1.14 VALUE ANALYSIS PRINCIPLES FOR EFFECTIVE BUYING

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ABOUT THE AUTHOR

Larry Miles developed the concept of value analysis and value engineering while employed with the General Electric Company. His book, *Techniques of Value Analysis and Value Engineering*, (2nd ed., McGraw-Hill, 1972) is published in twelve languages. Mr. Miles has taught and lectured in the United States, Japan, Canada, Europe, Mexico and South Africa.

For benefits to them, General Electric awarded him their highest honor for special achievement. For benefits from the use of the methodology, the United States Navy awarded him its highest civilian award—The Distinguished Public Service Award.

VALUE ANALYSIS PRINCIPLES FOR EFFECTIVE BUYING

One buyer will pay $16.00 for a high-volume repetitive item. Another will pay $7.00 for a higher grade similar item. Why? What does the second buyer do? Can it be put into a system, and taught, and learned? We shall see.

Full Quality Always

First and foremost, in achieving additional dollar benefits for the employer, there must be *no* quality reduction, and no unreliability brought into the buyers purchases.

Quality is the ability to serve the needs and wants of the user fully in two areas—USE functions and AESTHETIC functions. The USE function performs some task he wants done. The AESTHETIC function, which is equally important, pleases him, or helps him conform to his customs.

Value Analysis is the study of FUNCTION and COST

First, exactly what function or functions are wanted? What USE function? What AESTHETIC function? For operation under what conditions?

The function of a part, material or service is the job it does. In buying steel, we are buying a mechanical support . . . in buying paint, we are buying a surface protection. The value in a lamp is the relationship of price to light. We specify paper, but what we really buy is "something to write on." We order a pencil, but what we want is something to write well. In a true sense, every purchase order buys a function, a service, or a use. Value is not controlled by the amount of steel or of brass purchased per dollar but by the amount of a necessary service or function which is performed by the material of whatever kind which the dollar has bought. The object of this study is to provide a way for buyers to arrive at either a functional service or a functional product at lower cost.

The job of value analysis is to make certain that every element of cost, whether for labor, for material, for supplies, for styling, for services, for whatever—contributes proportionately to function.

Secondly, where in the country or now in the world, is the supplier with the best expertise in that function area, and the best manufacturing and distribution system? Find him. Involve him. Get his contribution.

Value Engineering is also the study of FUNCTION and COST

Depth study of function needed and wanted, of conditions surrounding it, of facts affecting it, of other means of providing it and of all costs of all functions is accomplished by different means. This results in decisions which are based upon the best and most economical means the engineers or equivalent have yet found to reliably provide the functions identified.

To fully understand all functions, and to promote great creativity in creating alternative ways to achieve the functions some very special approaches are used.

Some of these will often help the buyer.

1. Name each function, usually with two words—a verb and a noun.
   Conduct current, support weight, transmit torque, exclude substance are examples of USE functions. AESTHETIC functions are usually more subjective, are often called "Please Customer".
2. Classify each function. Is it Basic or Required Secondary?
   Basic function achieves something the user wants done.
   Required Secondary function, directly does nothing for the user, but is necessary. For example, if steel is the means of performing the function of Support Weight, then a Required Secondary Function exists to protect the steel from rusting. If brass or aluminium is used, the cost of this function is eliminated.
3. Evaluate each function.
   By valid creative comparisons, comparing alternative ways of accomplishing the function, establish an approximate proper cost for it.
   Value, the lowest cost which will totally accomplish the function, surprisingly cannot be determined exclusively by an examination of the item which is being evaluated. The value of any service or supply or material or product is established to a large degree by the minimum cost of available alternatives, by other materials or services which will perform the same functions. Value, then, is the price which must be paid for the product, process, idea, material

or service, required to perform a useful and wanted service, whether it be sweeping the floor or holding mechanical parts in position.

It is a prime opportunity and responsibility of the purchasing organization to assure to the management a true measure of value in exchange for every dollar of expenditure.

4. Use the Function Analysis systems Technique, usually called FAST.

   A very effective means of developing deep understanding of the functions required, and their relationships, and of promoting great creativity, is this system. It requires study and experience. It proceeds by asking two questions about the function. "Why" is the function performed, and "How" is it performed, then diagramming the results in a very revealing manner.

   The buyer who wants more knowledge of 1, 2, 3, or 4 will get it by attending a VA or VE seminar, or by studying some available books.

VA Buying is Understanding and Buying Functions

Essentially the buyer is deepening function and other kinds of knowledge and understanding, then developing real creativity in each situation.

All wants and need are for functions, either USE or AESTHETIC. All *building blocks* either of products or services, are functions. All costs are to provide functions the purchaser wants. All decisions are based upon function USE and AESTHETIC and costs. All comparisons are based upon functions USE and AESTHETIC and costs. Still, all catalogues, all material lists, most requisitions, most sales promotions efforts, are in the language of described materials.

The more nearly the buyer knows function, understands function, solicits and buys function, the more effective he becomes.

Some Reasons Why Buyers Using VA Techniques Bring Large Dollar Benefits

1. Vendors always know more about the product than buyers. What opportunities for lower costs or needed better quality lie in that knowledge?
2. Handbooks and catalogues are vital sources of general information, but they come up to only 85% of telling the whole story of what is available. What additional earnings benefits, or function benefits are in the other 15% of knowledge?
3. Price lists are written on the basis of generalities. Specific buying situations are often quite different. What opportunities are there in specific purchases to secure more usefulness, lower costs or other benefits?
4. The vendor often has a better material or product or service for a particular use. But he does not, in useful terms, know what the buyer's need is. Giving more proper knowledge to the vendor allows him to respond.
5. Specialized skills, materials and products can often be supplied by the vendor. Too often the buyer whose employer needs them, does not know either about them, or precisely about the need. Opportunity for product and/or profit benefits are missed. The buyer who gets knowledge and uses creativity can bring the benefits.
6. Vendors are sometimes unimaginative, continuing to sell products "as-is" when modifications or adaptations would better fit the buyer's need. Better quality, lower cost and other benefits sometimes result from the buyer's initiative, knowledge and buying skill.
7. Vendors must sell for the highest prices they can get in the competitive market. That is the basic rule of successful marketing. They are "looking out" for their companies. The buyer has opportunity to "look out" for his employer. Either one who "hangs in tough" gets more benefits for his employer. It's the buyer's opportunity.
8. Buyers are limited to using suppliers they know. Expanding knowledge expands earning potential from the buyer's work.
9. Requisitioners are not infallible, they are normal people, the same as buyers. They are much influenced by what they have done before, what the records have written in them and what the specification from the past says. The buyer has a contribution to make, not just a clerical operation to perform.

For High Success, The Buyer Jells Up Five Decisions

1. That he is the "goalie". No money is to go out unless value comes in, no matter what. He does not fault his teammates, or compete with them but he has a job to do. When the puck slips through, he stops it. No money gets out, without wanted functions coming in.
2. That he will not just "catch the ball and pass it on." Direction and force will be added by his function study and action. He will not receive requisitions and handle them clerically, he will contribute.
3. That as in any game, he will have blockers and stoppers, which he must overcome. He must expect this, be prepared for it, and do it.
4. That he must teach his teammates that he is competent to run the ball.
5. That he will teach his vendors to help him.

Ten Specific Function Identifying and Function Buying Approaches. There Are Many More

Description and examples of each of the ten will follow. The reader who wishes more depth of information about any example will find it by referring to the page listed, i.e., (100) in Miles Book, 2nd edition, McGraw-Hill. All examples are the result of the buyers initiative and the function buying principle.

1. *Purchased Part Function Analysis.*

The buyer assumes nothing, he learns the function of the parts which he buys. He asks questions until he understands. When a part seems to contribute little or nothing, he advises the requisitioner, asks if he wishes to reconsider, to cancel or change the requisition.

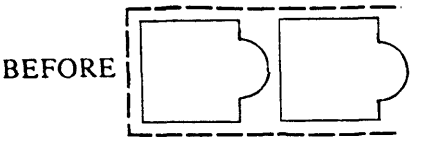
Example (100) "dust cover." Cost $5/1,000/yr. used, it was used inside of another gasket sealed container of electronic equipment and was about the size of a gallon pail. Since the equipment operated with the outer cover closed, it seemed that there would be no "dust" inside. The buyer saw no function. Questioned it. The engineer said "it has no function but marketing requires it." Next to marketing, who said "you say it costs $5. It has no function. One big customer wants it. Take it off, and we'll charge him for 'extra equipment' on his orders". $5,000 added to earnings.

2. *Purchasing Particle Function Analysis.*

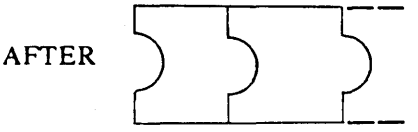
The buyer imaginatively and creatively examines each particle of the item he buys. Is that particle working? Are all particles working approximately to their capacity or are there some doing little but adding weight, volume and cost? When he finds non-working particles which he knows he must pay for, he questions, "can some of this nonworking material be eliminated, or put to work?"

Example (57) for an appliance shift lever bracket, the steel buyer bought 11¢ of steel 3" wide × ⅛" thick. He observed that the bracket was a flat stamping only 2½" wide and that scrap was made, not only between the brackets, but along the sides as well. Millions of nonfunctioning particles of steel being bought. He questioned it. Why not buy the width needed, then just cut it off with no steel waste? The designer was motivated. He said that the shape at the back end didn't matter, it could as well be a "cut-off." But he did even better, as seen in the illustration. He designed it so that with each stroke of the machine, not one, but two parts were made. One was cut off and one was punched out. All quality was kept and $37,000/yr. was added to earnings.

Appliance Shift Lever Bracket



Normal stamping operation with one piece formed at each stroke of machine and waste around edges.



Improved stamping operation with two pieces formed at each stroke of machine and no waste material.

3. *Purchasing Specification Function Analysis.*

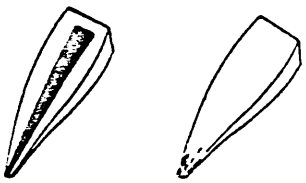
Each item of specification which adds cost is for the purpose of bringing some function. Surfaces smoother than normal, clearances tighter than normal, perpendicularness more exact than normal, each are for some functioning purpose. The buyer checks each other-than-normal specification, to learn which are adding cost, how much, and what function they provide. He often finds some that appear not to be adding function. He then determines the amount of cost benefits which would result if those specifications were not included. He provides this knowledge to his proper teammates so that actions may result.

Example (126). A small steel part about the size of the top half of a shingle nail had precision surfaces and tolerances all over it. 700,000 per year cost 6¢ each, $42,000. The buyer questioned their function. They were check valves in the gas system of a refrigerator. They were always mounted upright with the head at the top, in a vertical tube, so that any gas flow from below had only to lift their weight and pass on through, and any return flow from above was stopped by the fit of the under side of the head on the tube. Precise tolerances under the head added function. No other precision tolerance added function. Others were changed to standard. Suprisingly the cost dropped from 6¢ to 1/10 of one cent. A year's supply cost $700. $41,000 was added to earnings.

4. *Purchasing Aesthetic Function Analysis.*

Aesthetic function is important. No need to make it if it doesn't please the customer so that he will buy it. "Aesthetic" function is bought, the same as "use" function, excepting, the buyer often cannot use as much of his own general judgments. He must leave the selection of what is "artful" entirely to his talented teammate. He does, however develop cost for alternatives which might provide the same or better aesthetic functions at lower costs. This knowledge greatly aids the artful decision makers in selecting the best "aesthetics" at the lowest costs.

Example (2). A small pointed triangular shaped piece of very thin aluminum was used on the knob of an appliance. It cost $20,000 for one year's supply of 1,000,000. On it was a red dart, emphasizing the direction it pointed. It served two functions. It covered the screw which mounted the knob to the shaft, and it served as a pointer, indicating adjustment. The buyer reasoned that the shape was a pointer, without the addition of the red color, and perhaps achieved the function. He evaluated it by securing a quotation on the part made from highly polished stainless steel. It would cost $5,000 for a year's supply. The style designer said "buy it, I like it better." $15,000 was added to earnings.



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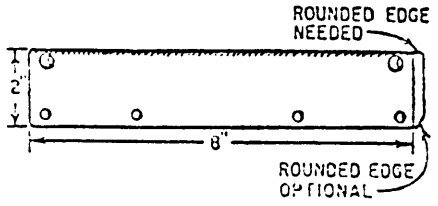
5. *Additional Cost Function Analysis.*

Is the part or material ready to use as received, if not, what is immediately done to it? What is that costing now? Could we buy it ready-to-use? How much more would that cost?

None of the decision makers in the system have that knowledge, unless and until the buyer gets it. Much of the buyer-added contribution is from the fact that he does, in fact have sources of information, which is really needed, but which is never developed excepting by his initiative and action.

Example (232). The buyer bought thin steel strip 2" wide to make 1,000,000 parts/yr. 8" long, for 2½¢ each. It became "back plates" in electronic equipment. A small pulley ran along the top, aiding adjustment.

Checking into "additional cost function analysis" he found that the back plates went into the product at 10½¢. Some of the addition was for making mounting holes, but much was for grinding, rounding and smoothing the top edge, so that the pulley would roll smoothly. He knew that by paying a small "extra", he could buy steel strip with one "mill edge". A smooth rounded edge is produced naturally by the rolling process, on each side of the sheet. A strip can be cut from each side, which will then have 1 rounded edge. Buying this strip ended much "additional cost," reducing the "ready-to-use" part from 10½ to 4½¢. $60,000 was added to earnings.



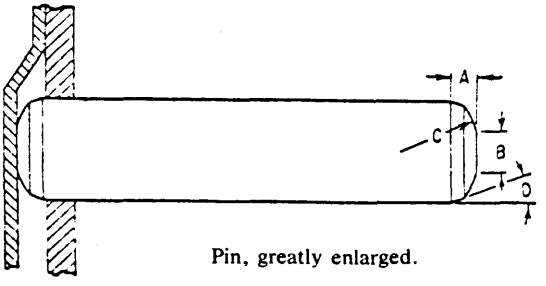
Back plate.

6. *Supplier Manufacturing Cost Function Analysis.*

On large volume competitive items, it is often important for the buyer to know much about the manufacturing practices and processes of his supplier. What raw material starts the process? What work is being done to it? What costs are being incurred which may not add to the functions which the buyer wants? The skilled buyer in the proper framework of buyer-supplier confidence, can relate approximate costs to functions in the supplier's operations. He often finds opportunity to end costs which do not bring wanted function. He ends them and brings benefits to both the supplier and the buyer.

Example (63). Enormous quantities, 50,000,000/yr. of tiny stainless steel pins, 1/16" in dia. × ⅜" long were purchased for electric clocks at a cost of $3.65 per thousand. The buyer examined the form of incoming raw material to the supplier, and each operation which added cost, together with the function provided by that cost. He found many non-functioning costs. Two will be described. The incoming stainless wire required three centerless grinder passes to get it to right size and

finish. The buyer found that with the large quantities, the steel mill would provide the exact size needed at no extra cost. Identical material was then made with one pass, and buying smaller wire, steel weighed less and cost less. Secondly, the supplier's factory had set its own tolerances at ½ of the buyer's requirement, which meant that all production between allowable tolerance and ½ allowable tolerance was scrapped. Of course it went into costs, and would have been usable, but was thrown away. Other changes were made in inspection and handling. Cost was changed from $3.62/M to $1.90/M for the identical product. Both buyer and supplier benefitted. The same changes on a similar part brought total added earnings to $100,000.

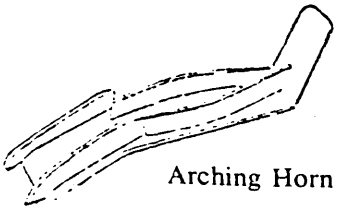


Pin, greatly enlarged.

7. *Functioning Product Function Analysis.*

Often, requisitions call for products. Learning the function needed, then securing proposals from suppliers who might provide that function by a different approach, is extremely profitable. The buyer then submits the proposal together with its costs, to the requisitioner for his study, and often, his approval.

Example (334–19, 339–19). 3,000 arching horns/yr. were roughly 15" long, 2" wide and varied in thickness. Each was made of flat bronze cut, shaped, bent and brazed. Each cost $6.50. The buyer studied the function. It was to absorb the heat of the arc when contacts were opened near it so that the arc would extinguish.



Arching Horn

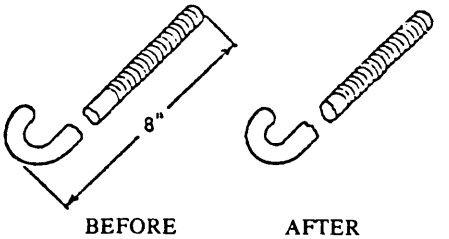
Since the function was accomplished by having a mass of bronze near the arc, the buyer reasoned that the properties of ductile bronze added no function, and that cast bronze would absorb heat as well, perhaps parts could be made thicker and would do better, and perhaps at lower cost. His supplier of shell molded castings quoted $2.25 each with a 65¢ mold cost on each for the first year. $11,000 was added to earnings.

8. *Supplier Manufacturing Process Function Analysis.*

The buyer first learns what functions are being performed by the materials he buys. He then uses this knowledge and skill to match up the function needs with the functions produced by his supplier's manufacturing processes. His batting average becomes pretty good.

Example (147,218). 800,000 8" long J-bolts, made of 3/16" steel rod were purchased for 11½¢ each, $92,000/year. Used in groups of three, their function was to support the heavy weight of the TV tube and surrounding coils and apparatus in the chassis. The buyer located a supplier whose equipment functioned to produce good threaded items, in large quantities much more efficiently than the usual thread "cutting" equipment. Slightly smaller rod-the root diameter of the thread-was used. The thread was then rolled up on it, a fast almost instantaneous process. Interchangeable J-bolts were produced. The cost became 1½¢ instead of 11½. $80,000 was added to earnings.

J-Bolt



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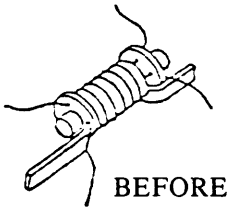
9. *Non-Working Cost Function Analysis.*

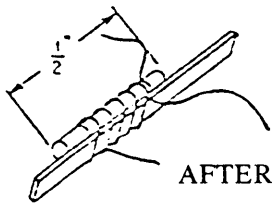
Each purchase cost is to secure some wanted function. The buyer learns what that function is. Often he can identify in the product, that part or parts which perform that function. He will also find supporting items not performing the wanted function, which are adding much to cost. His suppliers may suggest less costly means to provide this support. VA techniques call these secondary functions. They may ab-

sorb lots of cost. Proper change in them does not affect the wanted function from the device. The buyer secures quotation on the different construction.

Example (108). Large quantities of a tiny radio frequency transformer about twice the size of a grain of rice cost 39¢ each. The buyer reasoned "where is the cost"? Only a small amount of two tiny wires held close together performed the function. All of the rest of the cost is secondary. He found that a tiny spool was made. With microscope equipment 4 tiny holes were made in the spool ends, then a little wire was wound on the spool and the ends tediously threaded thru the holes. Slow and costly. The laboratory was asked for an adhesive which would not react with the insulation on the wires and which would have long life. They provided it. The functioning wires were wound on a support tab, then touched with a dab of adhesive. The product was 100%. It cost 19¢. 20¢ of non-functioning cost had been removed. Earnings were increased $40,000.



A small radio-frequency transformer.



A radio-frequency transformer, identical in function, one-half the cost.

10. *Combination Of Two Or More Purchasing Value Analysis Techniques.*

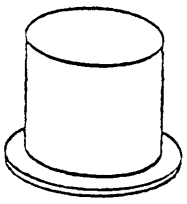
Example of Purchasing Specification Function Analysis and Purchasing Particle Function Analysis. The buyer will often use two or more in combination.

Example (127). 2,000,000 iron screw machine parts, cylindrical, ½" long, ½" dia. with a slight flange at one end, were used per yr. Cost was 3½¢ each, $70,000. Tolerances of dimension and finish were very exact overall. What was their function? They were pole pieces in loudspeakers. The flanged end mounted on an electromagnet, the plain end was inside the floating coil which was mounted to the cone of the speaker. The function of the flange was to facilitate fastening and the function of the part was to conduct the magnetic flux up through the bottom and out through the cylindrical sides-through the voice coil-and back into the magnet.

Function analysis showed 3 tolerances which contributed function. 1. Surface of flanged end which mounted on the magnet. 2. Diameter of main body over which the coil floated, and its surface finish. 3. Perpendicularness of flange face to cylindrical sides. All dimensions of flange, for mounting, and of length (upper end was in air in center of cone) could be normal. Particle function analysis showed that all metal was working excepting a conical shaped piece at the top. Flux came in the flanged bottom and went out the cylindrical sides. The buyer now suspected that a supplier of "coined" iron parts could make them by automatic "cut-off" machines followed by high speed "coining". There was plenty of tolerance and material allowance to take the variation in material at the cutoff operation.

He was right. The supplier could meet all of these functioning special specifications with the high speed equipment. Cost became 1½/. $30,000/yr. $40,000 was added to earnings.

Pole Piece



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