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Value Engineering in Road Rehabilitation and Traffic Improvements

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ABSTRACT

Value Engineering (VE) is the systematic review of a project, product, or process to improve performance, quality, and/or life-cycle cost by an independent multidisciplinary team of specialists. VE can be utilized in highway projects in both scientific research and construction fields. Value Engineering (VE) is one tool that can counteract the growing of highway design and construction problems by providing: cost reduction, process improvement and alternative means and materials for highway construction and maintenance. The main purpose of VE is to deliver the necessary function of a certain facility at the lowest cost. It helps identify high cost areas of the project as well as determine the most economical combination of functions to achieve the task (design or construction).

Function analysis involves thinking about why an item is necessary, rather than thinking about item itself, that is, its function-oriented rather than item oriented. The function analysis approach leads to more creative solutions than item oriented traditional cost reduction approaches.

KEYWORDS: *Value engineering, Job Plan, Time, Cost, Quality..*

I. INTRODUCTION

VE is an effective technique for reducing costs, increasing productivity and improving quality. It can be applied to hardware and software; development, production and manufacturing; specifications, standards, contract requirements and other acquisition program documentation; and facilities design and construction.

It is defined as "an analysis of the functions of a program, project, system, product, item of equipment, building, facility, service or supply of an executive agency, performed by qualified agency or contractor personnel, directed at improving performance, reliability, quality, safety and life cycle costs". It may be successfully introduced at any point in the life-cycle of products, systems, or procedures.

VE is a technique directed toward analyzing the functions of an item or process to determine "best value", or the best relationship between worth and cost. In other words, "best value" is represented by an item or process that consistently performs the required basic function and has the lowest life-cycle cost.

In the application of VE in facilities construction can yield a better value when construction is approached in a manner that incorporates

environmentally-sound and energy-efficient practices and materials. Because "costs" are measurable, "cost reduction" is often thought of as the sole criterion for a VE application and indeed it is primarily addressed in this document.

Value is one of the most fundamental concepts in value techniques. However, value is a term with different interpretations within different situations. In order to obtain a clear understanding of the term, the following paragraphs will examine what value is in the context of VM and explore its root in economics.

II. SCOPE AND OBJECTIVES

There is always a scope to improve value, in terms of material value or the worth. The main objective is to provide all necessary functions at a lowest cost. To find the possibility of the application of value engineering by the institutions of the building construction industry and to find out the benefits of application of value engineering in construction projects in terms of;

1. Time;
2. Quality;
3. Efficiency; and
4. Better management.

In this work, an attempt has been made to apply various value engineering techniques in the following areas;

- Use of alternative materials
- Energy efficiency.

Apart from application in the above mentioned areas, value engineering techniques can be applied in logistics, material procurement.

III. LITERATURE REVIEW

Literature survey aimed to identify the value engineering in road rehabilitation and traffic improvements in construction industry.

This report **"**Application of Value Engineering in Road Construction Project" was written by Ms. Sayali Dhayalkar & Mr. Hemanshu Ahire, Imperial Journal of International Research, Summaries Value engineering is an efficient tool among them for fostering the construction quality with an aim of low cost and high services. The value engineering is a methodology used to analysis the function of the goods and services and to obtain the required functions of the good and service of the user at the lowest total cost without reducing the necessary quality of performance. It is an intensive, interdisciplinary problem solving activity that focuses on improving the value of the functions that are required to accomplish the goal, or objective of any product, process, service, or organization. In this paper we have discussed the concept of Value Engineering and the effective implementation of it through case study.

An another report "Value Engineering In Road Rehabilitation And Traffic Improvement Projects" written by Tariq Shehab, Ph.D., Mohamad Mahani, International Journal Of Applied Engineering Research, This paper presents a cased-based reasoning approach to reduce the time and cost associated with VE processes. It provides a screening tool that points to high-potential improvement areas and suggests alternative options. Furthermore, it provides a useful tool to junior engineers through which they can learn from more experienced colleagues. The presented tool uses 30 Caltrans' projects and 76 VE solutions to perform the required task**.**

An another one report "Utilizing Of Value Engineering In Highway Projects" - Hossam El-Din Helal, Ibrahim Hassan Hashim, Ahmed Ebrahim Abu El-Maaty, Value Engineering (VE) is the systematic review of a project, product, or process to improve performance, quality, and/or life-cycle cost by an independent multidisciplinary team of specialists. Its focusing on the functions that the project, product, or process must perform sets it apart from other quality improvement or cost-reduction approaches. It also demonstrates the accumulated experience of VE related to transportation field and how VE can be utilized in highway projects in both scientific research and construction fields.

Prof. Amiruddin Ismail, Rahim Aminzadeh, Ali Aram And Ishak Arshad, "Value Engineering Application In Highway Projects" - American.J Of Engineering And Applied Sciences, On transportation projects, Value Engineering (VE) teamwork by involving construction, design and maintenance staff review the construction project features and look for ways to improve quality, control costs and time. This study briefly described VE and quality, cost schedule planning, application of VE, cost parameters, relationship of value, function, cost and worth. Results: VE, highway construction was survived and opportunities for better, less expensive means of completing the construction projects were analyzed. The intention is to progress project quality and productivity, foster innovation,

optimize design elements, also ensure overall economical costs. This study achieved to the model Value Engineering in Highway Construction (VEHC) which cause decrease time, decrease cost and increase quality in highway it has been.

The report “Utilization of Value Engineering to Optimize Concreting Productivity” - M. Abd, S.M. Abd, A. Ismail and M.F.M. Zain, Journal Of Applied Sciences, 2008, This study highlights the topics of productivity monitoring and measurement in constructing sector. To develop the productivity, several measures have been done in some area of construction projects. Concreting process is taken as case study. The finding pointed the relative importance of this activity in terms of time and cost. Three methods of concreting process were examined; manual method, semi-mechanized method and full-mechanized method. For small size works, the manual method was the best for concreting work less than 50 m3 for work more than 50 m3and less than 260 m3, the Semi Mechanized Method was the best and finally for work size more than 260 m3, the full mechanized method was the most suitable. A comparative model has been developed to determine the best method of construction, its cost and duration. This model can also be used as a predicting tool for selecting the method during the planning phase of project.

The report “Application Of Value Engineering In Construction Projects” - Senay Atabay And Niyazi Galipogullari, The current economic conditions have entailed the use of rational method and techniques and research and application of new techniques by utilizing advancements in technology in the field of production as well as in every field. Excess cost control requires to be maintained throughout the project life of building beginning from the initial stages of design. Scrutinizing the project well and considering all possible alternatives particularly in design stage are important for achieving optimum cost. In this study, how the principles of VE (value engineering) are applied in construction projects is explained, and by covering Bregana-Zagreb-Dubrovnik Motorway construction in Croatia by BECHTEL – ENKA joint venture as the sample project, practices of VE in this project are described. The satisfactory results of time and cost saving are achieved by applying value engineering principles through the VE team during the project preparation phase and project revision phase. Approximately 43,000,000$ and 12 months of time were saved in total thanks to all these VE works. This saving provided builder company with 6% financial saving and 17% work time reduction.

In this report "Application Of Value Engineering In Commercial Building Projects", - Nitin Rane, Department Of Civil Engineering , Value Engineering is one of the most effective techniques known to identify and eliminate unnecessary costs in product design, testing, manufacturing, construction, operations, maintenance, data, procedures and practices. The methodology is composed of three main stages. The first stage is the Pre-Study of the Value Engineering. The purpose of this stage is to plan and organize the value study. Value Engineering is the systematic application of recognized techniques that identify the functions of the product or service, creatively establish the worth of those functions, and provide only the necessary functions to meet the required performance at the lowest overall cost. Value Engineering focuses on accomplishing the required functions at the lowest overall cost. It helps in eliminating or minimizing wastage of material, time, and unnecessary cost, which improves value to the customer. The second stage is the Value Study which is the core of Value Engineering study and it is composed of five phases, the Information phase, Function Analysis Phase, Creative Phase, Evaluation Phase and the Presentation phase. All phases and steps perform sequentially. The objective during post-study activities is to assure the implementation of the approved value study change recommendations.

This paper presents “Implementation Of Value Engineering- Case Study” -Amit Sharma (March 2012) International Journal Of Marketing, the basic fundamental of Value Engineering and its different phases that can be implemented in any product to optimize its value. A case study is discussed of a bath fitting product in which the material of the product is changed according to the value engineering methodology. The material is chosen such that the cost is reduced without affecting the value of the product and its design. To find the best possible alternative from the choices we have incorporated a tool named as Decision Matrix. Decision Matrix gives the most appropriate result and is even easy to use. Hence the cost is reduced as a result of the analysis.

This paper “Evaluation for Improvement Plan of Highways by Applying Value Engineering written by Ryosuke Ando, Journal of the Eastern Asia

Society for Transportation Studies, Highway improvement and maintenance have supplied the economic development and enhanced our life convenience greatly. However the economic and social conditions changed heavily in Japan. The long period economic inactivation, the low birthrate and longevity constrain the investment to public projects strictly. The public works meet the criticism for the estimation of the effect and the mismatching between the projects and the local needs with any new highway improvement project contemporaneously. In this study, I applied VE (Value Engineering) as an evaluation approach for the highway improvement plans. The work started with the function definition and finished with the proposal of design principles on improvement plan. Finally, the study verified the effect of VE as a valid approach for the evaluation of highway improvement plans to help us to choose the best plan fitting with all of conditions and limitations.

This paper present, "Value Engineering in Road Design and Road Construction" written by Mahmoud El-Shourbagy, Value Engineering (VE) is one tool that can counteract the growing of highway design and construction problems by providing: cost reduction, process improvement and alternative means and materials for highway construction and maintenance. The main purpose of VE is to deliver the necessary function of a certain facility at the lowest cost. In order to better understand the application of VE, one should first identify the main terms which called Function, cost, worth and value. Function analysis involves thinking about why an item is necessary, rather than thinking about item itself, that is, its function-oriented rather than item oriented. The function analysis approach leads to more creative solutions than item oriented traditional cost reduction approaches. Another approach used for identifying and classifying the functional relationships of a study project known as Functional Analysis System Technique (FAST). By using of FAST diagram, a good understanding of the overall problem and its solution can be obtained. Benefits resulting from VE application on several highway projects are included in this review. Benefits resulting from VE application on several highway projects are included in this review.

An another one report "Possibility Of Using Value Engineering In Highway Projects - Renata Schneiderova Heralova", The paper deals with the possibility of using value engineering in highway projects. The reasons for criticizing highway projects are usually three. Firstly, they do not achieve expected project goals, secondly, project delivery is not within a reasonable amount of time, and finally, costs are not in line with their budget limits. The author believes that value engineering methodology can help to find ways to improve solutions to these problems by balancing cost, schedule, and scope through the generation of innovative alternatives. It was found that a project can significantly save on costs and improve performance of project functioning by using the appropriate value engineering process at the right time. The paper summarizes the benefits and effectiveness of the value engineering methodology along with recommendations.

IV. CONCLUSION

Value Engineering is a powerful methodology for improvement of value, cost saving and quality. This paper concludes that how Value Engineering technique works and also shows benefits of application of Value Engineering in Construction Industry. It is not applied in proper way in India and it is usually confused with the concept of cost saving. To overcome this Value, cost, quality problem one can uses many cost reduction techniques like Material Management, Budgetary Control, Waste Management, Value Engineering. Amongst all the technique Value Engineering is most widely used technique and give enormous result in cost reduction.

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