A Review on Value Analysis of Construction Equipment

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Abstract- *Successful product development in an organization requires a focus on value engineering analysis and ergonomic considerations. With the ever-changing customer requirements and the shorter life cycle of products due to technological advancements, introducing new products is crucial for sustainable profit and growth. To ensure that the product provides value to the customer, cost optimization and quality of function are essential. Therefore, value analysis plays a crucial role in product design and production processes, ensuring customer satisfaction at various levels. For instance, in this essay, we will examine the application of rational design, empirical design, industrial design, and design through experimentation by an Indian company to develop products. The product development process involves several stages, and a comprehensive analysis of the actions involved in the process will be presented. Specifically, we will be analyzing a new product, the "Wall plastering Semi-Automatic spray gun," which is used for plastering the outer surface of construction work, using the required tools, charts, and methodology to develop a cost-efficient, quality performing, and featured product.*

Keywords- Customer requirement (CR), Product design specification (PDS), Design for X(DFX), Modularity, Parametric design, detail design

I. INTRODUCTION

In today's competitive business environment, customer satisfaction is of utmost importance for organizations, which is directly linked to the functionality of their products. The value of a product is determined by its ability to perform its intended function. Organizations always strive to increase the value of their products by fulfilling the functional requirements. The cost of the product is equally important as it also affects customer satisfaction and the product's performance in the market. A proper balance between function and cost is achieved by increasing functional performance while keeping the overall cost constant or reduced. This can be achieved through "Value Analysis." The concept of Value Analysis emerged after World War II, when material shortages created problems for many companies. General Electric Company observed that many alternatives could provide better or equal performance at a lower cost. This led to the concept of Value Analysis/Engineering, which aims to increase or maintain product performance while reducing costs. The systematic approach to Value Analysis was developed by Lawrence D. Miles, following the establishment of the Society of American Value Engineers (SAVE) in 1959.
The Wall plastering Semi-Automatic spray gun is an excellent example of how applying value analysis with ergonomic considerations can benefit both the manufacturer and customer. By focusing on customer satisfaction, the manufacturer can increase the value of their product while reducing costs. Through value analysis, changes have been made to the design of the Wall plastering Semi-Automatic spray gun, resulting in improved plastering performance at minimal cost.

II. BACKGROUND

The history of plastering dates back to 7500 BC when people in Jordan used crushed limestone mixed with lime to cover building walls, floors, and hearths on a large scale. Over time, plastering techniques evolved for aesthetic and material quality purposes, but the working procedures remained the same. In the 14th century, plastering work got a new dimension with the introduction of decoration or pargeting, which was used to decorate the exterior of timber-framed buildings. However, all the plastering work was done manually with different types of handmade tools. In the 18th and 19th centuries, the advent of cement and Portland cement brought a new dimension to the plastering process. The process of mixing and strength of material improved significantly. With the rapid increase in population in the 20th century, the demand for construction work increased significantly. This led to the need to handle the plaster mixture more efficiently. With the advent of cement-based plaster, it became easier to think about automation in the handling of plaster mixture.

III. LITERATURE REVIEW

Many literature surveys were employed in the process of developing decision-making criteria and activity guidelines. Below is a discussion of the literature that is included in this chapter.

Jing Taoet al. have discussed about use of value engineering in sustainable product development. The model is used with different tools like Quality function deployment (QFD) with an understanding of economic, social, and environmental perspectives. In process engineering and industrial management, life cycle simulation is used for modeling complicated close-loop type product life cycles. Expert from various fields with a common vision help to develop more sustainable processes and products with their specific strata of acumen.

Marjan Leberet al. have suggested using the basics of VA to eliminate the characteristics not provide value for their money. Innovative management -VA and conjoint analysis are used to show the outcome-based new product design relevant to customer satisfaction.

Gleison Hidalgo Martinset al. This study used Pinch Bottom with Simple Fold (PBSF) for Value stream mapping along with Earned value analysis in a multiwall paper bag production process line. Diagnosis of wastages, operational efficiency, and product costing is done by continuous monitoring with PBSF. This system can be used as an auxiliary tool for the Lean manufacturing process. Potential gains in production efficiency and relevant quality are also found in this process.

Pranish M. Naoghareet al. have introduced value analysis to reduce takt time and throughput time which are indicators for best practice in production cycle of work rate and per piece production time in long run production. This rubber hose molding and assembly line which is governed by the concept of value analysis with the help of combining process operation and internal design parameters gives a huge positive change in cost reduction as well as productivity. Simplification of workplace design and layout gives good result in material movement which in turn reduce the throughput time.

Satish M. Silaskaret al. have discussed the utilization of value engineering with an example of ball valve design. Weight optimization is done based on value engineering principles used for customer satisfaction and value for their money. Improvement in the machining process to reduce cost by effective utilization of design tolerances.

Kamal Patelet al. have the role of value engineering in NPD by systematic design of parameters related to the critical to quality portion. Value engineering helps to diagnose and implement the key areas of cost reduction without affecting the quality of the product. To ensure high-quality value engineering matrices have been used.

Ainul Farahin Binti Abdullahet al. presents how utilization of Value analysis Value Engineering (VAVE) methodology in NPD. In this case change in the design process has been made to increase the value of the outer door handle with more features for better sales value without any deterioration of quality norm. Optimization of product value has been processed by using the Functional Analysis System Technique (FAST) which is an integral part of VAVE methodology. Customer satisfaction is a key parameter during VAVE which is directly and inversely related to function and cost respectively.

Lasse Makkonenet al. have used a specific method VWLS to use design parameters based on probability and least square fitting. Monte-Carlo simulation is used for providing estimation for extreme values which also can be obtained from EVA methods. In VWLS no subjective methodology is required for calculation.

T. Alix et al. have discussed innovative strategies for product-service systems in manufacturing to satisfy customer needs. Profitability can be increased by utilizing a diversified portfolio and providing additional services associated with products. Value engineering helps to match manufacturer expectations and customer needs.

Yinet al. have presented the difficulties of creating a model to accommodate performance and function with different ratios and activities. Performance is related to cost, function, time, and product quality all things can be contradictory. Sometimes process effectiveness can be taken as the measure of process function and its ratio to process cost can be used for quantitative measurement.

Șerban Micleaet al. The paper presents a novel approach of combination of classical with straightforward(intuitive) one and incorporating calculation-based (setting up) statistical confidence interval relationship with functionality and cost. The difference between ideal and real function-to-cost ratio without negative effects can be observed by setting up a confidence interval. To get “close to optimal state” for the function to cost ratio and also to understand the result difference aids like process generating solution, reallocation, integrating a new function, reengineering, and modernization.

Kate Dobsonet al. introduced case study on work experience in the different continents of this paper and recognized the evolution of Human Factors (HF) in the specific application from a practitioner’s point of view. Specific work areas or points where HF can be used like signaling and control systems. Available factors provide better reliance on the operator to remain industrious and respond efficiently when

intervention in automation is useful both within the control room as well as driver cab environments. This paper gives an insight into some human performance concerns for novel transportation control systems that are scenario regularly and discusses how critical assessment is for the area of cognitive attention, human error, and workload.

IV. CONCLUSION OF REVIEW LITERATURE

The number of approaches utilized for value analysis for construction design may be found in the literature review mentioned above. Based on the needs of the client, several design elements have been taken into account. In addition to choosing between standard, special purpose, and standard sub-assemblies, technology, cost, and material also play a significant influence in product design.

V. CONCLUSION

The most difficult task in any industry is value analysis due to the complexity of decision-making, the product life cycle, and money. Embodiment In addition to calculating strength, stability, and aesthetics, the design stage aids in the selection of mechanisms, modularity, and component kinds. In addition to employing tolerance fits, parametric design facilitates the application of contemporary design trends (DFX). Robust design processes also use quality loss functions. Profitability can be improved for business sustainability based on innovation and customer happiness. This methodology takes into account several aspects of consumer satisfaction, technical advancement, production cycles, and consumption cycles for longer product life cycles, faster construction projects, and profitability with customer satisfaction.

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