



REVIEW THE BENEFITS OF VALUE ENGINEERING AND QUANTITY SURVEYING ON CONSTRUCTION PROJECT

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Abstract: Saving money and saving material provides better value is a concept that anyone accepts. The benefits not in terms of money but value engineering and quantity surveying is saving also nature by applying different methods. By eliminating extra function and change material by applying a job plan which gets better value and saving the cost of the project. The thesis discussed the concept of value engineering and quantity surveying. How to apply both together. In this study you will find by applying job plan methods and analytically effective implement of value engineering and quantity surveying concept through a different study and its effort has been put into a project. The material get from the research is to reduce costs without affecting the quality and environment. The overall saving is 14.3% through this research., hence this method is significantly useful for the improvement of the function of the project.

Key words- Value engineering, Value management, quantity surveying, job-plan

➤ INTRODUCTION

The construction industry spends a lot of money developing residential, commercial, industrial, water and sewage treatment plants, roads, and other projects. The construction industry is directly related to the country's economy. The Indian construction industry has invested \$ 1.5 trillion in infrastructure. Each project has specific values or features that humans use. Today's construction industry demands a balance of project time, cost, and quality. Compared to other industries, the civil industry is the most difficult to manage due to these three factors. Certain modern technologies or methods are used to balance these three factors. These methods are like value engineering, quantity survey, project planning (including all resources and deliveries). In this case, value engineering and quantity survey are effective tools for addressing these factors. The project plan and design are completed before the execution. These two methods are used during the construction phase to obtain a quality of material with better value and better functionality of the project. One method is used for project sourcing and evaluation, and the other method is used to increase value and remove redundancies to reduce costs and accumulate project value. Today everyone wants more value at the lowest cost. Saving money while increasing the value of money is a concept that everyone can support. Value engineering and quantity surveying are one of the keys to reducing the cost of the project and increasing the value of the project or the functionality of the project (Karunasena & Gamage, 2017). Valuation techniques include methods such as work planning and a quick way to create value technologies.

➤ VALUE ENGINEERING, VALUE ANALYSIS AND VALUE MANAGEMENT

❖ Origin of value engineering

Value engineering was born in the early 1950s through the efforts of Larry Miles, an engineer who worked for General Electric. Today he is considered the father of value engineers. It aims for continuous improvement and the GEA has set up a central working group in the field. In the 1950s, many companies and governments used technique of value engineering that was very valuable. Institutions are set up to teach procedures, monitor processes and set standards. The process, developed by Mr Myers and the Department of General Electricity, provides the basic structure for this process and is still in place today. However, it should be noted that constantly improve is an important part of value engineering.

❖ Value engineering, value analysis and value management

Value engineering is used in the product or project pre-execution phase. All projects have other functions which are not necessary for high cost or additional projects. These additional elements or functions is removed from the project, which has resulted in lower costs and more function. For example, the fan performs the exhaust function and some companies install other devices and accessories, which results in additional costs and expenses.

Value engineering is a technique or process that minimizes redundant elements or functions when multiple functions are performed or managed. By minimizing the function in project, costs are reduced. Value analysis are also used to manage value and improve the design. Value Engineering, can change materials and methods with less affluent alternatives devoid of reduce function (barone, 2020). It focuses only on the purposes of the various components and materials, not on their physical properties.

The value analysis of a project or product that has been developed and analyzes whether it can be improved. It includes analysis and evaluation of developed products. It is an interdisciplinary method that can deliver the required functionality to you at the lowest cost without sacrificing quality, reliability, performance, and appearance. Cost analysis is an organized method that uses analysis functions to determine the unnecessary costs associated with a project and eliminate these costs without compromising quality, functional reliability, or service capabilities. Value engineering is help customers maintain value, address hidden and obvious cost and function oriented and performance-oriented approach.

Value management is a powerful tool to explore project goals and propose customer requirements (Alexander, 2000). It is a necessary tool for managing operations and contractual relationships, integrating supply chain management, simplifying language and contract agreements, and the cheapest and most valuable option. The management of the value of the construction industry depends to a large extent on the value and risk-sharing of the project. Benefits of value management is Decreasing costs, increasing profits, improving quality, expanding market share, saving time, solving problems and using resources more effectively.

➤ QUANTITY SURVEYOR

❖ Origin of quantity surveyor

The history of quantity surveyor dates to the reconstruction of London after the fire of 1666. Earlier, Seeley stated that masons, carpenters, and other craftspeople made payments daily, which meant that there was no need to estimate the amount of work because the payment was not based on that. Much work is needed to rebuild the city of London. This led to the decision to pay each craftsman an amount corresponding to the amount of work done. This requirement means that the drawings and specifications must be studied to determine the exact number of jobs completed, measure the number of different industries/work items, and calculate the cost of the entire building. The client began to design and build the house. However, the wealthy hired and hired others to design and build homes for them. These planning and construction contractors started out as the main builders of architects. They will hire "land surveyors" to create the need to build resources and cost estimates to facilitate their work (decision-support). To negotiate prices with the client, the contractor will hire inspectors to design and execute the project to assess and evaluate the project, and then negotiate with clients and architects on behalf of various retailers.

❖ Quantity surveying

A quantity surveying is a matter of time and quantity of goods, cost of construction, better material alternatives, cost recovery, schooling of possibility and evaluation of reach, benefits analysis, risk analysis, life cycle calculation (curve) and confirmation of ideas. The main purpose of the quantity survey is the systematic and efficient use of materials, labour, and money.

The Quantity surveyor is one of the key components of the project, including cost management, contract managing and dispute resolution (Editorialteam, 2017). The key objectives are given below.

- **Improvement and improvement of life:** - this research for the project or any part of the project is viable, this outcome is likely to change the design or material change.
- **Evaluation and quality:** - the actual cost equals the estimated cost. An analysis is also essential for cost extraction and the preparation of volume lists. The quality of the several activities is ready beforehand the project begins or as a technical detail of the offer.
- **Purchases:** - Buyers have a wealth of information, such as route, material price, supplier assessment, quality of materials provided, etc. The inspector decided all this.
- **Cost planning and control:** -QS prepares a construction calendar, which also provides a resource that gives you a monthly life cycle, by participating in this process, they control cost and predicted material requirements.

➤ OBJECTIVE OF STUDY

The overall objective of the dissertation to analyze the various aspect of value engineering and quantity surveying of the live civil project and study the variation in terms of money and methods. The specific research objectives of the study are given below.

- I. Provide information for a general overview of the quantity with the best quality and the best value.
- II. Propose a better replacement of material and design for the same project to reduce the cost and time of the project using value engineering.

➤ NEED OF STUDY

Construction projects are complex and require more workers. The construction industry has a lot of capital and it always takes time to complete a project. Most problems related to the implementation of the project occur in this industry. However, some problems are the correct management of the project value, the use of resources, the preference for expensive materials and redundant elements of the project. This research aims to determine the gap between the existing design and the use of resources for the project and to provide better alternative solutions for the same project.

➤ Literature review

Prof Nitin L. Rane (2016), state that Value engineering and cost reduction both are different by value engineering is function-oriented and cost reduction is product-related approach. Value engineering improves or reduces unnecessary function which reduce the cost of product. The job plan is used for research work. The project is of residence which is on the concrete structure. Due to government and environmental department river sand does not get in adequate amount so this sand is replaced by crushed sand of demolished structure which leads to saving 3.09% of money per cubic meter concrete. by this example value engineer and quantity, the survey gives the best idea to perform the activity with perform the same function.

Ayodeji Emmanuel Oke,Deji Rufus Ogunsemi (Ayodeji & Deji, 2012) ,The quantity surveyors in Nigeria have not a proper license and some surveyors don't have proper knowledge about cost control and value management of the project. This paper cross-examines the quantity surveyors for eligibility. This plate form gives knowledge about different aspect like value management, investment analysis, creatively problem-solving methods, team-leading etc. the main finding in the paper is given below.

- Value management course content in Nigerian institutions should be structured around the identified 10 areas of training requirements of value managers.

- Lecturers taking value management related course(s) in Nigerian higher institutions should include practical session and if possible, identify a life project and introduce value management approach.

Maral apazian Bedian (Maral, 2004), says four case study is studied by changing the design and methodology of work. The first project has a pile foundation on a rock up to 30 meters which are replaced by rock pile foundation up to 1.5m depth because of ground condition. Second was a bus deport was under the rocky area with caisson, in this case, engineers cut the rocks and the surface was treated by a mortar sully which saves concrete of structure and caisson. The third case of the bridge which has a pile foundation of 23m depth which is not possible due to hard strata is at shallow depth from this engineer suggest use hard strata as a foundation. Forth is for work near to huge mountain so value engineers suggest hollow pile which is filled by mountainous material. This solution saves money as well as material of a contractor. that's how the change of design and method leads to more functional solutions.

Li Xiaoyong, Ma Wendi (Li & Ma, 2012), Value engineering is a systematic application that uses common sense and technical knowledge to locate and eliminate unnecessary project cost and improve functions, serviceability. value engineering is applied in 1970 in different countries. the questionnaire prepared in six sections and every section has 35 questions for a different selection. The results showed that 44% of the designers and 32% of the construction workers felt that due to the lack of efficient means, they did not sufficiently understand the functional requirements of the project and therefore required the subjective judgment of the owner. About 10% of those questioned thinks that the expectations of owners often do not correspond to completed projects.

➤ **Research methodology**

Case study of Value engineering and quantity surveying is based on the job plan, a job plan is a systematic way to analyses a project and serves the maximum number of alternatives. In this alternative, quantity surveyor suggests better quality material and method of work. the different phase is given below.

1. Information phase: -it includes collection of background information related to the project/project such as owning and operating cost, limitation, project details. The main function of this phase is to gain as much information as possible about the project.
2. Function analysis phase: -identify function of the project and component. Its main purpose is to know the work involved and requirement of project. It helps in bifurcating non-essential function of the product.
3. Creative phase: -generate grate idea and alternative.
4. Evaluation phase: -evaluation of the creative ideas are done and developed for future recommendation to see whether the value of the project has increase or not.
5. Development phase: -conduct benefits analysis and estimate cost difference. Here, idea researched thoroughly and new design made and cost estimate are carried out between original and new proposed idea.
6. Presentation phase: -it is important phase as the new and creative idea is recommended and implemented by the owner.

➤ **DATA COLLECTION**

Research work is based on the case study which is used a housing scheme value of 660578653.8 which is in Bharuch, atali. I choose the data collection from the site is given below.

1. Bill of quantities with rates
2. Technical specification of tender
3. Drawing -architect, structure, and MEP
4. Method statements
5. List of approved make/manufacture for civil work material.

➤ DATA ANALYSIS

case study include activity which is value is more than 3% and their functions is given below.

Activity name	Function	Bifurcate activity between Primary or secondary	
Backfilling	Provide external strength to foundation	primary	
	increase stability of soil		secondary
RCC- concrete	compressive strength	primary	
	bind all reinforcement	primary	
	external strength to steel		secondary
Ordinary formwork of plywood	load distribution	primary	
	temporary support to concrete	primary	
	finish surface		secondary
Block work	load distribution of permeant structure		secondary
	give boundary to any area	primary	
	privacy purpose	primary	
waterproofing	load transfer		secondary
	water proof surface	primary	
flooring	avoid seepage of water in structure	primary	
	level surface	primary	
plastering	smooth surface		secondary
	good aesthetics		secondary
painting	avoid seepage of water from outer side	primary	
	increase aesthetic view		secondary
	free from termites	primary	

Information phase: -

- excavation is done by any Excavator and excavated soil is dumped outside the plot because the soil plastic index is low for backfilling criteria. And backfilling soil is transport from another place as per specification. Carting of soil from the plot and backfilling of soil with compaction is done at 10689866 costs.
- Different grade of concrete is used in a different component. in slab and beam have concrete of M25 have an amount of 50019533.
- Formwork, the client wants an ordinary finish with ply formwork. This formwork is a panel-based formwork system which is manufactured by Ancrow.
- blockwork is done by AAC block of Ultratech company in different size have amount of 38575320.
- Waterproofing is done in three-layer and then dumped with lightweight material in toilet sump have amount of 7101938
- Flooring has different materials like Kota stone with ruff and mirror polish and tiles have an amount of 60389929.28.
- The plaster is in two-part outer plaster is 20 mm and the inner plaster is 12mm with the lime finish is the amount of 88330306.
- Painting is of three-coat emulsion paint and three-layer of apex ultima of the relevant company have the amount of 24774614.

From the creative phase list the ideas, In development phase idea is ranked by the weightage mean method and the evaluation phase gives them to rank and prepare rate analysis. From this phase what I get is given below.

- Excavated soil mixed with 4.5% limestone and 12% fly-ash is used in backfilling which increases all property of soil.
- Slab design is a change to bubble deck to decrease concrete consumption.
- Formwork is a change to the Ancrow aluminum formwork system because of plywood wastage.
- Blockwork is a change to solid hollow block which decreases mortar as well as no need of plaster.
- Waterproofing material is a change to Cico chemical which is equivalent to material which is suggested in BOQ.
- All flooring is changed to vitrified tiles which decrease the cost of material and improve the design.
- Sand plaster is eliminated because of solid hollow block finishing. So, only 3mm putty work is done on plaster,
- In painting, a material changes to British paint in inner and Akzo on the outer side with texture.

➤ RESULTS AND DISCUSSION

This study is based on a case study of a residential building with a commercial building in which certain materials and methods have changed, which saves time and money. Value engineering and quantity measurement are separate fields, but both are used for value management. Value engineering is value management by eliminating unnecessary functions, while quantity surveying is value management technique by looking for substitutes and the best materials using locally available materials.

In this study, the real value of the savings was 94545073, or 14.3% of the total value of the Tender and environmental perspective, through a specific activity and elimination of cleaning activities, we saved 4267.8 tons of river sand and 3013.26 tons of aggregate.

Activity	Actual cost	New cost governs by alternative and idea	saving in each activity	saving in %
excavation and backfilling with antitermite	30493553	26959128	3534425	0.53
RCC- concrete	99429488	84423629	15005859	2.27
Ordinary formwork of plywood	54689067	36055264.79	18633802.21	2.82
Block work	38575320	33239163.6	5336156.4	0.8
waterproofing	20810423	15563647	5246776	0.79
flooring	102050823	87307161.52	14743661.48	2.23
plastering	63555692	56879807.43	6675884.568	1.01
painting	24774614	17635672.4	7138941.6	1.08
total	660578653.8	566033580.3	94545073.46	14.31

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