

# **Value Engineering For Cost Reduction and Sustainability in Construction Projects**

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**Abstract:** *In construction industry the aim of project control is to ensure the projects finish on time, within budget and achieving other project activities. Time and cost are two main concerns which increase importance of cost reduction techniques. Reduction of cost of construction is a constant goal for construction industry. One way of reducing construction cost is to implement value engineering and sustainable analysis within the construction industry. Both value engineering and sustainable development play a very important role regarding quality, reliability, durability and enhancing the performance throughout the life of project without disturbing future needs. This paper covers role of value engineering as a cost reduction technique as well as stages of value engineering in correlation of sustainable construction.*

**Keywords:** *Cost reduction, value engineering, construction, function, quality, cost, value, project*

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## **I. Introduction**

In many construction projects project managers and contractors find difficulties like poor planning of project, poor material, labour shortages, increased cost of material, delays in deliveries, wastage of material, over budgeting, unexpected weather changes, lapse in management and control, loss of material, poor communication etc. These result into cost and time overruns, conflicts in project. So there is need to identify cost reduction or cost control techniques for carrying construction projects effectively. Due to cost reduction techniques cost of project is managed so that contractor does not suffer losses while carrying different activities of projects. Now a day's awareness of importance of VE has grown within construction industry. The construction industry has both positive and negative impacts on the environment and people. So both value engineering and sustainable development play a very important role regarding quality, reliability, durability as well as in enhancing the performance throughout the life of project.

## **II. Value Engineering**

### **2.1 What is value engineering?**

Value engineering (VE) is a systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall cost.

### **2.2 Value engineering for cost reduction**

Value engineering can be applied during any stage of a project cycle. VE may be applied more than once during life cycle of construction project. Early application of VE helps in more organized implementation of project activities, thus reducing overall cost by avoiding any major changes right in the beginning. If the application of VE is done in later stages it may result in higher project cost.

VE is applied in an organized process known as VE job plan. The purpose of job plan is to assist a study team to identify and focus on key project functions in a systematic manner, in order to create new ideas that will result in value enhancements.

The VE job plan consists of five phases as below:

- a. Information Phase: In this phase maximum information is collected from various aspects of project regarding identification of problems to be solved and gathering of information on background, function and requirements of the project.
- b. Creative Phase: This phase involves generation of creative ideas and listing of them project viewpoint.
- c. Evaluation Phase: In this phase of project, VE team together with client defines the criteria for evaluation.
- d. Development Phase: During this phase many of ideas are expanded into workable solutions.
- e. Presentation Phase: In this phase presentation of recommendation is prepared in the form of a report

2.3 When presenting value engineering options to a client following points are considered:

- Cost Reduction – A less expensive alternative to a specified product or system, which may or may not include a difference in quality.
- Value Added – A higher quality product that may or may not carry a higher price but will bring added value to the project.
- Life-Cycle Analysis – During the review of products and systems, we can typically identify options that will allow us to strike the proper balance between initial construction cost and long-term operational costs.
- Maintainability – We can review the building from the perspective of the owner's maintenance staff and recommend products that can produce long-term savings through reduced maintenance costs.

### **III. Connection of VE and sustainable construction**

3.1 Sustainable development is the development that meets the needs of present without compromising ability of future generations to meet their own needs. It is the balance between economic progress and environmental conservation needed for future survival. Sustainable construction is used to describe the application of sustainable development in the construction industry.

Following principles are adopted to achieve sustainable buildings:

- High performance lighting
- Environment responsive site planning
- Acoustic comfort
- Visual comfort
- Energy efficiency
- Reuse of existing building assets.
- Thermal comfort
- Indoor air quality
- Reduction in pollution
- Safety and security
- Cost effectiveness

3.2 VE can be used as a tool for achieving sustainable construction but must be applied during early stages of a project. As sustainable construction brings additional value to projects, VE can be used to ensure that these values are maximized. The main issue for construction regarding sustainability are what to build, where to build, how to build and whether to build? and this is related to planning, design and construction. But VE plays important role in sustainability for generating significant funds in initial installation and operating cost. It is not only a management approach for construction industry but also is the best technique for producing best results in achieving value for money for client. The sustainable decision uses professional judgment and vision to distinguish between capital expenditure and operational expenditure. VE job plan is a systematic approach for identifying problems and finding out solutions of them. It can raise sustainable construction principles and can give the techniques to help decision makers to take appropriate decisions and actions in order to realize value of project. Functional analysis enables the team members to apply sustainability issues in assigning components of a project. In creative phase of VE suitable alternatives for sustainability are generated and unsuitable alternatives are discarded.

To apply sustainability principles following steps are considered during project.

- For VE study experienced VE professional should be appointed.
- Consumption of non-renewable energy resources should be minimized.
- Protection and conservation friendly material should be adopted.
- Appropriate design and construction solutions are developed.

### **IV. Conclusion**

It was discussed that using cost reduction technique like value engineering by multidisciplinary team, value and economy are improved through study of alternative design concepts, material and construction methods without compromising functional requirement and quality. Thus, cost reduction techniques assure best cost, value will be obtained over life cycle of the building or structure. For environmental protection, cost optimization and social improvement VE provides powerful tools and techniques to achieve sustainability in

construction. This paper also discussed conceptual linkage between value engineering and sustainable construction which can be helpful for further research.

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