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Value engineering analysis: Fine grain scrutiny on Industrial design products

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Abstract

This paper mainly deals with implementation of value engineering in industrial design products. Many of the products are included with the best possible features but their cost is too high for a medium earning person. By using value engineering concepts can result in reduction in the excess cost by finding the alternatives of enhanced quality. It can significantly save cost and increase performance of product. The benefits of the value engineering in industrial design projects is explained with help of a consumer product.

Keywords*: Functions, Cost analysis, Value Engineering*

1.0 Introduction

Value engineering (VE) is a methodologyof product development by which value of a new or existing products order is improved. The VE is a functional and systematic approach and a team used to analyse and improve the value of a product, installation design, system or service. It proposes a robust methodology to solve problems and reduce costs while improving performance and quality. It is also a project management tool that effectively recognises and stabilizes the scope of the project with independent of time and cost. The rapid escalation of manufacturing, productivity and maintenance costs, along with reduced revenues and a wide variety of brand options, have generated greater interest in the industrial design products industry. In addition, it helps project managers to quickly identify alternatives material for rapid product development and reducing cost. VE consist of five-level "work plan" which is mentioned below:

1. Evidence phase (background knowledge, analysis of most important functional problems: costs and effects in connection with the function)
2. Innovative phase (ways to provide the required functionality for customer value)

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3. Scrutiny phase (definition of evaluation criteria, investigation of ideas, weighted calculation)
4. Development phase (ideas expand to feasible solutions: design change, evaluation of benefits and Disadvantages (cost comparison, LCC calculation, comparison with the original draft)
5. Presentation phase (recommendations, significant impact on costs).

In addition to these all VE methods have the following minimum basic characteristics:

- Explanation of the aims and scope of the project in sufficient details.
- Prominent Goals.
- Content of each study and its schedule
- Creation of objective statistics for the formal demonstration of the outcomes of the project.

The main objectives of this paperis to apply VEfor development of consumer product that is mixture of kettle and a sandwich maker i.e. “KetWich”.

2.0 Methodology

The methodology of this study is divided into 3 parts including cost-function relationship of the product, creative worksheet of the alternative product, function-cost-worth analysis, and cost comparison chart. The systematic application of recognized techniques that identify the characteristics of the product or service. Value these jobs and provide the necessary jobs. To meet the required performance at the lowest total cost. VE uses balanced logic (a unique question of "how" - "why" technique) and function analysis to determine relationships to increase this value. A quantitative method is similar to a scientific method that focuses on hypothesis-conclusion approaches to test relationships and process research, which use models to predict predictions.

2.1Analysis of cost-function relationship

Firstly list of parts of products i.e. components, functions, division of primary and secondary function columns, cost, and cost percentage of the whole product are listed. After preparing the functional analysis worksheet of different parts of the product, evaluation is done on each part. The numerical evaluation is made for the respective component. The primary and secondary functions are subjugated for clear picture of what actually worth about the product.The creativity worksheet comes later to improvisations required for the existing

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product parts as a better alternative for the reduced costs. The selection of the alternatives are done by the decision matrix. The decision matrix contains the rating from 1-5, 1 being the poor and 5 being the excellent along with their assigned parameter weights.The recommendations sheet for alternative product part along with their costs is made for proof generation. Samples of the recommended alternative is further prototyped and tested with the customers. If reports were found satisfactory for all the alternatives, weight reduction was found with cost reductions. Then the final step is to put a proposal for management or finance for the approval of funds for mass manufacturing. Conclusions and future scope of the product are listed along with proof of reports about cost savings and development of product made Modifications in the design are made so that value of the product is enhanced.This process was applied to chosen product i.e. KetWich (kettle+ sandwich maker) and results are listed in table 1 to 5 and figure 1 respectively.

Table 1: Cost function relationship of Kettle+Sandwich maker (KetWich)

S.no	Component	Function	Primary-Function	Secondary-Function	Cost (Rs)	% of Cost
1	Kettle Container	Boil Water	P		120	16.9
2	Sandwich press/grill	Press / Toast bread	P		110	15.49
3	Heat controller	Control temperature		S	35	4.9
4	Display	Show Information		S	110	15.49
5	Child Lock	Provide Protection		S	20	2.8
6	Power cord	Supply Current		S	15	2.11
7	Wood Frame (Teak)	Provide Support		S	200	28.16
8	Fabrication and polishing	Avoid Bacteria		S	100	14.08
			2	6	710	

Table 2. Creative worksheet of alternative 1

S.no	**Component**	**Function**	**Primary function**	**Secondary function**	**Cost (Rs)**	**%of cost**
1	Kettle	Boil water	P		120	24.4
2	Sandwich press	Press / toast bread	P		110	22.44
3	Display	Show information		S	80	16.32
4	Snap fit lock	Provide safety		S	20	4.08
5	Power cord	Supply current		S	15	3.06
6	Plastic frame	Provide support		S	110	22.44

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7	Heat controller (thermostat)	Control temperature		S	35	7.14
			2	5	490	99.88

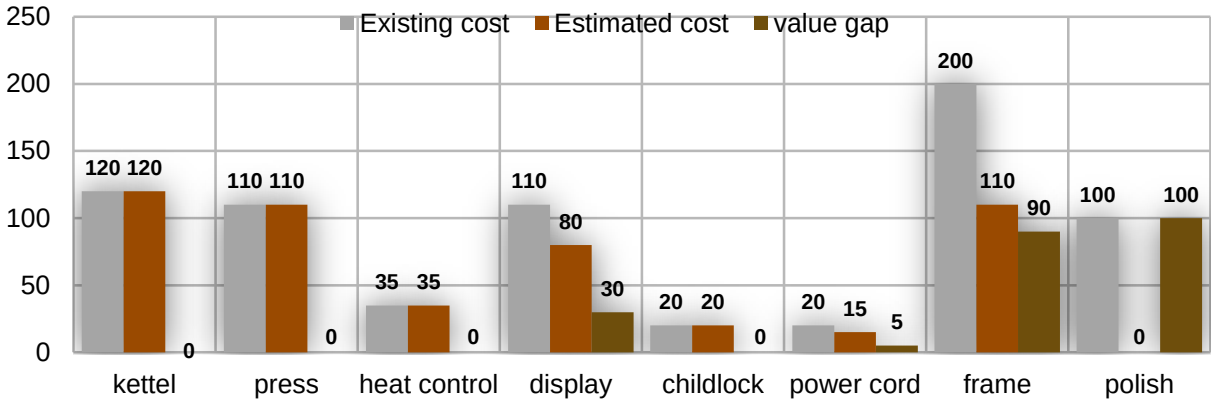

Figure 1 Function –cost worth analysis

Table 4. Cost comparisons chart

S.no	Material	Cost	Alternative material	Cost	Savings
1	Teak wood	200	High density plastic	110	90
2	2*16 (standard display)	110	2*8 semi (Display screen)	80	30

Table 5 Evaluation Matrix

Parameters Weightage	Rigidity 7	Light weight 3	Aesthetics 6	Usability 6	Total
Existing	4	1	4	2	67
Alternative proposal	4	5	3	4	89

EVALUATION PHASE

- Rigidity
- Lightweight
- Aesthetics
- Usability

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Alternative

1. Used the plastic frame instead of wood reduce to the weight and increase thelife time of frame.

2. Because of plastic there is no need of the polishing on the new frame.

3. Included the upgraded display which is 30/- cheaper.

Parameters

- Evaluation for the existing and proposed alternative phase.
- Ranking the product in 5 different ratings such as, 5 being excellent and 1 being poor.
- The rating of 4 people is taken as consideration while preparing the above value.
- By the figures above, the alternative product changes proposal is the best possible as per the customers review with the cost reduction.

3.0 Results

By application of value engineering and finding out the alternative has increased the profits by 220/- The product's design modifications was enhanced without compromising the cost. The cost price has been reduced so it generates a hike of 156% of profits compared to previous profit. By this analysis of cost-function on my product with alternative has proven that my creative worksheet can be further moved to mass manufacturing by raising the funds.

4.0 Discussion

Many of the products are included with the best possible features but their cost is too high for a medium earning person. By using value engineering concepts can result in reduction in the excess cost by finding the alternatives of enhanced quality. Using value engineering method can help in finding a way of alternative solution by balancing the schedule, cost, functionality of the product. It also found significantly that a project can save cost and increase its performance by using the refined value engineering techniques and launching it in right time. The benefits of the value engineering in industrial design projects is recapped in other products also.

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