



## TenStep Supplemental Paper

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### **Make A Difference! Adopt Value Engineering**

*Don't always look for ways to cut costs, look to add value.*

Quality and value are two vital concepts that have been deeply imprinted on people's minds. The first thought that comes to mind be it with regard to purchasing or dealing with a business transaction, is whether the decision is right. Evaluations based on quality and values are the key forces that drive the decision momentum.

Over the last few decades, organizations have been looking for ways to continuously improve, as conventional methods failed to help them keep pace with the growing needs. Fiercely competitive, 'quality, cost and time' conscious markets have forced organizations to ponder over how to achieve the best results.

The initial approach to cut costs in an attempt to compete did not bring in expected growth and success. Organizations were, and still continue pondering about achieving best results in terms of improving performance, reliability, quality, safety, and life cycle costs without going high on costs. Industry experience is now proving that a mix of Value Engineering (VE) techniques, a bit of hard work and a lot of common sense yields remarkable results.

#### **What is VE?**

VE, or Value Analysis, is a well-defined process of functional analysis of products, processes, materials, systems, projects, etc., directed at improving performance, reliability, quality, safety, and life cycle costs. VE primarily aims at cost avoidance, without sacrificing quality and scope.

#### **The big difference!**

VE emphasizes on,

1. 'Value' rather than cost
2. 'Function' rather than action
3. 'Creativity' rather than judgment

#### **1. Understanding 'value'**

Value is an imprecise word; its implication depends on both the user and the context. It is the goal. Any organization delivers value to its customers. Value, here refers to the real value for money.

Value can be classified as use value, cost value and esteem value. Use value is the value of the basic function of a product or the basic need of the customer. Cost value reflects the sum of all initial costs required to produce a product/provide a service like material, labor and overhead expenses. Esteem value is the value added to the basic function of a product or service in terms of special features, attractiveness, etc., to increase salability.

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Often, to make things better, organizations first look at reducing cost. The changes thus developed may reduce costs, but more often than not, they tend to reduce the desired function of the item, thereby reducing its value. If this reduction in function is more than the reduction in costs, then things get worse, not better.

*Then how does one provide better value?* Experts say that it is almost always possible to provide the required and desired function at a lower cost. This is better value. In other words, an item or process is said to have the ‘best value’ when it consistently performs the basic functions and has the lowest total cost. This in turn necessitates an in-depth understanding of functions.

### **2. Function: the foundation of clarity**

Customers do not buy a product/service for itself, but for its function. If you sell a watch to a customer for one-tenths’ its price, it might be a good buy for him, but if it does not tell time, then he does not require it. However, if there were an alternative way to know time without using a watch, he would definitely prefer that.

A function can be defined as the objective of an action. It is the specific task required to satisfy a customer’s need while cost is the resource consumed in achieving this function. In his book *Value Engineering: A Plan for Invention*, Richard Park defines ‘function’ as ‘the foundation of clarity’. A two-word combination of verb-noun to define a function is imperative for better understanding of any action.

Consider a motor vehicle, which has various functions to satisfy. For simplicity of VE, the major functions can be broken into simpler ones. Function definition of the chassis, for instance would be,

- Produce torque (engine)
- Control direction (steering)
- Provide retardation (brakes)
- Convert torque (gears/transmission)
- Provide flexibility (suspension)
- Control fuel (pump accelerator etc.,)

Each of these functions can be further broken into sub-assemblies and analyzed up to the component level.

It is therefore important for organizations to first understand what function the customer is seeking and paying for. The definition of function and the corresponding function analysis are not just crucial, but also the exclusive elements of VE that set it apart from other improvement initiatives. Seeking other ways to perform the same function in a better and less expensive way is the key to the success of VE.

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### 3. First creativity, then judgment

New and creative ideas are required to look for better ways to perform a function. Brainstorming facilitates this. Groups of employees are encouraged to ‘*brainstorm*’. However, care should be taken to see that ideas are not judged as quickly as they are thought of or spoken. This could obstruct flow of ideas.

Brainstorming brings about scores of ideas of which, many are non-workable and some like gold nuggets. In this process, the ideas that seem good to one individual or one functional group may not be the best for the entire organization. Richard Park calls this technique of idea generation and selection *Blast-Create-Refine*.

Judging ideas is the toughest part of VE. Evaluators play a key role here. They have to ensure that the selected ideas are worth implementing and check for hidden risks. Moreover, they must know when to accept the ideas, when to send them back for more rework (to overcome minor flaws) and when to completely reject ideas. This is a no-win situation as rejection might cause flared tempers. Hence, it is important that they be creative and professional. The organization must also be able to ensure that employees do not take rejection personally and stop giving ideas.

In a nutshell, the essence of VE lies in three simple questions,

- What are we really trying to do? (Defining and understanding the function well)
- Are there other ways to do the same? (Brainstorm for ideas)
- Which would be the best alternative in the prevailing situation? (Judge, evaluate and identify the most workable)

Value Engineering (VE) originated in the industrial community; initially developed at General Electric Corp. during World War II. Due to its potential for yielding a large Return On Investment (ROI), it has gained popularity in a wide spectrum of businesses and industries ranging from automakers, industrial equipment, government projects, construction, business re-engineering to small parts analysis.

The various elements of VE can be encapsulated into a sequence of steps known as a ‘*Job Plan*’. This can be devised as an answer to the following questions:

- What is the problem or situation that needs to be changed/improved?
- What is good about the existing situation?
- What would require improvement in the situation?
- What functions need to be performed?
- In what other ways can we perform each function?
- Which of these ways are we willing to try?
- What are the steps to be followed and who will execute them?

These questions have to be analyzed and discussed thoroughly before taking up VE implementation. The ‘*Job Plan*’ has eight phases:

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**1. Selection:** Project selection is beyond the control of the study team. The study team comprises employees from various departments of the organization, consultants and customers. Projects are generally selected when:

- Existing part/product cost is high
- A cheaper product needs to be introduced
- Existing technology is old or complex
- Projects are important, but low in priority and fail to meet budget cut-off
- Problems reoccur

This phase can be tabulated as:

Phase	Objective	Key Questions	Techniques	Tasks
Selection	Select project(Problem/opportunity)	<p>What to study?</p> <p>Who is best able to study?</p> <p>What must be known to start study?</p>	<p>Solicit ideas</p> <p>Identify low /value/high cost areas</p> <p>Plan/Obtain approval to proceed</p> <p>Allocate resources</p>	<p>Speculate on project sources</p> <p>Develop plan to identify projects</p> <p>Evaluate projects for potential</p> <p>Present the same to management</p> <p>Select projects</p>

**2. Investigation:** The value team comes into picture here. The team first discusses what they know about the project from readily available sources. Then they determine what they must know to define and/ or solve the problem. This brings the three fundamental VE concepts (function, cost, value) to the forefront. Basic questions discussed in this phase include:

- What is it? (The situation/problem)
- What does it do? (Identify function)
- What must it do? (Basic function)
- What is it worth?

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- What does it cost?

After delving for required information, the value team looks for areas for potential savings. Pareto's Law of Distribution comes in handy here. This states that 80% of a project's costs are in 20% of the work. The team thus identifies and functionally analyses high cost elements along with their cost-value relationships.

Here, the basic function and its elements are identified. For instance, a bridge is useful to 'cross obstacles'. It is immaterial whether the obstacle is a river, ditch, a railroad, or a highway. The basic function is to provide a means to overcome an obstacle. Being non-specific helps arrive at varied options to perform the generalised function. By the end of this phase, the value team identifies high-cost elements, functionally analysed and assessed their cost/worth relationships to justify the need for better alternatives.

Phase	Objective	Key questions	Techniques	Tasks
Investigation	Analyze function & costs	<p>What is the worth of the basic function?</p> <p>Worth of secondary functions?</p> <p>What are high cost areas?</p> <p>Can any function be eliminated?</p>	<p>Evaluate by comparison</p> <p>Put costs on specifications &amp; requirements</p> <p>Put costs on key tolerances and finishes</p> <p>Put costs on key standards</p>	<p>Analyze costs</p> <p>Analyze functions</p> <p>Evaluate value of function/cost</p> <p>Evaluate project potential</p> <p>Select specific study areas</p>

**3. Speculation:** Also known as the creative phase, here, the value team applies brainstorming techniques to arrive at feasible alternatives for the current situation.

In this phase, a synergy develops where one idea triggers another in the form of like, contrasting or adjoining ideas. Sometimes, the ideas may sound crazy, but may be of good value if speculated well. The team speculates on all possible solutions to the problem/ opportunity based on the two word 'verb-noun' functional statements defined.

Phase	Objective	Key questions	Techniques	Tasks
Speculation	Speculate on alternatives	What else will perform the	Be imaginative & bold, list everything	Select techniques to be used

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		function?  How else can it be done?  Where else can it be done?	Defer judgment, avoid criticism	Speculate on alternatives  Speculate on all parameters
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**4. Evaluation:** The advantages and disadvantages of all the alternatives are listed. Analysis is done based on the relative importance of each of the desirable criteria to be addressed. The VE objective to achieve the best blend of performance, cost and schedule should be kept in mind here.

A simple tabulation of this phase is as follows:

Phase	Objective	Key questions	Techniques	Tasks
Evaluation	Evaluate alternatives	How might each idea work?	Choose evaluation criteria Refine ideas	Speculate on evaluation criteria
		What might be the cost?	Put approximate probable cost on each main idea	Evaluate alternatives
		Will each idea perform the basic function well?	Evaluate by comparison	Select the best alternative

Once the value team arrives at the best alternative, it moves on to the fifth phase, which is 'development' to work out details.

**5. Development:** After selecting the best alternative/solution to implement change for improvement, the VE team develops it further through sketches, cost estimates, corroboration of test data and other technical work to validate the assumptions made during the study. Then it formulates an implementation plan. Finally a formal report with recommendations is presented to the management.

This phase can be tabulated as below:

Phase	Objective	Key questions	Techniques	Tasks
Development	Develop alternatives	How will the new idea work?	Compile information from best sources, specialists, customers, suppliers	Speculate on information needed & the sources
		How can disadvantages be	Consider specialty	Develop selected

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		overcome?  What will be the total cost?  Why is the new way better?  Will it meet all the requirements?  What are the life-cycle costs?	material, products and processes  Consider standards & use new information  Compile costs	alternatives  Select preferred ones  Develop implementation plan  Audit data
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**6. Presentation:** The value team presents their report to the management and other key decision makers to gain their acceptance before taking any action. Management support and commitment is crucial for obtaining resources and funds to implement changes.

Phase	Objective	Key questions	Techniques	Tasks
Presentation	Present alternatives	What was the problem?  What is the new way & its benefits?  How to present idea?  What is required to implement the idea?	Be factual  Be brief  Using selling techniques  Provide an implementation plan	Make a written proposal  Speculate on roadblocks to acceptance  Present VE study alternatives

**7. Implementation:** Implementation is a key phase that requires support and co-ordination from all areas. Care should be taken to ensure that management and employees take appropriate action to ensure that the VE team's suggestions for change are implemented.

Phase	Objective	Key questions	Techniques	Tasks
Implementation	Implement alternatives	Who is to implement change?  How to amend present	Translate plan into action  Overcome	Develop change document  Implement

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		plans/contracts? Have all resources been allocated?	problems Monitor project	approved alternatives Evaluate process
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**8. Audit Results:** After implementation of new solutions, regular and on-going surveillance are mandatory. This helps to keep track and assess problems like customer complaints, reduced VE savings and overall VE performance. VE performance is calculated as the ratio of actual VE savings versus proposed savings. Any deviation from the proposed values needs further investigation. The number of surveillance checks scheduled should be strictly adhered to without deviations. The efforts of the VE team should be appreciated and rewarded to ensure continuation of successful VE projects over time.

Phase	Objective	Key questions	Techniques	Tasks
Audit	Audit Results	Did the new way work? What did it cost? What are the savings? Did the changes meet expectations? Who has to receive recognition?	Verify accomplishment Decide on whom to award Report to management	Audit implementation results Evaluate project results Present the results Present awards

Each of the eight phases of VE includes several tasks. *It is the blending of various tasks and techniques, coupled with finesse in their application that makes VE successful.* When all the above phases are implemented well without any deviation in interest and enthusiasm of the people involved, VE helps to create the best value for products and services.

Industry experience has proved that a team of 5-8 persons, a couple of them well versed with the concerned project, and the rest with diverse backgrounds works best for VE projects. The duration of a VE project depends on its complexity. Ideally, VE projects should be finished at a stretch without breaks to maintain the enthusiasm of the team and momentum of the project.

### Look before you leap!

Implementing VE is no simple task. Often, organizations implement VE in haste, and expect magical results. Ultimately, they face burnout.



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A classic case is that of the Washington State Department of Transportation's (WSDOT) VE projects. For WSDOT, striving for excellence included doing more with less. Hence it took up various VE projects along with process improvement and Total Quality Management (TQM). Over a period of 15 years, WSDOT took up many VE projects, but reported huge variations in their success. A value analysis was conducted to determine the cause of failure of the VE projects.

The value analysis revealed that employees who previously took up VE already had full time positions and could not dedicate enough time. Moreover, teams comprised of whoever was available, rather than those trained in VE. Some of the VE project teams did not have sufficient functional expertise. Hence, functional analysis was not satisfactory. Available VE experts were overused and they reached a burnout stage due to multiple responsibilities. Teams did not take full ownership of VE reports and report submission was invariably delayed. Moreover, design teams were reluctant to implement recommendations fearing delays. Most of the VE projects undertaken identified a mere 5-10% potential cost savings, whereas a well-operated VE project would identify nearly 25-35% potential cost savings. All this happens despite excellent management support.

Based on the value analysis report, WSDOT decided to make changes to clear out the above inadequacies before taking up any VE project. Some of the changes included introduction of formal VE training for employees, reworking the composition of VE teams and setting deadlines for submission of VE reports. *This exercise also proved that value analysis is not just for projects, but can be applied to processes also.*

With all the above recommendations implemented, WSDOT implemented new VE projects and achieved various improvements along with major cost avoidances.

Top consulting firms like Arthur Andersen (AA) discovered the tremendous cost savings VE generated. AA believes that the use of VE as part of an overall target costing process is critical for organizations to remain profitable. This is particularly so in today's tough markets characterized by powerful customers, intense competition and pricing pressures.

We can definitely provide better value to our customers and be rewarded for our efforts. It is not simple. It calls for hard work and thinking differently. But it is possible and if done well, worth the effort.