

53-13

University of Nebraska
Sigma Tau Convocation for Engineering Students
November 18, 1953

SOME EXPERIENCES IN DEVELOPING VALUE ANALYSIS

L. D. Miles
Manager-Value Analysis
General Electric Company

WE WERE SURPRISED

Although it was expected that the present designs of products and processes used in manufacturing them were established at the limit of scientific knowledge, it is found that human attitudes and traits are, in many cases, the limiting factors. As a result of detailed study of hundreds of products, parts, and processes actually used and products actually being manufactured, we can point to the type of information which is lacking and to the human traits which have limited the use of the information available. We believe that you will be able to increase accomplishments by application of some of the human findings. A better understanding of your human environment should also promote the effectiveness of your work in it.

WHAT IS VALUE ANALYSIS?

It is a creative search for new information affecting each particular part, product, or material. It is a study of every item of cost in every part or material. It considers other possible materials, newer processes, abilities of specialized suppliers, and possibilities for engineering re-evaluation. It focuses engineering, manufacturing, and purchasing attention on one objective--equivalent performance for lower cost.

Value Analysis recognizes the human factors and in all of its phases strives not only for product value improvement but also for improvement of human attitudes and action habits.

In the study of Value Analysis, we place the same high degree of importance upon value which has traditionally been placed by all engineers upon performance. Value is important. "To improve value is to put more of today's new conveniences--automatic toasters, dishwashers, television sets--into use in more homes." The object of the program is, "to secure the same performance for lower cost."

Why do products cost so much? Is all of this cost essential? Does it all represent quality, or, if not, how much represents waste? What really is value? These questions forced an answer.

-speech-
-Credit: Miles-

WHAT IS VALUE?

Value can roughly be called, the relationship of function to cost. Value is not established by material, labor, and other manufacturing cost inherent in a product. The value of a pencil is in its ability to handle well, appear well, and write well and its value is established by the lowest cost of something to meet these functions. The "Value" of the "Home Coming Queen" is not determined by a microscopic examination of her blood and bones, but rather, her "Value" is established by a comparison with other "Misses", evaluating her abilities against theirs, to please the eye and the imagination.

Why do so many products seem to lack value? What must we do to provide value to them?

WE NEED MORE INFORMATION

We will try to help you find the answer. We will show that it lies some in the field of information but much in the area of human attitudes. For example, 10,000 1/2" bolts a foot long were needed. Everyone knew that bolts are so fully developed and mechanized that close interrogation would yield nothing. Still, because this particular purchasing engineer did not accept the customary philosophy, he saved \$500 on the order. He found that they were used for making cable reels and a stud with two nuts instead of a bolt with one nut accomplished the same job. Furthermore, he found that, if bolts were to be used, the head could be left untrimmed and provide the equivalent of a washer at no extra cost--if we knew enough to order them that way--saving labor and washer costs.

We were to find lack of value often resulted from widespread lack of available information. For example, 700 gaskets per year of this cork-type material were being laid out and cut by the machinist at a cost of \$4.15 each while specialist suppliers whose sole business consists of making gaskets could provide the same gasket for 15¢ each in lots of 50. Again, 400 small knobs per year cost \$2.25 each and were being manufactured on the job while a slightly larger, more convenient knob for use could be purchased of specialist suppliers for 25¢.

HOW ABOUT HUMAN ATTITUDES?

We were to find that lack of value often results because human beings won't use the information they have. We will be studying some of the attitudes and traits which cause this result. There are, of course, many important attitudes but we can only single out the few that are vital to Value Analysis.

We were to find that the cause of much unnecessary cost is about one-third lack of information and two-thirds personality traits and attitudes which inhibit the use of available information. For example, we saw yards of scarce costly asbestos paper stretched on the floor under a paint conveyor. Why? The answer--the fire safety committee would tolerate nothing but asbestos. These associated

with buying and using the asbestos had been content to accept this; however, prompted by Value Analysis, a buyer pressed further. Why not use a non-burning paper? A special paper manufacturer provided samples, the buyer provided the impetus, and the safety committee found that the paper also would not burn. So, it was approved at vastly lower cost.

In job after job, simpler, better, lower cost ways for design and manufacture were easily within reach, but were often unused. For example, the changing of a 1/4" J-bolt about 8" long on one of our high volume products called for cut threads. The engineer "knew how to design a bolt" and "how to specify threads"--or thought he did, and that is what is important. Actually, by changing from cut threads to rolled threads which allowed the part to change from a screw machine part to a rolled thread part the strength was increased slightly and its cost was reduced from 10¢ to 2¢, saving \$80,000 per year.

WHERE OUR HABITS TAKE US

Why is information which is so readily available not always used? For one reason--we go where our habits take us. Our habits take us where we were yesterday. It took us 40 years to get from the 48" baggy wheel down to the 16" automobile wheel. If somebody drove a 1999 automobile into your yard tonight and offered it to you at today's prices, would you buy it? You wouldn't. Habit is too powerful! Look in your kitchen. Admittedly, we have been imitating the ice box in our refrigerator designs for 25 years. Now the new design is built right in the kitchen cabinets, so there is no tombstone in the kitchen. Basically, then, in all of our design work we really are copying what we have and refining it. It really takes strong medicine to get us away into new ground. Many of you know of C. F. Kettering, the Vice President of Research in General Motors. He has one story that I think is so appropriate. He had quite a lot of rivalry with one of his associates in Detroit. They drove from Detroit to Dayton regularly - lived in Dayton. Kettering always drove it in 4 hours. His friend said it couldn't be driven in 4 hours. Kettering said, "Next week you ride with me. He did. They made it in 4 hours. Kettering said, "There it is - 4 hours." "Yeah, that's right," his friend said, "but you didn't stay on Route 21!" It's hard to get off of "Route 21."

GET OFF OF ROUTE 21 TO EVALUATE THE DESIGN"

We were to find that our designs and actions of today are yesterday refined. For example, in product design, the value of a product is the amount it would cost to reliably do the job which the product does. This control device, in performance, is a double circuit breaker. It handles 15 amperes 110 volts on each side of neutral so, in effect, it is two 15 ampere 110 volt circuit breakers. It costs \$12. Is it worth \$12? Our habits would lead us to look at each individual part. Can they be made of a different material, can they be combined, etc.? However, that is not a design evaluation.

What would it cost by other means to do an equally reliable job? This circuit breaker is designed for home use. It costs \$1.50. It breaks 15 amperes at 110 volts. Presumably then, two of these, side by side, costing \$3 accomplish the basic function. Add \$1 for a mounting box, common handle, etc., and we have a two-circuit, 15-ampere, 110-volt breaker, not for \$12, but for \$4. Therefore, this evaluation has marked out an entirely new field. We will waste little time studying the detailed parts of the old design.

HOW STOPPABLE ARE YOU?

We were to find a ratio of 100 to 1 in the "stop-ability" of men. We were to find that this "stop factor" in humans rather than availability of materials, methods, or ideas often determines the degree of design excellence in our products, or the manufacturing processes used, or the quality of our suppliers. For example, during the development of the hermetic sealed refrigerator unit now accepted and used throughout the entire industry, the welding specialist told the chief engineer that it would be impossible to weld two cylindrical sections together as expansion and contraction would continuously crack the weld behind the torch. To accomplish the simple assignment, it was necessary to get a regular welder from the factory. The first weld was perfect.

Underwriters required a fibre backing to a heater, costing us \$10,000/year. It always seemed to us to be unnecessary. So, using two of our Value Analysis teachings -- "Question what doesn't seem to make sense to us" and "Eliminating Roadblocks" -- we pressed Underwriters who admitted they could now see no reason for it. Now we save the \$10,000.

EXPERIENCE ENSLAVES US

We were to find that where progressive change is essential, men become relatively powerless after prolonged experience on a job. For example, the personnel involved had looked at a hub and shaft on one of our products so many times that they felt the present method of machining the hub and shaft and mounting together was the ultimate. A qualified but inexperienced man with a fresh viewpoint suggested die casting the hub on the machined shaft which provided the same product for less than half the cost.

We were to find that far too many individuals feel, although most would not admit it, that they are on trial for the past; so that, to habit, which prolongs yesterday, they add an active attack on anything different in their area of responsibility.

ALL WORK IS DONE BY AVERAGE PEOPLE

On the average, all products are designed by average engineers -- tooled up by average manufacturing men -- bought by average purchasing men -- and that brings an average yield on the investment. By skilled use of specialists and assistance of others, performance in all areas well above the average can be secured.

WE BECOME HERMITS

We were to find that most men given an assignment become hermits. We have design hermits, manufacturing hermits, buying hermits. Really, aside from special assignments such as research, and many others, when a man is given a job--his boss places a high premium on results--not on whether he did all of it. Industrial companies are filled with sales engineering specialists who have a high degree of skill and knowledge in the use and application of their specialized products and processes and they are available to help all who call on them.

WE'VE DONE IT THIS WAY FOR TWENTY YEARS

We were to find that most people think that the way things are done is about right, but they may be off by a factor of ten to one. Evaluation of timer studs showed that instead of screw machine parts at 6¢, they became upsetter parts at 1/3¢--the same performance for 1/15 of the cost. In another case, a stud spacer costing 15¢ had functions of separating certain parts and holding certain parts together. The same function was provided by a simple stud and a simple spacer at a total cost of 3¢, reducing costs from 15¢ to 3¢, saving \$51,000 a year.

We were purchasing 35,000 cap screws per year. When the Value Analysis engineer studied the function, he found that we then ran the thread on up to the head. Cost was \$118/M. He asked the vendor if he couldn't supply them with the long thread. He could. The cost became \$24/M. Result: the same performance for 1/5 the cost."

IT WON'T WORK

We were to find that improvements in value cannot be made unless the men involved really want them to work. Of course, nearly everyone says, and many believe, that they want new improvements to work. Is it actually true? As an example on the positive side, although everyone informed knows that it is practically impossible to resistance weld copper to copper, a young manufacturing engineer in one of our plants "wanted to do it." He didn't consult anyone further. He went at it and made it work, and now has a whole row of machines making millions of copper to copper welds per year.

SO YOU CAN HANDLE A SLIDE RULE--CAN YOU WORK WITH PEOPLE?

So, when you are learning the science of mathematics, materials, processes, and natural law, you are working on a very necessary one-third of your equipment for life. What are you doing about the other two-thirds?

We have found that engineers with these qualifications do an excellent job in Value Analysis work.

1. Engineering or methods and planning experience supported by a general understanding of the properties of materials and their uses.
2. A good creative imagination.

3. Enough initiative, self-organization, and self-drive to start and complete their projects with little, if any, supervision.
4. A feeling of the importance of value.
5. A mature personality, stable, not easily discouraged.
6. The desire to work with others and the general knowledge of how to do it.

We will select one characteristic which, above all, would help you most when you start your industrial experience. It is very simple, but very difficult to acquire. Men who can learn it by their graduation day are years ahead of their peers. "It is the ability to never resent criticism." Always yesterday is gone. Usually there is something of value to you in criticism. Always search objectively for its value. Always relate it to your future work. Never give criticism power over you by resenting it.

And watch a couple more simple and important attitudes.

... "Always attribute to each man with whom you are dealing the characteristics which he should have to fill the job he holds"

and

... "Don't let a man's attitude toward you influence your attitude toward him."

CONCLUSION

As you have seen, Value Analysis is an intelligent, intensive creative search for information--information which will provide the same performance at lower cost. As you have also seen, this information is not enough. Human beings must be included as part of the problem and handled expertly.

As you go forth into your chosen field within the next few years, you may be sure that you will find room for striking improvements. Select any field or product or part. Study it intensely and creatively and you will wonder why we have done it as we have for so long. Factor in the human beings involved and you will find the answer.

You need have no fear of finding an interesting place where you can make a large contribution especially if you have caught the philosophy of Dean Green in the area of human attitudes.