

VALUE ENGINEERING FOR REDUCTION IN COST AND PRODUCTIVITY IMPROVEMENT FOR A CONSTRUCTION PROJECT

Kirthika Janani¹, Dr. R. Malathy²

¹M.E., Construction Management,

II Year, Sona College of Technology. ²Head/ Professor, Sona College of Technology.

ABSTRACT

In Construction industry, the main objective of project control is to ensure the projects finish on or before stipulated time, within the estimated budget and succeeding other activities in the project. Cost and time are the two main things that increase the necessity of cost reduction technique in a construction project. Value engineering is the structural and analytical process that seeks to achieve the value of money. Value engineering can be applied at any stage of a project cycle. VE may be applied more than once during lifecycle of a project. Early application of VE helps in reducing overall cost by avoiding any major change in right in the beginning. 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.

VALUE ENGINEERING (VE)

Value engineering (VE) is a systematic method to improve the "value" of goods or products and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be manipulated by either improving the function or reducing the cost. It is a primary tenet of value engineering that basic functions be preserved and not be reduced as a consequence of pursuing value improvements.

The reasoning behind value engineering is as follows: if marketers expect a product to become practically or stylistically obsolete within a specific length of time, they can design it

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to only last for that specific lifetime. The products could be built with higher-grade components, but with value engineering they are not because this would impose an unnecessary cost on the manufacturer, and to a limited extent also an increased cost on the purchaser. Value engineering will reduce these costs. A company will typically use the least expensive components that satisfy the product's lifetime projections.

Due to the very short life spans, however, which is often a result of this "value engineering technique", planned obsolescence has become associated with product deterioration and inferior quality. Vance Packard once claimed this practice gave engineering as a whole a bad name, as it directed creative engineering energies toward short-term market ends. Philosophers such as Herbert Marcuse and Jacques Fresco have also criticized the economic and societal implications of this model. Value engineering is the structural and analytical process that seeks to achieve the value for money.

In a nutshell, value is defined generally as a ratio of function to cost.

Where,

Value = Function/Cost

Function is what the product or service is supposed to do.

Cost is the expenditure needed to create it.

Therefore, Value can be increased by either improving the function or reducing the cost. But while imparting the key factors in a construction project which is cost, time and quality.

The existing expression maybe revised as,

Value = (Function + Quality) / (Cost + Time)

Where,

Function is what the product or service is supposed to do.

Quality is the ability to satisfy stated or implied needs.

Cost is the expenditure needed to create it.

Time is the plan, schedule, or arrange when something should happen or be done.

LITERATURE REVIEW

SenayAtabay and NiyaziGalipogullari(2013) have done a project in Application of Value Engineering in Construction Projects Success of a project, deciding on where and how a project will be built, completion of the structure according to desired design and building quality, within determined time and cost limits, are all possible with good estimations and solutions. Realism of estimations is completely in direct proportion to success. Carrying out correct estimations is closely based on the knowledge level of the team. Value engineer assumes regulating and analyzing duties to increase the value of the project while preventing unnecessary costs. It is not possible to apply VE on each project a company produces. Much more successful value engineering studies can be carried out on complex and big projects which have high potential of restoring the investment. Of course value engineering works have a cost, therefore this project shall be big enough to meet this cost and obtain profit.

Khaled Ali AlabdAhmed1 , R. K. Pandey(2016) have studied the Concept of Value Engineering in Construction Industry Volume 5 Issue 4. The necessity of effective the application of value engineering is generally acknowledged by the construction industry and the findings indicate that VE is recognized as an effective construction industry Management tool. Many concede that a variety of problems exist within the construction industry process which need addressing such as the amount of complex information to be communicated. The literature supports the concept that an individual designer's approach affects the design method which they employ, endorsing the idea that construction industry is a complex, creative and undefined process. Management techniques have a definite origin and a structured development.

Sustainable Construction (SC)

SC is generally used to describe the application of sustainable development in the construction industry. This may mean that for the construction industry to continue its business and growth under the premise of sustainable construction it will need to slow down its growth in some areas, or grow in different ways (Plssis 2002). Sustainable construction could be defined as “the

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creation and responsible management of a health built environment based on resources efficient and ecological principles” (Hill and Bowen 1997).

Sustainability in building design construction

Sustainability is a broad term describing a desire to carry out activities without depleting resources or having harmful impacts, defined by the Brundtland Commission as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs.' (ref. Brundtland Commission, Our Common Future, 1987).

Some broader descriptions include social and economic welfare although these can confuse the basic issue of the depletion of resources.

Sustainability in building developments is a vast and complex subject that must be considered from the very earliest stages as the potential environmental impacts are very significant (ref. Technology Strategy Board).

Once it has been decided to build a new building, as opposed to say changing working practices or refurbishing an existing building, a very significant commitment to consume resources has already been made. Designers and contractors may be able to help limit that consumption, but they cannot change the overall commitment.

This consumption of resources can be even more significant if the client makes a decision to relocate, with the impact this has on their staff, requiring that they either move house or change their travel plans. Decisions such as this which are often made outside of any environmental assessment process can have a far greater impact on sustainability than decisions that designers are able to influence such as the form of the building and selection of materials.

Key decisions may be picked up by an environmental impact assessment on larger projects, but even then, this can be a post-rationalisation process used to justify decisions to the local planning authority, rather than a genuine decision-making process.

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Clients may wish therefore to appoint an independent client adviser with specialist knowledge of sustainability during the very early stages of their project (before the consultant team has been appointed) to help them address these high-level decisions.

Clients may have an existing environmental policy, that sets out an overall sustainability vision, as well as detailed objectives and targets. They may also have environmental accreditation such as ISO 14000 (a series of standards which provides a framework for environmental management).

Other standards may be imposed by funders, the building regulations, and planning legislation(including the possible need for an environmental impact assessment). It is wise however to write a specific environmental plan for the development being considered, as building projects involve many detailed issues that go beyond the scope of an existing corporate plan.

The environmental plan should:

- Set specific, measurable targets.
- Set standards that must be adhered to.
- Establish risks and mitigation measures.
- Establish procedures for communication and training.
- Establish procedures for monitoring and reporting.
- Establish procedures for revision and updating.

Environmental plans require policing, and on a large project this can be a full-time job for a specialist. At the client level, a senior champion should be appointed to take responsibility for environmental matters.

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.

Advantages of value engineering

Value engineering is characterized by a branch of knowledge and practical methods to solve problems for other quality improvement in the following:

- Job analysis distinctive way (function analysis).
- Get appointed a large amount of good ideas that are applicable.
- The action plan in place which consists of several sequential stages of a logical sequence.
- Multi-disciplinary team working in the studies of collective values.
- Ensure coordination between the relevant authorities in the project.

Type of projects that benefit most for Value Engineering

There are costs associated with value engineering; therefore, it is probably impractical to use it on every project. However, it is good idea to apply value engineering if any one of the following items is the case on the particular project:

Costly Project

Since value engineering will usually results in costs saving in the order of 5 to 10%, or in many cases higher percentage, applying value engineering to high cost projects is almost always cost effective.

Complex Project

A value engineering study affords an opportunity to get expert second opinions. When using value engineering, team members who are independent from the original design team for very technically complex project, getting a second opinion is almost always an excellent idea.

Repetitive Costs

When an organization is involved with repetitive type construction project those which they tend to build many times in various locations, the utilization of value engineering is usually very cost effective because the cost reduction ideas can be incorporated in each of the latter project of the same type.

Unique Projects with Few Precedents or with New Technology Elements

This is very simple situation to complex projects. Again the benefit of value engineering is in achieving an expert second opinion when independent team members are included.

Projects with Very Restricted Construction Budgets

With projects of this type, it is imperative to achieve maximum value for money. Since by definition value engineering seeks to achieve the elimination of unnecessary costs, its application on projects with tight budgets is usually a very good idea.

Projects with Compressed Design Programs

The old saying 'haste makes waste' is especially true with regard to construction projects. Whilst value engineering is an added requirement which can have a tendency to add to projects programs, this time can be minimized if the value engineering activity is properly coordinated with the design programs.

High Visibility Projects

This situation applied to the government sponsored or environmentally sensitive construction projects. If errors or problems developed on a project they tend to be seized upon by the media and publish headline news. Again as value engineering provides an opportunity to obtain expert second opinion it is very effective tool for avoiding problems of this nature.

Reasons for the Increased Unnecessary Costs and Poor Quality

The study of value, including what it characterized by collective action between the specialist team is an opportunity to bridge the gap that may occur in the usual process design based on

the individual work for each specialty on its own. Work is the individual tends to put upper limit of the factors of safety and efficiency and functional reasons for this:

- Lack of information
- Temporary conditions
- Erroneous beliefs
- False Customs and traditions
- Few ideas
- Change in technology
- Change in the requirements of the beneficiary
- Follow an old specifications and standards
- Time constraint
- Absence of ties or good coordination.

The Difference between Value Engineering and Cost Reduction Method

Some confused between governance and value with cost reduction method that there is substantial difference between them. Reducing project costs based on segmentation and eliminating some of these parts while managing value based on analysis of project posts and then subtracting alternatives lead purpose required but less expensive alternatives may be quite different from what is found in the design.

For example if we have a multi-building story of 10 stories and our budget is not enough not to build eight roles only, cost-cutting method may require reducing the size of the building as a cancellation of some parts of the project or roles for example resulting in naturally eliminating some posts for the project while managing value looking for cheaper alternatives to the project systems, such as construction, air-conditioning system, System isolation, electricity system ... Etc. Without removing any parts or functions or minimize project.

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The Measuring of Value

To improve the value of anything you must first find a way and a mechanism to measure this value. From the foregoing we can say that value is based on three key elements are cost and quality and functionality, and get a real measure of value, must take all these elements into account:

Functionality the primary purpose or purpose for 1. which the product was found, or project or administrative process.

Quality and mean the requirements and the expectations and wishes of the beneficiary.

The total cost (Total Cost or Life Cycle Cost): initial cost often attracts the client but this cost is usually between 6 to 30% of the total cost in construction projects.

Selection of Team Work Study

Starts with selection of the team to conduct the study value to choose the commander of the study team, which must be a specialist in value engineering and holds a Specialist Engineering Certified Value (CVS) Certified Value Specialist, and that the qualification has the appropriate experience and enjoy the capabilities to manage a team to work efficiently. The rest of the team members by making the efficiency of scientific and practical experience both in the field of specialization, depends how many people component of the working group on the size of the project and the conditions and quality, time and information available to the study, and that the type of specialties determined by the type of project and needs in question, as that of the duties and responsibilities of team leader determine number and disciplines needed by the study and the use of any external expertise in matters of minutes may not be available locally.

Cost

What is Cost?

Expense incurred by a contractor for labour, material, equipment, financing, service utilities etc. plus overheads and contractors' profit. Cost of land, architectural design, fee of consultant and engineer are not construction costs.

Types of cost

Fixed Costs

Fixed costs are those that do not change throughout the life-cycle of a project. For example, if construction of road is there, the excavators and bulldozers are fixed costs. For software development projects, the physical development space and development computers are fixed costs to the project.

Direct Costs

Direct costs are expenses that come out of the project budget directly. For example, if outsourcing some of the development work, the developers are expected to put in a specific amount of time, which is then billed for. The developer salaries are direct costs.

Sunk Costs

Sunk costs are those that have been incurred in a project, but have not produced value towards the project's objectives.

COST REDUCTION TECHNIQUES

So, there are various cost effective techniques of construction. Lots of them are also energy efficient and easily adoptable. Since India is a developing country, the economy has importance. There is a need for the adoption of strong, durable, environment friendly, ecologically appropriate, energy efficient and yet cost effective materials and appropriate technologies in construction.

In construction project reduction in cost can be achieved by some of the following techniques:

- a) Value Engineering
- b) Material Management
- c) Budgetary Control
- d) Cost optimization Techniques
- e) Cost Reduction Techniques at site

SOME COST REDUCTION TECHNIQUES NOW IN PRACTICE

- Thinner walls or single brick thick walls
- Load bearing brick work
- Brick-on-Edge Cavity Wall
- Precast stone masonry block
- Modular Brick Masonry Walls
- Hollow Clay Blocks For Shell Type Houses
- Sundried Brick walls with Waterproof Treatment
- Precast Hyperbolicshell for roofing

CONCLUSION

- A vast study has been conducted on value engineering and the application phases has been analysed within the thesis from the study it's detected that price engineering is a powerful problem-solving tool that may scale back prices while maintaining or up performance and quality requirements.
- Value engineering will improve decision-making that ends up in best expenditure of owner funds while meeting needed operate and quality level.

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