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PERFORMANCE IMPROVEMENT BY VALUE ENGINEERING IN SMEs

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ABSTRACT
Today's rapid changes and global competition force SME to become increasingly competitive and responsive to consumers and market developments. The purpose of requirements in engineering activities is to add business value that is accounted for in terms of return-on-investment of a product. This paper focuses on developing a function-oriented value method strategy required to implement the value methodology for SMEs. The Value methodology has function and cost as the foundation upon which the technique operates. Therefore a toolkit with value methods as the central management tool was developed. The toolkit integrates few supporting techniques (return on investment, cost modeling, Pareto analysis, quality function deployment and target costing) within value method. This plays a crucial role in realizing quality, reliability and durability as well as enhancing performance. They also help to improve service related outcomes within budget constraints to achieve a more efficient use of resources and accomplish an optimum combination of Life Cycle Costing (LCC) and quality to satisfy the user requirements.

KEYWORDS: Performance, value, quality, reliability, cost.

INTRODUCTION

Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. Society of Japanese Value Engineering defines VE as: "A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost" .Value Engineering is an effective problem-solving-technique. Value engineering is essentially a process which uses function analysis, team- work and creativity to improve value. Value Engineering is not just "good engineering." It is not a suggestible program and it is not routine project or plan review. It is not typical cost reduction in that, it doesn't "cheapen" the product or service, nor does it "cut corners."Value Engineering simply answers the question "what else will accomplish the purpose of the product, service, or process we are studying?"

LITERATURE REVIEW

During World War II, many manufacturers were forced to use substitute materials and designs as a result of critical material shortages. When the General Electric Company found that many of the substitutes were providing equal or better performance at less cost, it launched an effort (in 1947)to improve product efficiency by intentionally and systematically developing less costly alternatives. Lawrence D. Miles, a staff engineer for General Electric, led this effort. Miles combined a number of ideas and techniques to develop a successful methodological approach for ensuring value in a product. The concept quickly spread through private industry as the possibilities for large returns from relatively modest investments were recognized. This methodology was originally termed *value analysis* or *value control*. In 1957, the Navy's Bureau of Ships became the first Department of Defense organization to establish a formal VE program. Miles and another General Electric employee, Raymond Fountain, set up the Bureau of Ships program to help reduce the cost of ship construction, which had nearly doubled since the end of World War II. The Bureau of Ships asked that the technique be called "Value Engineering" and staffed the office with people under the general engineer position description.

CASE STUDY

In this paper we have considered a medical instrument manufacturing company, located in West Bengal, for analysis which runs export business of medical microscope. This firm is producing different types of microscopes which they export to various countries around the globe. All of the products manufactured here are conforming to the international standards. It is an ISO certified company. One of their modelSL250 has a component named Focus Adjustment Knob for Slit Lamp in microscope. Value Engineering is applied to the Focus Adjustment Knob. The steps used for this purpose are as follows:-

1. Product selection plan
2. Gather information of product
3. Functional analysis
4. Creativity Worksheet
5. Evaluation sheet
6. Cost analysis
7. Result

Steps followed during the analysis are given below:

Plan for Product Selection

Product selected is Focus Adjustment Knob for Slit Lamp in microscope which is used to adjust the focus of lens for magnification purpose. The present specifications of this part and its material used are costlier than the average industry cost. Value of this product can be increased by maintaining its functions and reducing its cost or keeping the cost constant and increasing the functionalism of the product.

Obtain Product Information

Product specifications are:

i. Material – Aluminum Bronze Alloy
ii. Diameter of base plate –30 mm
iii. Thickness of plate--3 mm
iv. Cost of the scrap is –Rs. 293/Kg
v. Pieces Produced annually – 8000
vi. Process used – C.N.C. indexing milling
vii. Cycle time—2.5 min
viii. Anodizing—2/min
ix. Material cost—Rs.65 / gm
x. Total Present cost –: Rs.29.99/piece

Functional Analysis of Present Functions

Name	Basic Function	Basic Function	Secondary Function	Secondary Function
Focus Adjustment Knob	Index	Lens	Fix	Gear tooth

Table I Functional Analysis

Develop Alternate Design or Methods

During brainstorming these ideas were listed:-

i. Change design
ii. Change material
iii. Use plastic
iv. Make it lighter
v. Change the production process
vi. Use nylon indexing unit

Evaluation Phase

For judging the ideas, the following points from designs aspect were considered:

- Function
- Cost
- Maintainability
- Quality
- Space

Each of these design criteria was given a weight age factor. This was carried out as follows: each of the above criteria was compared with others, and depending on their relative importance, three categories were formed, viz. major, medium, and minor. A score of 3, 2 and 1 respectively was assigned to each of the levels. The details are as given in the tables.

Weight age analysis	Points
Major difference	3
Medium difference	2
Minor differences	1

Table II

Symbol	Attribute	Score
A	Function	6
B	Cost	8
C	Maintainability	2
D	Quality	5
E	Space	0

Table III

Following attributes have been designated the symbols and been given the score from 0 to 10 according to their importance in Table III

The above ideas were discussed and the best feasible ideas were separated as mentioned below:

a. Change the material to steel
b. Use Nylon unit
c. Use existing material

RESULT

The total savings after the implementation of value engineering are given below:

- Cost before analysis –Rs.29.99/-
- Total Cost of nylon knob –Rs.18.40/-
- saving per product –Rs.11.59/-
- Percentage saving per product – 38.64 %
- Annual Demand of the product – 8000
- Total Annual Saving –Rs.92,720/-
- Value Improvement - 62.98 %

CONCLUSION

Value engineering methodology is a powerful tool for resolving system failures and design improvements in performance of any process, product, service or organization. Its application results in significant improvements to quality and reliability by focusing the team's attention on the functions that are contributing most to the problems, and the most likely causes of these problems. Then, the team develops ways to improve these root causes of the problems, and ways to fix the problems that have occurred along with means to prevent their recurrence.

In the Case Study discussed above we have used the concept of Value Engineering to analyze the focus adjustment knob of microscope and with the critical evaluation of it we were able to increase the value of the product by substituting another material in place of the one that is currently in use.

The various advantages have been observed in terms of cost reduction, increase in overall production, reduction in manpower, and reduction in scrap. In future we can alter the design of the product and integrate this technique with various other prevailing industrial engineering tools which will bring down the cost by substantial margin and thereby increasing the value of the product.

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