VALUE ANALYSIS AND ENGINEERING

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QUALITY CONTROL AND VALUE ANALYSIS

As the technology of Quality Control rose from economic need, so has the growing technology of Value Analysis.

As the objective, in very general terms, of the Quality Control Program has been to assure that the product accomplishes the functions the customer wants--well and reliably, so the general objective of Value Analysis is to assure that the functions which the customer wants are accomplished at appropriate costs.

In preparing for this discussion with you, I asked a sampling of people two questions:

1. What do you mean when you say a product has good quality?
2. What do you mean when you say a product has good value?

The consensus of the answers was this:

1. If a product...

   "does what I expect it to
   as long as I expect it to...
   it has good quality."

2. If a product...

   "does what I expect it to
   as long as I expect it to...
   and - costs what I think it should...
   it has good value."

These simple statements will confirm the more sophisticated charter which started the research work resulting in the techniques of Value Analysis a few years ago.

The objective was to develop techniques which would keep quality, safety factors and customer features but more efficiently and effectively provide appropriate costs.

LOWER COST AND BETTER QUALITY

As the special techniques were developed, it was a gratifying surprise to find that they improved value two ways -- one by lowering costs, a second by improving quality.

A pattern of techniques based upon product or service "function" developed. The Value Analysis process started with a clear understanding of the function or functions desired by the customer, separated and classified each, provided a system for generating alternative means for accomplishing the functions, means for establishing the dollar value of each, and techniques for overcoming the stoppers and "roadblocks" encountered.

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It became very understandable that these techniques and the associated special knowledge which promoted a clear view of the desired functions, then provided alternative solutions, not only bring forth for review solutions that are lower in cost, but also many that are better in quality, more simple, and more reliable.

Experience in a recent Value Analysis technique-training course will be of special interest to Quality Control people.

Training is of a teach-learn-do type. Seventy-five men in twenty-five groups of three, each had product assemblies or production problems to which they applied the Value Analysis techniques as they learned them. The projects of twenty-two of the groups left nothing to be desired in quality. They accomplished their functions well, constantly, and reliably--the only needed improvement was lower costs. To three of the groups, however, were provided projects which, although accomplishing the desired function, were sometimes troublesome. These men were challenged to use the techniques to eliminate the troublesome and unreliable features even to the extent, if needed, of adding $10,000 per year per project to the cost. All three completely ended the quality problems in their projects providing simpler, better, lower-cost means for accomplishing the functions and all three at lower costs.

To provide basic understanding of this new technology, some orientation follows.

VALUE ANALYSIS ORIENTATION

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 would 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. This we know because we evaluate by comparison; 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 determined 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 care.

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.

Quality control makes its major contribution to value by aiding the customer to secure appropriate, reliable and continuing performance.

Value analysis and engineering make their major contribution to value by aiding him to secure appropriate costs.