COST REDUCTION THROUGH VALUE ANALYSIS

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I am going to tell you how you can accomplish better cost reduction work through Value Analysis. Value Analysis also has other advantages which don't show up as cost reduction—such as vastly better value in the original design, but today we focus on its benefits to the cost reduction programs.

About 20 years ago one of the leading chemical companies in Germany was experimenting on a means of producing a certain chemical. They could get only about three to five per cent of the efficiency they felt they should have, until one day a lot came out with 95 per cent efficiency. It was tremendous. They went through all the records, but they could find nothing different on that particular lot. To shorten this story a great deal, they finally gave up the search and started out the series again. Then the manager insisted that he wouldn't allow another test until somebody found out what was different on that one lot.

Finally an attendant came in with bowed head and apologetically told the story. While he was performing an operation his arm had hit a thermometer and broken it off. He was embarrassed by his awkwardness and figured that the simplest thing to do was just to take another thermometer, push the bulb of mercury down into the batch, and let no one find out about it. This he did—and the mercury was the catalyst that made the operation a totally successful one.

We believe that Value Analysis may operate in the cost reduction program very much like that catalyst. Value Analysis, as the name implies, can be compared to performance analysis. We analyze performance, so that knowing more about it, we can improve it. Similarly we analyze value so that knowing more about it, we can improve it.

Now, what is value, and how is it determined?

Imagine that I am holding in my hand a small electric clock. What do you think it is worth? It might be three dollars—seven dollars—five dollars. So let's take the average and say five dollars. Why do we say five dollars, instead of perhaps five hundred dollars? Because we're familiar with clocks like this and we know they cost around five dollars, so we feel their value is about five dollars.

But now I'm going to drop the clock, smash it to bits, pick up the pieces with a spring dangling—now what is the clock worth? Ten cents—maybe a quarter, you say. Its value has decreased? Why? There's added labor in this clock. I had to bend over to pick up the pieces. So now we have something that actually cost more, but its value has decreased. It was worth five dollars; now it's worth a quarter, and it has more cost in it.

Now one concept is crystal clear: there is absolutely no relationship between cost and value. Just because something costs us $85.00 to make is no indication that it's worth even fifty dollars or twenty dollars.

So the question is: what is the important thing that we start building value on? What changed in connection with the clock?

The answer, of course, is the use—the function. That changed when the clock was broken. And when we begin to talk about function, we're getting at the keystone of Value Analysis. All value is built upon function, and as we will use it here, value is the lowest cost of reliably accomplishing a function by any means. To evaluate is to find that lowest cost.

I want to add that quantities don't matter. We think in terms of one or a million; the part that weighs two to five tons shows the same kind of decrease in cost as the million small parts. Quality is never affected by this approach. We are after exactly the same quality, for vastly lower cost—not five, or ten, or twenty per cent lower, but for *half* the cost. Often, by evaluating individual parts, we can even cut it down to a quarter.

Value is determined by comparison. For example, let's evaluate a piece of a steel bar, one inch by a half inch by two inches long. It has two holes drilled and tapped; so, in effect, it is a double nut. Evaluate it by comparison. If you didn't have this, how else would you do the job? How would you perform 1/2 of the function?—a half-inch heavy nut in lots of a thousand from a mill supply? Alright!

Three cents for half the job, three for the other half, and we've got six cents. But that doesn't quite do it—we want them fastened together. We'll have to weld them onto a thin sheet of metal, weld wires on the side, or weld them together. How many cents to weld them together? Another two cents—and that makes a total of eight cents for the value of this nut. But let's look at the cost records. The double nut is now made by the simplest method conceivable, of standard material, on standard equipment. It costs 32 cents!

Now that we've evaluated the part we know we're going to have to look for an entirely different approach for getting the function. Here's the solution. A weld-nut company provides the nuts, they're welded in our plant, the cost is eight cents.

By the simple job of evaluating by comparison, we arrived at the eight cents. We got exactly the same performance for a fourth of the cost.

Roadblocks

When anything is as simple and straight-forward and relatively easy as that, you wonder why it hasn't been done before. How could such a big yield be overlooked? The reason is what we call roadblocks. A roadblock stopped that nut at the cost of 32 cents, instead of allowing it to go down to eight cents.

In every normal industrial manufacturing concern, there exist roadblocks that lock up unnecessary cost, cost which an evaluation will bring into focus. I'll tell you something about the substance of these roadblocks.

1) *Habits.* The first is habits—guide-rails—call them what you like. They are built into the drafting office, into the machines, into the methods and planning, into the men's minds. We are really people who live by habits; we find them in all our activities.

Here's an example of what I mean. Back around 1900 a kitchen range was a tremendous block of iron and steel, with big, heavy iron grates (they had to be big so you could shake hell out of them every morning). You had to have them big enough to hang a reservoir on, you had to have a place for ashes. There was good reason for the enormous amount of steel. Well, here we are 50 years later and we're still buying a kitchen range patterned after the old one. Maybe all we really want is a nice shoulder-level oven or two, and at different places in the kitchen a couple of sets of burners. It is on the market now, but how long it was in coming!

Here's another story about this roadblock known as habit. In Schenectady, a couple of years ago, we built a laboratory with an enormous x-ray in it to study large-size casings and forgings for hidden defects. Because the radiation would injure at several thousand feet, the drawings showed a horseshoe-shaped piece of concrete outside of the building, to protect adjacent areas. It was seven feet thick and fourteen feet high. Bids showed the cost to be fifty thousand dollars. Then something happened that broke the habit pattern. The works manager acts as a landlord, leasing this area out to different businesses in our company. He heard about the concrete and this is what he said: "I have leased you this land for a certain period of time, but I want to make sure that if you put that concrete in there, you take it with you when you go."

Well, that really raised the dickens with the habit patterns. Concrete was the usual way to stop radiation. So they called in a man who it happened, had had Value Analysis experience to work it out. He asked the questions; what is the concrete for? They said, "To stop x-rays." What else will stop x-rays? Lead, he was told. But lead costs too much—what else? This value man didn't know an x-ray from second base, being only a construction man, so he logically asked "how about a pile of dirt?" "It would do the job, if you had enough." "How much would it take?" They found a factor of two to one. So they used a pile of dirt fourteen feet thick instead of concrete seven feet thick. They got out the drawings, erased the concrete, and put on the fourteen-foot pile of dirt.

At our Schenectady plant today you'll see a nice grassed-over horseshoe of dirt that went in at five thousand dollars;—instead of the concrete at fifty thousand dollars—that the habit pattern had put onto our drawings.

Getting a little closer to actual products, here's a spacer made of 3/8-inch steel rod, machined and threaded at both ends, 3" long. This went through the screw machines. Why? Because in that particular area people always made this type of part on screw machines. We had the screw machines and we were used to doing it that way. Then somebody analyzed the value of the part: what did it do? It held something together and it spaced something. A simple screw to hold it together would be worth about a penny; some kind of spacer, another penny —it looked like about a two-cent job. Then one of the fellows said, "I wonder if we can't buy a nail with two heads on it, with a thread rolled on each end. We'd have the spacer." A supplier company could do it. So, instead of eight cents, which the habit pattern brought us, it becomes 8/10th of a cent, and does exactly the same job equally well.

Another quickie. We always made insulator studs as drop-forgings. We wouldn't dare change it, because "it might drop a power line somewhere if it weren't perfect." So for years this was the habit pattern. Then one of the men in value work, evaluating by comparison, said, "We buy a lot of up-set parts for other jobs, how about that?" He invited in one of our suppliers—talked it over with him. They made up a sketch to see what it would look like—and the results: samples made and tested by engineering, then parts at four cents apiece less. Big volume, eighty thousand dollars a year less in purchase cost, and exactly the same performance.

In making some of our heavy equipment we used a ring made of plate, welded and machined. Its cost was twelve dollars. When its value was studied it didn't have a value of anything like twleve dollars. It was changed to a casting and its cost dropped to two dollars.

Why had the ring been made of slate steel instead of cast? For two reasons: (1) in that particular shop everything was made of plate and the people were in the habit of "grinding out plate;" (2) attitudes were against change. Attitudes serve to protect habits, to keep us where we are —in a comfortable, stable, unchanging environment.

2) *Attitudes.* Let's consider a few examples of how attitudes can act as roadblocks. In one of our plants a methods-man, who had had some Value Analysis training, wanted to try making a little cam out of a kirksite dye, but he couldn't get his boss' approval for a 50-dollar shop order because it "was a wild idea." So the fellow did what you or I or any other good employee would do-he put it on someone else's shop order. He klunked out a few samples and they were excellent, so now he was in a jam. But he decided to take another calculated risk, and showed them to his boss. He was amazed and soon was bringing all kinds of people to the shop—methods men, planners, design engineers, managers—and klunking out a few more cams. Well, to make a long story short, at the end of the day they collected all the samples and discovered they had enough for three years' production! (Now I might facetiously say he was also in trouble with the inventory control man).

Here's another case of how attitudes can block the road. Some of the small parts for an appliance assembly that is never opened were being put together with costly fasteners but when it was suggested to use "glue" (one of those wonderful new adhesives), the engineer said

"You're crazy." Asked how the brakes worked on his new car he said, "Fine—I can stop on a dime." It was quite a shock to him when he learned that his brake bands were "glued" to the shoe. (I don't know whether we changed his attitude or not but the rumor is he's been driving 15 miles an hour ever since.)

Attitudes are tough things to change, but the real pay-dirt comes when they *do* change.

3) *Lack of Information.* The third roadblock is lack of information. A little stud, for instance, was made on an automatic screw machine and costs 7 1/2c—until somebody learned about a company in New York that made miniature die-castings, and that company could do the job for 1 1/2c.

And this motor screen is another example of how lack of information can cost us money. The screen used to cost $6.25 but Value Analysis brought out the fact that there was another reliable way of getting the same function for $1.25.

4) *Wrong Beliefs.* This is a roadblock that's hard to come to grips with. All of us have a certain percent of wrong beliefs. Decision-making people all have some wrong beliefs. Honestly held, they're in a position to keep unnecessary costs blocked in the product year after year unless something happens to change those beliefs.

For example some people still think that "plastics are brittle" (some kinds are, of course), and if these people are the decision-makers they'll go right on wasting money by not making use of the newer plastics which have a variety of properties—some almost as strong as steel.

We used to braze pieces of an arcing horn together because, with only 2000 a year, "it would cost too much to buy tooling, to cast it." At least that was the belief until the foundry department, in a Value Analysis Seminar, bid $1100 for tools—and the cost dropped from $6.80 to $2.80—for exactly the same part.

Here's another example—welding segments, 3/8-inch-thick steel, and about the size of the palm of your hand. They're made from bar, and cost $1.41. We use only 3000 of them a year. Tool engineering people said we "couldn't afford to buy tooling." Provided a quotation from a small lot stamping supplier who would charge $75.00 for tools. They were startled—even more so when the part price dropped from $1.41 to 39c. Seventy-five dollars gets you $3000—when you win over the decision-making man who holds an honest, wrong belief.

Of course each of us holds a certain percentage of wrong beliefs. Many times the longer we're on a job the more we hold. So the extra costs because of honest wrong beliefs remain in the product.

5) *Lack of the Idea.* It's impossible for anyone, when making a decision, to always hit on the idea that fits the situation best, although sometimes that idea is so simple it makes one feel stupid afterwards. To show you what I mean: here's a refrigerator condenser, as it was made after 25 years of cost reduction. It has copper-weld type tubing on steel, and it works fine. But one of the fellows got the idea of using wire to back it up instead of steel. He went to the wire companies and learned all he could learn about how to join wire—krimp, weld, etc.—and here's the new condenser, costing within pennies of half, and a little more efficient.

6) *Temporary Conditions.* When the engineers first build a product they have a lot of problems on their hands, and their main job is usually to meet the specifications and get the "show on the road." Take the garbage disposer, for instance. Look at the problems the engineers had at the beginning! They had to devise something that would grind cabbage, and bones—but not silverware or the kids' hands—something that wouldn't get water in the bearings or build up undesirable odors. Give them great credit for getting something that worked.

Later on, the initial problems are solved; the temporary conditions no longer exist. Then it's time to take another studied look.

When this filter circuit was built, it was on a forced time schedule, and it cost $40. It's important to recognize when temporary conditions are gone. The filter circuit is now in an entirely different type of enclosure and costs $6.80, not $40.

A stud on a disposal was being made for 15 1/2c, until the "evaluation by comparison" technique showed that the same function could be obtained for 2 1/2c. Considering the high volume of the disposal, the savings ran into thousands of dollars.

Before I leave the subject of temporary conditions I want to emphasize one thing. Someone may be inclined to criticize the engineer, and that's wrong. Remember, he's the fellow who had to get the job out when a lot of difficulties existed. Just be sure to recognize the importance of a second look when the temporary conditions are gone.

Summary

To repeat what I said at the beginning of this talk: to evaluate correctly we must find the lowest-cost means of accomplishing a function. Find it in spite of the habits and attitudes that block the way. It takes competent, high-caliber people to do that. It requires skillful handling, salesmanship, and expert human relations.

Where lack of information exists, fill the void with facts and new ideas. If the ideas are lacking, try the brainstorming technique. We'll hear quite a lot about it in this program. There are really only a few reliable ways to get something new into our products. One is to see it in the competitor's product and rush back and put it into our own. Another way is to have a brainstorm where we, in effect, cast out in all directions for ideas—ridiculous or otherwise. These ideas become thought-centers later used as springboards for useful improvements. Another excellent source of ideas is the suppliers—small companies, medium companies—who really excell in their chosen line. Show them what you want—the function you want to get—and let them suggest how their products and processes will help accomplish the result.

When you're blocked by wrong beliefs, develop more information—and again, it takes competent people to take the first step in providing this information.

Concerning temporary conditions, remember this—"it works, why change it" is the best way to go out of business. Things are moving so fast in this competitive era that what's fine today is outmoded tomorrow. It's sure death if decision-making people hold the old why-change-it philosophy. They'll make better decisions when they have the information provided by the value man.

To reduce cost without danger of reducing quality—Analyze and establish value.