MP482
PRODUCT DEVELOPMENT AND DESIGN

MODULE IV

- Value Engineering / Value Analysis. : Definition. Methodology, Case studies.
- Economic analysis: Qualitative & Quantitative.

Value

- Value, as defined, is the ratio of function to cost.

- Value is the lowest price you must pay to provide a reliable function or service

- Value can therefore be manipulated by either improving the function or reducing the cost.

- It is the   n.

$$Value = \frac{Function\ (or\ Utility)}{Cost}$$

Function

- Value engineering Defines function as that which makes a product work or sell

- It is the end result or action desired by customer.

- Customer wants a function to be achieved reliably ,efficiently and effectively by product or service.

Cost

- Amount incurred to manufacture the product so that it performs the intended function.

Types of Values

- Cost Value
  - It is the cost of manufacturing a product
- Use Value
  - Also called functional value
  - Considers the work done, functions performed or services rendered by the component or product
- Esteem Value
  - Involves the qualities and appearance of a product which attracts person and create a desire to possess the product.
- Exchange Value
  - Product is said to have exchange value if the same product can be exchanged for something else.

Types of Function

- Function specifies the purpose of the product or what the product does, what is its utility,etc.
- Types of Functions are
  - Primary Function
    - Basic function that product must exhibit
    - Cannot be changed
  - Secondary Function
    - Supporting Functions
    - Can be modified or eliminated
  - Tertiary Function
    - Additional benefits that a product gets
    - Can be modified or eliminated

Types of Function Example

- Eg: Painting a merchant navy ship
- Primary Function:
  - Save the ship against corrosion and deterioration
- Secondary Function:
  - To make it recognizable
- Tertiary Function :
  - To make brilliant appearance

Value Analysis

- Value Engineering (VE, or Value Analysis) is a management technique that seeks the best functional balance between cost , reliability and performance of a product, project, process or service.

- A process of systematic review that is applied to existing product designs in order to compare the function of the product required by a customer to meet their requirements at the lowest cost consistent with the specified performance and reliability needed.

Value Engineering and Value Analysis

Difference between VA and VE

Value Analysis (VA) is the application of creative techniques for increasing the *Value* and *Functions* to an **already** *Existing Product / Services* to minimize the *Cost* of that Product. This is like a Post-mortem analysis, done after the fact, so a Remedial Process.

Value Engineering (VE) is the application of creative techniques for increasing the *Value* and *Functions* for *New Products* at the design stage itself, to minimize the *Cost* of the Product. This is done before the fact at pre-manufacturing stages such as concept development and design, so a Preventive Process.

Value Engineering and Value Analysis

Value Analysis	Value Engineering
It indicates application on the product that is into manufacturing	It indicates application on the product at its design stage
In value analysis all factors come together including workers,subcontractors,engineers to make a team with total experience and knowledge	Value engineerin is always done by a specific product design(engineers) team
It may change the present stage of the product or operation	The changes are executed at the initial stages only
It is worked out mostly with the help of knowledge and experience	It requires specific technical knowledge

Objectives of Value Analysis

- To provide better value to a product/service.
- To improve the company's competitive position.
- To ensure that every element of Cost (Labour Materials Suppliers and service) contribute equally to the Function of the product.
- To Eliminate unnecessary Cost.
- To use efficient process
- Faster cost reduction technique

Application of Value Analysis

- Capital goods – plant, equipment, machinery, tools, etc.
- Raw and semi-processed material, including fuel.
- Materials handling and transportation costs.
- Purchased parts, components, sub-assemblies, etc.
- Maintenance, repairs, and operational items.
- Finishing items such as paints, oils, varnishes, etc.
- Packing materials and packaging.
- Printing and Stationery items.
- Miscellaneous items of regular consumptions.
- Power, water supply, air, steam & other utilities (services).

Application of Value Analysis

- Military Equipment
- Import substitutes
- Automobile Industries
- Material Handling equipment
- Machine Tool industry

Advantage of Value Analysis

- It leads to improvements in product design so that, most appropriate products are produced .
- High quality (value) is maintained.
- All-round efficiency is achieved by eliminating waste of various types.
- Cost savings provide a measure for judging managerial effectiveness.
- New ideas are generated and incorporated.
- Teams spirit and morale are improved.
- Areas requiring attention and improvement are pin pointed.
- Improves the company's competitive position.
- Each element of Cost contribute equally to the Function of the product.
- Uses efficient process
- Faster cost reduction technique

Value Analysis Job Plan/Value Analysis Methodology

- Orientation Phase
- Information Phase
- Functional Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase
- Implementation and Follow-up Phase

Orientation Phase

- Identify issues
- Prioritize Issues
- Drafts scopes and objective
- Establish evaluation factors
- Determine Study Team
- Collect Data
- Prepare for value study

Information Phase

- Further familiarization of the project by the team; all team members participate in determine the true needs of the project.

- Areas of high cost or low worth are identified.

- In this first phase, the team attempts to understand why the project exists and who or what it is to produce.

- They obtain project data, present the original design or product concepts, and understand the project scope.

- Schedule, costs, budget, risk, and other non-monetary issues are studied until the team is comfortable with the concept of the project, what it is to produce, and who its end users are.

- This step also includes things like site visits and meetings with the project team, if required.

- Project documents like plans, drawings, specifications, and reports are obtained and the value engineering team becomes familiar with them.

Functional Phase

- Functional analysis outlines the basic function of a product using a verb and a noun such as 'boil water' as in the case of our kettle.

- The team attempts to determine the functions the project serves. Functions come in two forms:

- ***Primary functions*** are those that represent the reason for the project's existence,

- ***Secondary functions*** are those that the project serves without being core to the project.

- The functions are described in verb/noun pairs, such as "supply water to all suites," or "Maintain view of adjacent park."

Creative Phase

- This step requires a certain amount of creative thinking by the team.

- A technique that is useful for this type of analysis is brainstorming.

- This stage is concerned with developing alternative.

Evaluation Phase

- In this phase of the workshop, the VA team judges the ideas developed during the creative phase.

- The VA team ranks the ideas.

- Ideas found to be irrelevant or not worthy of additional study are disregarded.

- Those ideas that represent the greatest potential for cost savings and improvements are selected for development.

Development Phase

- The team develops the selected ideas into alternatives (or proposals) with a sufficient level of documentation to allow decision makers to determine if the alternative should be implemented.

Presentation Phase

- The presentation phase is actually presenting the best alternative (or alternatives) to those who have the authority to implement the proposed solutions that are acceptable.

Implementation And Follow Up

- Develop an implementation plan
- Execute the plan
- Monitor the plan to completion Objective:

During the implementation and follow-up phase, management must assure that approved recommendations are converted into actions.

Case Study

- Focus Adjustment Knob for Slit Lamp in microscope

Phases

- Product selection plan
- Gather information of product
- Functional analysis
- Creativity Worksheet
- Evaluation sheet
- Cost analysis
- Result

Plan For Product Selection

- This Product 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 functionality of the product.

Obtain Product Information

- i. Material – Aluminum Bronze Alloy
- ii. Diameter of base plate –30 mm
- iii. Thickness of plate--3 mm
- iv. Cost of the scrap is – 293 rupee/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—65 gm
- x. Total Present cost – 29.99 rupee /piece

3.Functional Analysis

FUNCTIONAL ANALYSIS				
Name	Basic Function Verb	Basic Function Noun	Secondary Function Verb	Secondary Function Noun
Focus Adjustment Knob	Index	Lens	Fix	Gear tooth

4. 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

5. Evaluation Phase

- For judging the ideas, the following designs were considered:

- A. Function

- B. Cost

- C. Maintainability

- D. Quality

- E. Space

6.Cost Analysis

6. Cost Analysis

Item	Material cost (₹)	Machining cost (₹)	Anodizing cost (₹)	Total cost/Pc (₹)
Focus Adjustment Knob	19.04	7.30	3.65	29.99
Nylon index unit	11.60	6.80	-	18.40
Part Eliminated	-	-	-	-
Difference /part	9.44	12.72	6	11.59

7. Result

- The total savings after the implementation of value engineering are given below:
- Cost before analysis – 29.99 rupee
- Total Cost of nylon knob – 18.40 rupee
- Saving per product – 11.59 rupee
- Percentage saving per product – 38.64 %
- Annual Demand of the product – 8000
- Total Annual Saving – 92,720 rupee
- Value Improvement - 62.98 %

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