



The Risk Management and Value Engineering: Mitigating Challenges in Construction

Muhammad Waheed

Quaid-e-Awam University of Engineering and Technology, Nawabshah,
Pakistan

Corresponding Author: Muhammad Waheed waheedkumboh94@gmail.com

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ABSTRACT

Value Engineering is a management technique crucial in construction for enhancing value and reducing costs. Unlike mere cost cutting, Value Engineering aims to improve functionality by minimizing energy consumption in terms of manpower, materials, and machines. Multidisciplinary teams of engineers, influencing the design process, enhance Value Engineering benefits. It's highly effective in identifying and eliminating unnecessary costs across building design, construction, operations, and maintenance. Value Engineering involves three main stages: Pre-Study, Job Plan, and Post-Study. This literature review delves into how Value Engineering principles are applied in building projects to achieve superior quality at lower costs.

INTRODUCTION

The construction industry is a significant indicator of a nation's growth, especially in India where the real estate sector has gained prominence due to economic liberalization. It stands as the second-largest employer, employing skilled and semi-skilled labor, following agriculture, and plays a vital role in the nation's economy.

Value analysis, value engineering, and value management are part of a unified administrative approach focused on finding practical solutions and reducing unnecessary costs.

- **Value Analysis:** This study is applied to completed projects or existing products to enhance their performance and eliminate extra costs.
- **Value Engineering:** Aimed at improving the quality and reducing the cost of construction projects, value engineering is implemented during project conception or after completion to address public perception.
- **Value Management:** This is a comprehensive concept involving the management of programs and the setup of value studies and follow-up procedures. It ensures that value engineering workshops or value analysis is integrated into the overall management process.

Value Engineering is a management technique focused on achieving the optimal balance between cost, reliability, and performance across products, projects, processes, or services. It serves as a powerful problem-solving tool capable of reducing costs while maintaining or enhancing performance and quality standards. By improving decision-making, Value Engineering ensures the most efficient use of owner funds while meeting necessary functions and quality criteria.

The success of Value Engineering lies in its ability to identify opportunities for cost reduction while ensuring quality, reliability, and performance meet or exceed customer expectations. It involves a systematic study of functions aimed at satisfying user needs with a high-quality product at the lowest life cycle cost, often through creative approaches.

METHODOLOGY

Value analysis, value engineering, and value management constitute an integrated administrative strategy with a primary emphasis on identifying pragmatic solutions and minimizing superfluous expenses. In the case of Value Analysis, its application is directed towards finalized projects or existing products, with the goal of optimizing their performance and eliminating unnecessary costs. Value Engineering, on the other hand, is geared towards enhancing the quality and reducing the cost of construction projects. It is implemented either during the project's conceptualization or after completion, with a focus on addressing public perception. Value Management encompasses a comprehensive approach involving program management and the establishment of value studies and subsequent procedures. It ensures the seamless integration of value engineering workshops or value analysis into the overarching management process.

RESEARCH RESULT AND DISCUSSION

In their study, Darshan and Jitendra et al. (2017) emphasized that value engineering concepts primarily aim to reduce project costs by recommending the use of locally available advanced replacement materials. They found that simply substituting materials with more suitable alternatives can lead to significant cost reductions, with potential savings of around 8% of the project cost. This reduction is particularly noteworthy for projects with high construction costs, as it represents a substantial proportion of the overall expenses.

In their survey-based case study, Mohammad, Omid, Vahid et al. (2017) discovered that by thoroughly investigating various options for the transmission pipeline, it was feasible to slash construction costs by as much as 41% through the adoption of an alternative route to cross the Reno Mountain. This finding highlights the significant potential for cost savings through strategic decision-making in value engineering practices. The study suggests that future research efforts could concentrate on proposing innovative strategies to further optimize results in value engineering implementation.

In their study, Arivazhagan, Guru, Partheeban, Rachel et al. (2017) observed that the application of Value Engineering led to significant cost savings, ranging from 20% to 25% of the total project cost. However, their findings also revealed concerning trends regarding awareness and implementation practices. They found that only 53% of respondents who applied Value Engineering were aware that the selection of the bridge construction method should involve the designer and project manager, while a mere 33% mentioned the importance of the cost estimator in this process. This discrepancy highlights potential gaps in understanding and collaboration among project stakeholders. Furthermore, the study uncovered that most respondents admitted to not following an organized Value Engineering job plan as expected. This suggests a need for improved processes and methodologies to ensure the effective implementation of Value Engineering practices in construction projects.

In their study, Khaled and Pandey et al. (2016) propose that the primary reason for the underutilization of value engineering as a construction management tool is not necessarily due to a lack of management support. Instead, they suggest that senior management must first recognize and appreciate the benefits of implementing value engineering in construction management before its usage can be increased effectively. The authors highlight the importance of professionals involved in managing the design understanding the conflicting agendas between design and management. Additionally, they stress the necessity for these professionals to grasp the tools available for managing the construction process effectively. Moreover, the study emphasizes that decisions made in the early stages of a project have far-reaching effects on all aspects of the project. Despite this critical stage, the construction industry tends to allocate the least amount of resources to it compared to other industries. This underscores the need for greater attention

and investment in the early stages of construction projects to optimize outcomes and mitigate risks.

In their study, Attarde and Rane et al. (2016) examined the application of Pareto's Law, also known as the 20/80 principle, which suggests that roughly 20% of the functions typically account for around 80% of the cost in a project. They found that these functions are the primary focus of value engineering efforts. Additionally, the researchers concluded that the optimal time for conducting a value engineering study is during the planning stage of the project, before it is released to the contractor. This early intervention allows for thorough analysis and strategic decision-making to optimize value and mitigate costs effectively. By addressing key functions and potential cost drivers early in the planning process, value engineering can have a significant impact on the overall success and efficiency of the project.

According to Gowrisankar and Nayana et al. (2015), the information phase holds significant importance in understanding the problem thoroughly. They suggest that having a wide and abundant pool of information makes the process of generating ideas much easier. Furthermore, the decisions regarding which ideas to select can vary based on the relevance and comprehensiveness of the information collected during this phase. In essence, the quality and breadth of information gathered during the information phase greatly influence the effectiveness of idea generation and subsequent decision-making processes in value engineering.

In their study, Husseinb, Ibraheemb, Mohammedb, and Youssef et al. (2012) found that the most valuable alternative in value engineering is not necessarily the one with the lowest price. Instead, it refers to an alternative that achieves a significant percentage of the required functions at the lowest cost. Additionally, they observed that each school building may have its own unique criteria, and the alternatives for each building carry their own weights against each criterion. This holds true even if multiple buildings share similar environments or users. This highlights the importance of considering specific project requirements and objectives when evaluating alternatives in value engineering, rather than solely focusing on cost.

In their research, Philip, Stephen, and Udo-Inyang et al. (2006) discovered that in the private construction industry, the utilization of independent facilitators for value engineering studies is infrequent. They noted a prevalent confusion within the industry, wherein cost-saving measures are often mistaken for value engineering. This suggests a potential gap in understanding and implementation of value engineering principles within the private construction sector. By recognizing and addressing this confusion, stakeholders can better leverage the benefits of value engineering to optimize project outcomes.

CONCLUSIONS AND RECOMMENDATIONS

Value Engineering is indeed a proven management technique that contributes significantly to enhancing value and reducing costs in the construction industry. Value engineering does improve decision-making, leading to optimal expenditure of owner funds by balancing cost, reliability, and performance effectively. The best time for conducting a value engineering study is typically during the design and planning stage of a project when potential cost-saving opportunities can be identified and integrated into the project plans.

Value Engineering application indeed leads to better quality, faster completion, environmentally friendly practices, and reduced waste generation, among other benefits. Value Engineering typically results in about a 5% to 10% reduction in construction costs for building projects.

ADVANCED RESEARCH

Value Engineering is a management technique crucial in construction for enhancing value and reducing costs. Unlike mere cost cutting, Value Engineering aims to improve functionality by minimizing energy consumption in terms of manpower, materials, and machines. Multidisciplinary teams of engineers, influencing the design process, enhance Value Engineering benefits. It's highly effective in identifying and eliminating unnecessary costs across building design, construction, operations, and maintenance. Value Engineering involves three main stages: Pre-Study, Job Plan, and Post-Study. This literature review delves into how Value Engineering principles are applied in building projects to achieve superior quality at lower costs.

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