

Study on Value Engineering in Construction Projects

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Abstract: - Value engineering is a technique by which we get to know how the cost of the project can be optimized without affecting the quality, requirements, function of the particular project. This paper tells us about the various factors which affect value engineering technique, the problem areas in the construction of buildings and also about the importance of application of value engineering to construction projects. Value engineering is a proven technique and the need of the current era.

Keywords- *Value Engineering, construction, quality, function.*

1. INTRODUCTION

Value engineering is mostly applied to most of the construction projects for having better recognition of scope of project and also necessary for eliminating the cost which is unnecessary and also without affecting its functional requirement of the each item concerned with the projects. Construction projects are nowadays getting bigger in size day by day and it is becoming necessary to complete the project in planned cost and time. But due to various uncertainties in the projects there is much delay in projects and simultaneously increases the cost of project. Through Organized and creative approach and thinking it is possible to impart value to the system. It is very necessary to meet all the needs of the customer and value engineering helps to determine the best scheme for it. In 1978, this theory was introduced in China and it has been since adopted by all companies for greater economic benefits.

There are many aspects which can impart poor value to the project. (1) Proper information is not considered as there is time shortage. (2) Whenever there is a problem some adjustments are done and the problems are tried to be solved which lacks the quality. (3) Sometimes the requirements and needs of the customer are not taken into consideration and after the completion of the projects it lacks its functions for which it was meant to be. (4) No proper communication is been done and few aspects are misunderstood.

Value engineering is always applied on a service or product for its analysis and design. In value engineering the people who are experts take into consideration of all the parameters based on their experience and knowledge with construction. During the review, the external factors are also taken into consideration so that to identify its impact on the projects and also the extent of the impact. Also it is necessary to keep in mind to check if these parameters are able to tackle all the challenges. Then the experts check for all the alternate possibilities and which can

suit with the existing conditions. The alternatives should be able to resist all the influences.

Value engineering can be applied for various aspects. Few uses are: (1) it can be used for reduction of unnecessary cost on existing project. (2) It can help in determining the possible alternatives which is best for the project. (3) The schedule of the project which was delayed due to uncertain situations can be improved. (4) Whenever there is threat for risk in project Value engineering can help in reducing risk. (5) It is imparted for better quality, reliability and satisfaction of all the needs of customer. (6) The performance of organization can also be improved to a better extent.

2. LITERATURE REVIEW

2.1 Review of Technical papers

1. V. Bazjanac, J.T.O'Donnell, S.Tarantino, N.Mrazovic and J.Compostella (2014)

- i. The objective was to do a performance based value engineering so that the later impacts will not hamper quality.
- ii. This was possible through employment of semi-automatic generation of all inputs.
- iii. The PBVE model enables better delivery of energy performance predictions. It enables to maintain the original building energy efficiency aspects.
- iv. This paper concludes telling us about the importance of having performance based value engineering.

2. Chong ZHOU, Bing WANG, Yong GUO (2014)

- i. The objective was to integrate the theory of value engineering and analytic hierarchy process and also on project management research optimization.
- ii. This was possible through a model which evaluate function, cost etc. With establishment of evaluation

index for high rise building they identify first level and second level indicators.

- iii. They calculate the weight of each index through integration of VE and AHP.
- iv. This method was implemented in various projects and found to be helpful in maximizing the value of project management.

3. *Wan-hua Qiu, Han-peng Zhang, Ze-Shui Xu, De-Sheng Wu (2015)*

- i. The objective was to propose a new theoretical model which was based on the introduction of VE/VM into space system.
- ii. This was possible through taking function analysis, functional optimization and functional realization of object development as base to get final optimization.
- iii. The application of Design structure matrix will also further help in optimization of project.
- iv. This model provides an idea which is new for structured optimization of space system and improves function value and cost management.

4. *A. Afshar Ghotli (2013)*

- i. The objective of the study was to find the gap between how Value management is being practically used with the Value management published knowledge.
- ii. This was done by investigating the current works of VM and also about the level of practice of VM.
- iii. The usage of literature survey, questionnaire among experts, interviews were carried out. Further analysis of this information and critical issues were identified
- iv. New strategies which include new organization charts, specification binding, involvement of government, using technical articles etc were suggested by author.

5. *G.B. Lin and Q.P. Shen (2010)*

- i. The objective of this paper was developing a framework for proper measurement for Value management studies in construction.
- ii. This was done by study of the existing frameworks and factors which had major impacts are identified and foundation based on theory is established.
- iii. The preliminary framework was developed and Key performance indicators by a survey based on questionnaire was presented.
- iv. It was found by analyzing of the various data providers, weight ages of the KPI's and case study, focus group meeting proper framework for measurement was made.

3. THEORY OF VALUE ENGINEERING

3.1 *Concept of Value Engineering*

The Value engineering is a scientific method through which we strive to improve the value of the product/service from the point of view of the customer to have the desired function from the elements of the product cost at the reasonable cost of the deployed resources. VE always takes into consideration of the existing product and services. The objective of maximizing profit by proper examination of all the areas which is having high cost and finding ways to eliminate those unnecessary cost and do benefit for the company. The main focal point in VE is reduction of material cost. The value is increased by reducing cost and retaining the value of the product/service. Also sometimes the increase in cost is necessary but also it should be considered to increase the value much more than cost.

The Value engineering team comprises of a cross-functional team and it is necessary for all the key expertise to be in the team for the best outcome of the VE study. The method of selecting critical areas will result in the success of VE. It is necessary to select the critical high cost area so that we can have better outcomes. Also before selecting the areas it is necessary to categorize into prominent categories so that it will give us better idea to select from the most appropriate categories. The VE team has to initially study all aspects of the project including the performance function of each aspect. Then with help of proper tool select the most appropriate areas. Value engineering has always proved to be one of the best solutions for all the major cost runs in a project which can be controlled.

3.2 *Factors influencing Value Engineering*

There are various factors which has a great influence on the Value engineering study.

3.2.1 *Customer requirements*

The basic function of any product is to provide satisfactory performance to the customer as they are the prime importance of any business.

While doing Value engineering it is necessary to keep the basic function of the product/service same and also the functionality of the product should not change. There is always a must and want type of needs. It is necessary to keep the must needs of the product and the want needs can be taken into consideration depending on the cost and utility.

3.2.2 *Brand value*

When a service is in a market it is always having a brand name associated with the product/service. This is also considered to be one of the important aspects as Value engineering shouldn't hamper the quality of the product and

thus affecting the brand value. It is always used to study in detail the benefit and problems associated with the alternative material. Selecting the most appropriate material along with keeping up the quality of the product/service is important.

3.2.3 *Cost of material and labor*

The cost of material is the major 50% cost of total cost of the product. Hence it is very important to consider reducing the cost of material by way of reducing wastages, substitution with alternatives without affecting quality and even adding some changes to the existing material. Even a very small reduction can bring about much reduction in the overall cost. The labor productivity is a major issue and we need to seek for ways by means for improving the productivity and improving overall efficiency.

3.2.4 *Systematic process approach*

The major problem for effective functioning of value engineering ideas needs a systematic process approach in the organization. If the methods in which the activities are done are not controlled and not systematic then the value engineering is of no use. It requires all to involve together and understand the objectives of the company and cooperate together so that success is achieved. It needs to be taken care that all the processes need to be crucially studied and identify the problems so that better function ability is achieved.

3.2.5 *Continuous Improvement*

The systematic methodology should be followed so that the value engineering changes made to the organization has an impending effect for future. Also continuous monitoring on periodic basis is required so that it can be analyzed where there are problems mitigation of the same can be done at earliest. The continuous improvement will ensure the stability of the organization and also much cost savings in the unnecessary cost.

3.3 *Problems faced in Construction of Buildings*

The Industrial construction is one of the prominent sectors where India is having much greater growth in the recent years. There has been much cost incurred when it comes to construction of Industrial buildings. There is also much unnecessary cost which comes throughout the life cycle of construction. More precise ways have to be taken to have such buildings to be constructed. During the planning stage itself many aspects which affect the cost of construction have to be considered. The necessity of a value based design is an ultimate necessity of industrial construction. The industrial buildings are always designed heavily as heavy loads are expected to be imposed on the structure.

The major problems faced in construction projects are

- (1) The improper planning is considered to be one of the major problems to affect the cash budget. When there is an unexpected uncertainty which comes up and due to which the finance of the project is certainly affected and also there can be other problems which comes up due to improper planning.
- (2) Lack of skilled workers in the execution of the projects. As major construction is having a need for skilled workers as there is precision required in the activities. Lack of proper workers available affects the schedule cost and quality of construction projects.
- (3) An environmental regulation hinders the conformance of the project as per the requirement. It is necessary to design considering the requirement and environmental restrictions. The cost of considering these environmental aspects will increase in the cost of construction and indirectly affecting the budget.
- (4) Increase in cost due to safety issues is also one of the major concerns. Due to some thefts or some problems due to internal staff also affect the functioning of the activities in the project.
- (5) Cost overruns are a common problem in the construction industry. It is necessary to identify those areas where these cost overruns occur. It can be due to various reasons such as improper handling of materials, no proper methodology and functioning efficiency.
- (6) There is huge scope of work which is involved in the construction projects and many times there is a dispute that arises in the course of work so to resolve the disputes there needs a DRB or arbitration and that is a time consuming process and can be a major reason for delay in completion of projects.
- (7) Due to constraints in the schedule of works it becomes necessary for completing the works in restricted time which impacts on the quality of works and ultimately puts black mark on the organization.
- (8) Most of the works is been undertaken without proper supervision and it ends into work completing with lots of defects and it becomes a different task for rectification of defects which includes much time and cost.

4. APPLICATION OF VALUE ENGINEERING TO CONSTRUCTION PROJECTS

There has been much competition in the construction sector from last decade and it requires them to have a better reliability towards the customer which intends them to give better services at reasonable cost. There are many factors which need to be considered for keeping a low cost. It is necessary to know that having low cost is not only the binding factor but also it is necessary for them to have a better value to their

project. The value in this case can be different for all concerned parties. Each party tries to have a better value and the main motive behind a business is to have a good profit. When it comes to the contractor side he would always try to complete his work in the lowest possible cost similarly for the client he should be getting maximum gains as possible. The customer has to only consider his comfort level and the design team would consider its functions and aspects to be taken into consideration.

As construction involves a larger amount of task starting from the planning to the execution stage, there is a risk of completing the tasks in the given time and cost. Also it should be considered that the durability, reliability of the work should also increase. It is necessary to take precautionary measure in the planning or initial stage but we take fewer measures for considering value. Also after the work completed it is less seen the tendency of comparing the construction with the value but generally it is seen that the profit basis is been considered and compared. In value engineering we consider for designs which are integrating both value and cost and for that it finds the critical elements and eliminate the unnecessary cost associated with the project.

The production cost is always a major concern and it has to be reduced for achieving a better reduction in the overall cost of project. It can be either the material cost, equipment cost etc. It's always necessary to check whether the equipments and materials being used are according to the conformance of the current needs and if not then it is necessary to replace them with materials which is equivalent to existing material and also it's necessary to consider the cost reduction aspect also.

The minimization of the defects and lack of clarification during the execution of projects leads to future unnecessary cost indulged and this can be reduced by proper details to be given to the execution team so that a better quality project could be done and the future unnecessary cost can be controlled. Value engineering can impart a good integration between the cost and value of the project. It is very necessary to always check the aspects of the project on a periodic basis. That basically helps to achieve more understanding of what functions need more clarity and changes to be done so that good quality can be achieved.

When we plan to do value engineering to particular project it is necessary to properly follow all steps related to VE in a proper manner so that we get better results. Firstly it is necessary to identify the critical elements which are imparting unnecessary cost in a project. There can be various such critical elements but it is not possible to carry VE on all the critical elements as it can affect the overall quality of the project. The combination of the elements should be taken which can have maximum cost reduction in a project. The possible combination of the elements can be selected by proper mathematical models which help us to analyze the best

possible combination. Also it is necessary to compare the selected results with the quality of the project. The quality is to be maintained so that future sustainability is maintained.

5. CONCLUSION

The success of the project depends on various factors which are involved in a project such as the methods applied for the projects, the internal and external factors associated with the projects. The initial estimates which are prepared should be maximum in accordance to the project and it is necessary as it can directly affect the fund requirements in the execution of project. It is necessary to identify the necessity of VE in any project. The VE can only be applied on projects which can have considerable cost benefit. Hence it is useful if we apply value engineering to a big project where the VE can bring considerable benefit to the organization. Also there should be a proper balance between all the things which are being applied to a project and also the needs of the customer should also be taken into consideration.

The VE savings can be brought about in favor of all parties concerned to the project. It is necessary that all parties should understand the importance of value engineering and impart it as an important part of their function. Successful VE implementation is possible only through the coordination of all concerned participants. VE is mostly properly defined and understood by all levels in the organization. It can be an effective technique for having better performance with cost reduction. The quality of the concerned people undertaking VE is very important. It gives us better quality, cost and performance for the concerned product/service.

The need of the era is for a better analyzing and evaluating technique which can be used for better value engineering results which assuring better performance for the future. Many mathematical models are been applied but the functional relationship with the elements is important to be considered as it will affect the post performance of the project. For choosing of the correct alternative is the most important key feature of value engineering. Value engineering was found to be the important aspect which imparts value to a project.

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