# THE VALUE ANALYSIS SYSTEM

Presented at the 17th Annual Conference and Convention Program of the
American Institute of Industrial Engineers

Detroit, Michigan

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Isn't Value Analysis another name for Industrial Engineering? This question is so often asked by industrial engineers that we will start with it today.

## OBJECTIVES ARE SAME

Basic objectives of both might be approximated as "To prevent or eliminate unnecessary costs."

For comparison, the objective in transportation might be to traverse the distance between Detroit and Toronto. The means used might be an airplane, train, automobile or bicycle.

Similarly, for the objective, "prevent or eliminate unnecessary costs", different means will exist. Success will result from choosing the most appropriate means for each specific situation. Similarity of objective does not to the slightest degree indicate similarity of approach, of technique, of resources used, or of results accomplished in specific situations.

## MANY OF "TOOLS" ARE SAME

Wheels are found on the airplane, train, automobile, bicycle, engines in the airplane, train, and automobile, steel, copper, aluminum, fabric in all. Still they are entirely different products. They do not accomplish the same results in any given situation, nor is one best for all situations.

Similarly, in industrial engineering and value analysis, common parts will be found, sometimes used identically, sometimes used differently, sometimes provided different emphasis.

## SAME OBJECTIVE - MUCH IN COMMON - STILL MUCH THAT DIFFERS

Together, let us clearly see that different technologies, like different products, have much in common. The automobile and the airplane have wheels, engines, generators - still the airplane also has wings, emphasizes lightness, emphasizes streamlining, etc., and, as a result, is a totally different product, worthless as a substitute for the automobile in some situations, far exceeding its performance in others.

Similarly the radar equipment and the television equipment have much in common - electric components, oscillator circuits, filter circuits, antennas, etc. Still, each has the addition to its system of a vital few differing parts so that the overall is a different product producing very different end results.

The difference in products and in product capabilities in specific situations is created by the difference in some of the parts included in the product system.

The difference in technologies and in technology capabilities in specific situations is created by the difference in some of the parts - techniques and special knowledge - included in the technology.

## DIFFERENT PRODUCTS OR TECHNOLOGIES ARE IDENTIFIED BY THEIR DIFFERENCES

To be most helpful and to promote the best understanding, I would like to discuss:

1 - the differences
2 - the strengths of each
3 - the limitations of each

However, since your knowledge of industrial engineering far exceeds mine, I can best approach the ideal by confining my comments to the technology of value analysis and value engineering, perhaps re-stating the three subjects:

1 - areas of "newness" and of emphasis
2 - specific strengths of value analysis and engineering
3 - specific limitations of value analysis and engineering

## AREAS OF NEWNESS AND OF EMPHASIS

1 - Dividing all expenditures into costs of
    use values
    esteem values
    no values

2 - Emphasizing function as the only true base for the determination of appropriate costs.

3 - The evaluation of functions in dollars and cents.

4 - Increasing the emphasis on creativity.

5 - Identifying the "stoppers" or roadblocks which prevent value information development and the provision of special techniques to deal with them.

6 - Emphasizing the necessity for promptly using special knowledge, for locating and utilizing functional products. Providing special techniques to better accomplish it.

## SPECIAL STRENGTHS OF THE TECHNIQUES OF VALUE ANALYSIS

1 - Basic approach is entirely from the customer's viewpoint. What does the

Customer wants . . . suitable performance
. . . suitable cost

Suitable performance includes two classes of items:
Suitable use values - which include quality, life, safety factors, etc.
Suitable esteem values - which include attractiveness, shapes, colors, features.

When translated to the manufacturer's language, these "values" become "functions"
Use values become product use functions.
Esteem values become product esteem functions.

The use functions cause the product to "perform", while
The esteem functions cause the product to sell.

2 - With functions only as basic considerations, the approach and techniques promote good answers to the question of how to reliably provide the functions which the customer wants at lowest cost.

Work does not start with such self-oriented considerations as:
How do we want to design it?
What tooling do we have in place?
What in-place know-how should be used?
What materials do we want to use?
Do we want to buy it or make it?

These, and similar considerations, limit original thinking, prevent the creation of the best value alternatives and often result in lost business and closed factories. These considerations are important after appropriate values of functions have been determined and are factored into decision-making in the implementation of value alternatives.

3 - The evaluation of groups of functions and of individual functions in dollars and cents saves large amounts of design time and expense, in that it at once rules out many design and manufacturing approaches as being too costly, so that effort is at once channeled into approaches which have the potential not only of achieving suitable performance, but suitable costs as well.

4 - The force on followed-up creativity produces simple, reliable, low-cost solutions not obtainable without this emphasis.

5 - The special techniques for overcoming roadblocks which limit the development of useful value alternatives, used in combination with the functional approach, provide alternatives which are usually simpler, better quality and lower cost than was believed possible.

## LIMITATIONS OF VALUE ANALYSIS

Just as securing better performance requires two steps:

1 - Developing practical technical alternatives.
2 - Making decisions and taking actions to implement them.

So, securing better value requires two steps:

1 - Identification of unnecessary costs--this is done in the design concept, the design, the purchasing, or the manufacturing stages.

2 - Making decisions and taking actions to implement them.

Although extremely efficient and effective in the first step - the identification of unnecessary cost - no special techniques or procedures are provided in the area of decision-making and action-taking which control the implementation of value alternatives.

Large amounts of cost, either prevented or eliminated by the use of value analysis techniques, are therefore limited to those areas where the personnel in management in engineering, in manufacturing and in purchasing are in reality oriented toward the matter of making decisions and vigorously supporting actions which eliminate large amounts of cost.

## SOME ORIENTATION INTO THE VALUE ANALYSIS SYSTEM

Let's distinguish between two types of "value", which I will call "use" value and "esteem" value.

For example, the value of my necktie may be about $2. Now, let's separate the $2 into its parts of "use" and "esteem" value. The "use" value to me of this necktie is zero. It has no "use". Its "esteem" value is $2. I must wear it to conform to custom. If I didn't, I'd suffer the loss of more than $2 worth of "esteem". As a comparison, this tie clip with a value of $2 has a "use" function and an "esteem" function. The "use" function--what the tie clip does--could be reliably accomplished by a suitable pin or other simple product that would cost not over one cent. Therefore, we can roughly say its "use" value is one cent and its "esteem" value $1.99. How about the button on the shirt? If it has a total value of one cent, probably nine-tenths of it is "use" value and one-tenth is "esteem" or "appearance" value. A nail, for instance. has an even higher proportion of "use" value, approaching one hundred percent.

The Value Analysis Techniques provide means for establishing the dollar value of the "use" and of the "esteem" portions of the function.

Now let's take a quick look at the so-called relationship between dollar value and cost. The value of this clock is $5. We know this because we evaluate by comparisc we have seen them around, we have bought them. Because we know what it costs, we have given it a value.

Now, let me add more cost to it. I am going to do some work on this clock, adding labor and overhead to it. Do you think that the added cost of the modification will increase the value? Watch carefully! (Smashes clock on floor.) What is the value of the clock now? It's zero, or scrap value, although its cost was increased, by labor and overhead.

Two things we learn from this demonstration:

1 - There is positively no relation between cost and value. The cost has been increased, but the value decreased.

2 - A sound usable base for value is function. The function capability of that clock changed!

Let us, for the time being, use this definition of value. "Value is the lowest cost to reliably accomplish a function"--where function consists of those elements which cause the product to "work" and those elements which cause a product to "sell."

Some of the approaches and techniques which Value Analysis uses are:

1 - Approach

Clearly and sharply identify and understand the function, beginning with the function of the overall product, breaking it down into the functions of assemblies, then of the subassemblies, etc.

2 - Technique

Evaluate this function; i.e., assign a dollar and cents figure to it which is the lowest cost to reliably accomplish the required function. This will be determine by a creative search for engineering, manufacturing, and other value alternatives which would reliably accomplish the total function together with the overall costs involved. Obviously, this evaluation will be just as good as the tools and knowledge and effectiveness of the evaluator. For example, for the function of containing 200 gallons of gasoline in a landing craft which has a useful life of eight years, what is the value? Four 50-gallon drums might cost a total of $25, but probably they wouldn't stand the environment. They would need some sort of coatings. As a first guess, let's estimate that the coatings would slightly more than double the cost. Estimate--$60. Now we have a quick estimated value of $60 for the function. Always do this before finding out how the job is planned to be done, because it will lead to new and startlingly simple, reliable, and lowest-cost solutions. In this case, the specification actually called for specially-fabricated, special alloy tanks costing $520 each. The result was that in this procurement of tanks for 1000 ships, the cost to you and me, the taxpayers, instead of being the expected $520,000 was $80,000... and the function was indeed accomplished by using four drums with appropriate coatings just as on the preliminary evaluations, for $80 each set.

3 - Another and different technique is called, "Blast, Create--then Refine." This means, get a clear mental picture of the function that is required and of the way it is planned to accomplish it. Then mentally blast this down to something that will have only a small fraction of the cost and will only partially accomplish the function or will have some of the attributes needed in the finished product. Next, creatively refine, adding increments of performance, of function, together with their increments of cost, until the product now will accomplish the total job with adequate reliability. This approach sounds simple, but it is amazingly effective. For example, in the gas tanks just used...first was the blast to the $25 drums which would not accomplish the total function; next,

came a review of what must be done to provide the total function. Then followed the vital, but simple solution--coat the drums--which added only $55. So now, by the use of this step-by-step technique, the total function is provided with the same reliability for $80 instead of $520.

Eleven additional techniques are learned by the value engineer, each functioning in its own type of situation to cause the development of applicable reliable low cost value alternatives.

One of the major problems in obtaining acceptance of Value Analysis is that men feel toward the value part of their own work as they would feel toward their artistic work in painting a picture. They have done the best they know how, there are no measurements as in "performance" engineering to tell them how good or bad their value is. They feel very emotional, edgy. The thought of anyone making suggestions which affect the value part of their job gives them the same emotions which a painter feels when he hears what he believes to be "untalented people" criticizing his art. To minimize this problem calls for lots of understanding, forethought and ca

Another major problem is the proper timing of Value Analysis effort. In research and development activities, top-grade "value" work is of great importance but has not been generally so recognized. Research and Development work is substantially performance oriented. Feasibility models are made as fast as possible--the problem is to save time, not to save money. But before the production design is released for quantity manufacture, it needs a large contribution from cost-centered, "Value"-oriented engineers. It is too often the case that pressure of time and shortage of value-oriented capabilities forces the subsequent quantity manufacture of "development models", a procedure creating problems in complexity, very high cost, extra weight, and poor reliability. In order to gain time, the value work can be done in the laboratory simultaneously with the performance work.

SUMMARY

The technology of Value Analysis and Value Engineering consists of a system of techniques and of special knowledge which are used in the design concept stage, the design stage, the purchasing stage or the manufacturing stage to efficiently identify unnecessary costs so that they may be prevented or removed.

This technology is function-based and operates to create alternative means for reliably accomplishing functions. By providing better answers, not only costs but also quality and reliability are improved.

Industrial Engineers readily appreciate the magnitude of opportunity to identify and prevent or remove unnecessary costs. Those who are able to secure training in the techniques of Value Analysis and Value Engineering will find great assistance in this set of techniques and procedures which will assist them in applying their technologies efficiently and effectively.