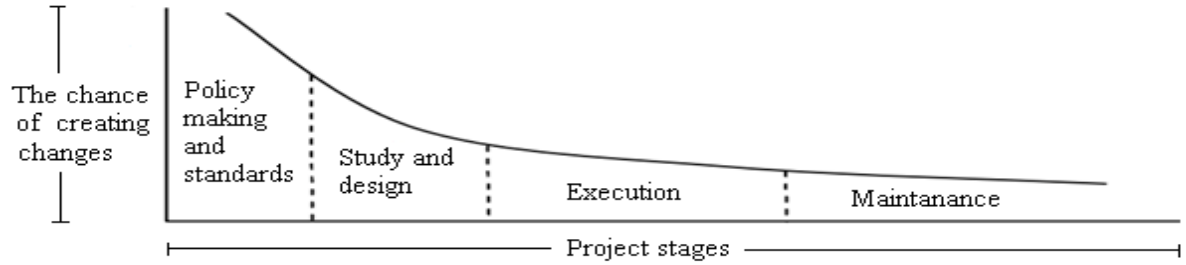

Fig. 3. The reduction of the chance of changes during project execution

9. The position of value engineering in project management process

The experiences of various project evaluation and existing experiences in using value engineering in projects execution process showed that saving potential in life service costs depend upon the time of applying value engineering and the limitations of its execution. In other words, value engineering can lead to considerable saving in costs and the required conditions to use it are provided. In other words, value engineering can lead to considerable saving in costs and required conditions can be provided. It is required to identify the required conditions for high potential for saving and value engineering can focus on these grounds. As it was said, it can be said effective factors on increasing project costs and reduction of their value arising from the effect of various principles of projects in design, execution and operation can be used. Although the effect of various factors as government, employer, consultant and contractor and operator are varied based on the type of plan and project, the effect of project factors is shown in Figure 4[3].

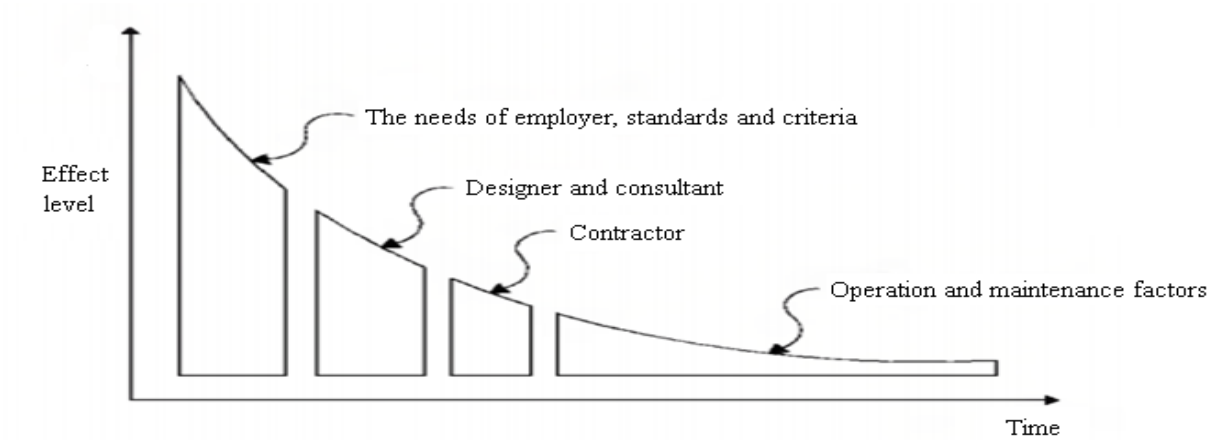

Fig. 4. Process model of value engineering

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Based on the investigations and the necessity of using value engineering, basic components in success of value engineering are key success factors in engineering. As shown in Table 1, these items are:

Table 1. Basic components in success of value engineering [4]

1.Reduction of costs	11.Simplification of activities	21.Rules	31.Evaluation of staffs performance
2.Balancing performance with costs	12.Savomg capital and resources	22.Financial systems of organization	32.evaluation of units
3.Balance between the quality and resources	13.Synergy	23.Empowerment of human resources	33.Resources and facilities
4.Creativity	14.Improving communication	24. Individual factors of human resources	34.Equipment and tools
5.Customers satisfaction and fulfilling the customer's needs	15.Creating and improving group work morale	25.Organizational culture	35.Financial information of each sector
6.Saving time	16.Improving competitive ability of production	26.Policy making	36.Informaitno of performance
7.Improving quality	17.Avoiding reworking	27.Organizational development	37.Applied technology
8.Improving product value	18.Long-term goals	28.Management skills	38.Information of activities time
9.Reliability	19.Organization structure	29.Organization strategies	
10.Reduciton of intra-organizational correspondence	20.Technical knowledge	30.Organizational environment	

10. Conclusions

Value engineering technique is recommended to complete the studies during executive operation as an applied method for optimization of construction and execution process. Value engineering has the capability to take a measurement by selected team among the experts of main specializations of the project subject with function-based approach with creative view and solve the project problems and improve its quality and reduce the execution time and costs.

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