

## VALUE ENGINEERING CONCEPT FOR BUILDING CONSTRUCTION

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*Abstract: This paper presents the basic fundamental of Value Engineering and its different phases that can be implemented in any product to optimize its value. Value engineering also improve the product cost by reducing the unnecessary costs including with the product. Value Engineering is an intensive, interdisciplinary problem solving activity that focuses on improving the value of the functions that are required to accomplish the goal, or objective of any product, process, service, or organization. Job plan is the main key factor for value engineering.*

**Keywords:** Value Engineering, Job Plan.

### INTRODUCTION

Value Engineering is the systematic application of recognized techniques by multi-disciplined teams that identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost.

Value engineering is a systematic method to improve the "value" of goods or products and services by using an examination of function. The best value is determined by two considerations function & Cost of product. Value, as defined, is the ratio of function to cost.

$$\text{Value} = \frac{\text{Function}}{\text{Cost}}$$

Value can therefore be increased by either improving the function or reducing the cost. It is a primary tenet of value engineering that basic functions be preserved and not be reduced as a consequence of pursuing value improvements.

The value of product can be increased by either increasing the function or decreasing the cost while maintaining the performance, quality, and reliability.

Value Engineering essentially aims to produce solutions creatively and economically by:

- Identifying unnecessary expenditure
- Challenging assumptions
- Generating alternative ideas
- Promoting innovation

- **Optimising resources**
- **Saving time, money and energy**
- **Simplifying methods and procedures**
- **Eliminating redundant items**
- **Updating standards, criteria and objectives.**

The fundamental aspects that are identified below summarised the VE technique:

- **A proven management technique;**
- **Enhance value, quality, safety, reliability, maintainability and optimise whole life cycle cost;**
- **Function oriented, analysis;**
- **Improve decision making;**
- **Meets user’s requirements, needs, and expectations;**
- **Multidisciplinary, proactive, creative teams approach;**
- **Problem–solving technique; and system, techniques, approach.**

### ORIGIN

Value Engineering was considered in industries during World War II when it was difficult to obtain critical materials industries. This strategy led to the replacement of materials and designs. In 1947 Lawrence D. Miles, one of America's General Electric engineers evaluated possible cases. He designed different ways and methods to deal with the upcoming changes and provided an appropriate method for determining the value of a proposed project. Using the theory in industry quickly became popular in the industry and a great return on investment along. He called this motion "value analysis". Value engineered make his way in the industry with “value analysis”, " value method" " value development", "Value Methodology".

### HISTORICAL DEVELOPMENT

Table.1

YEAR	DEVELOPMENT
1947	Value Analysis Program formally ushered in at General Electric Company, USA. A one-man operation under Mr. Miles.
1952	Mr. Miles conducted the first Value Analysis Workshop Seminar. It was considered company confidential.
1954	US Navy Bureau of ships adopted this concept to cost improvement during design in their organization and changed the name Value Analysis to Value Engineering.
1956	Watervliet Arsenal, under US army ordnance corps initiated a Value Engineering program.
1958	The Electronics Industries Association (EIA) formed a committee on value engineering. The committee was headed by Admiral Mandelkon (USN, retired).
1959	Society Of American Value Engineers (SAVE) was founded in Washington D. C., USA, to unite all practitioners and promote the growth of the profession.
1961	Value Engineering contract clauses were established in US Armed services

	procurement regulations (ASPR), permitting contractor incentive sharing in Value Engineering contract cost reductions.
1962	US department of defense made value engineering contract incentive clause a pre-requisite for all procurement contracts in excess of \$ 100,000. And Value Engineering Ltd., founded in London.
1963	US Navy Bureau of Yards and Docks began applying Value Engineering incentive clause in their contracts.
1964	US Army Corps of Engineers Value Engineering program started.
1965	Society of Japanese Value Engineers (SJVE) formed as a voluntary society. And Value Engineering Pty., founded in Australia.
1967	Working committees were started in: Canada: Canadian Society of Value Engineering. Scotland: Scottish Association of Value Engineering. Norway, Denmark, Sweden: Scandinavian Association of Value Engineering. South Africa: Value Engineering Management Society of Africa. Value Engineering introduced by the Chinese Productivity Council.
1969	US National Aeronautics and Space Administration, office of facilities, began conducting Value Engineering studies and training.
1970	General Services Administration began its building contractor Value Engineering program.
1977	The Indian Value Engineering Society (INVEST) was founded in October. First national Conference held in New Delhi.
1978	China forms Shanghai Value Engineering Society (SVES).
1981	2 <sup>nd</sup> INVEST National Conference, New Delhi.
1982	3 <sup>rd</sup> INVEST National Conference, Bangalore. And Invest Eastern Zonal Chapter inaugurated, at Jamshedpur.
1983	4 <sup>th</sup> INVEST National Conference, New Delhi.
1984	5 <sup>th</sup> INVEST National Conference, New Delhi.
1985	6 <sup>th</sup> INVEST National Conference, Jamshedpur.
1986	The Society of Indian Value Management (SIVAM) founded in Bangalore.
1987	1 <sup>st</sup> International Congress on Value Analysis, Milano, Italy.
1989	SIVAM convenes First Value Engineering conference, Bangalore.
1990	7 <sup>th</sup> INVEST National Conference, New Delhi.
1991	8 <sup>th</sup> INVEST National Conference, Bombay.
1992	World Federation of Value Societies, formed.
2012	Asian Conference on Value Engineering - a key initiative by Asian countries for Sustainable Growth, New Delhi.
2014	The International Value Engineering Conference - Gulf Hotel Convention Centre Kingdom Of Bahrain

#### WHEN VALUE ENGINEERING IS USED

- To determine the best design alternatives for Projects.
- To reduce cost on existing Projects.
- To improve quality, increase reliability, and customer satisfaction.

- To improve organizational performance.
- To improve schedule
- To reduce risk
- To identify problems and develop recommended solutions.

## WHAT VALUE ENGINEERING IS NOT

- Value Engineering is not just "good engineering."
- It is not a suggestion program
- 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?"
- It stands to reason that any technique so useful should be applied to every product, and at each stage of the normal day-to-day development of a product.

## APPLICATION OF VALUE ENGINEERING

### a) Construction:

- 1) Project concept
- 2) Customer requirements/specifications
- 3) Site selection
- 4) Design proposals
- 5) Material selection
- 6) Construction programmed
- 7) Construction methods and
- 8) Facility maintenance.

### b) Manufacturing

- 1) Product concepts
- 2) Customer requirements/Specifications
- 3) Design proposals
- 4) Material selection
- 5) Manufacturing methods and
- 6) Product Marketing

### c) Systems, services & Processes

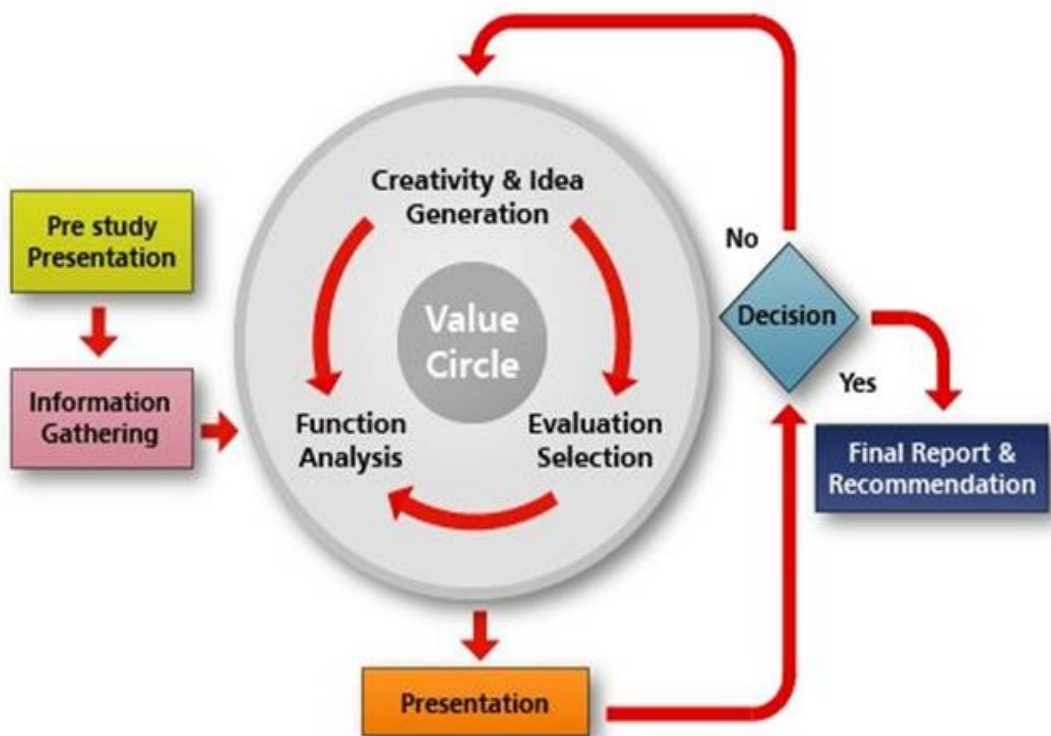
- 1) Concepts
- 2) Customer requirement/specifications
- 3) Design proposals
- 4) Implementation procedures
- 5) Monitoring procedures
- 6) Maintenance procedures; and Strategic planning.

### d) Management decision making in circumstances when value engineering is used as a team problem-solving process on issues such as:

- 1) Strategic planning
- 2) Policy formulation
- 3) Asset management

- 4) Supply chain management
- 5) Maintenance management
- 6) Marketing
- 7) Administration
- 8) Overheads
- 9) Capital and recurrent budgets
- 10) Organization design
- 11) Cycle time management
- 12) Programming development and
- 13) Information technology.

**VALUE ENGINEERING JOB PLAN**



Several versions of the VE Job Plan can be found in current VE literature. Some give five, others six and yet many others seven phases. It is the systematic approach which is more important to achieve the desired objectives. The phases of the Value Engineering Job Plan are as follows:

- **Information Phase:** All Possible Information regarding the product is collected in this Pre-study. The value engineering team starts to identify the areas that will allow for the most improvements. The team gathers information about the present design and cost, then determines the needs, requirements, and constraints of the owners/users/stakeholders, as well as the design criteria.
- **Function Analysis Phase:** The function analysis technique is applied in the effort of identifying all functions and their costs. The team defines the project functions using a

two word active verb measurable noun context. The team analyzes these functions to determine which need improvement, elimination, or combination. Tools used during this phase include: Random Function Identification, Function Analysis System Technique (FAST), Function Listing, and Value Index.

- **Creative Phase:** Alternatives to the analyzed functions surface through e.g. the alternatives are recorded, but not discussed and selected. The team uses a variety of creative techniques, such as brainstorming, to generate alternative ideas to perform the project functions.
- **Evaluation Phase:** The alternatives are evaluated against the analyzed function through e.g. weighted evaluations. The Best alternatives are regarding, function-cost relationship are selected. The team refines and combines ideas, develops functional alternatives, and evaluates by comparison. Appropriate tools of comparison include advantage and disadvantage comparison and an evaluation matrix with weighted criteria.
- **Development Phase:** The selected functions are refined and developed into a value engineering proposal. Based on the evaluation phase, the team begins to develop in detail the alternatives with the greatest potential value. During this phase it is essential to establish costs and backup documentation needed to individually convey the alternative solutions.
- **Implementation Phase:** The objectives of this final phase is to get the approval of the sponsor to proceed in implementing the recommendations. The implementation plan, included in the study summary report, should identify the person who will be responsible for the implementation of the changes that have been approved by management. In addition, the plan should address the general impact on design and construction costs, letting date, manpower requirements, consultant resources, design and construction schedules, and any other impact resulting from team recommendations. Specific changes required by these impacts shall be determined and addressed by the project manager.

## CONCLUSION

VE is a systematic approach for achieving optimum value for money, while maintaining or improving quality, safety, reliability and maintainability. It is a problem-solving technique based on analysis of the project functions demanded by the owner in order to meet the end users requirement and needs. VE uses multi-discipline teams to analyse a product design, an engineering concept or a construction approach.

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