

1. VALUE ENGINEERING AND ANALYSIS

1.1 THE VALUE CONCEPT

For the sustained growth of an organisation, it is an undisputed fact that the gap between the Price and Cost of production, i.e. the PROFIT margin should be widened as far as possible without any binding limits.

In any system

$$\text{PRICE PR (N)} = \text{COST C(N)} + \text{PROFIT P(N)}$$

Where PR(N), C(N), & P(N) are the price, cost and profit of the Nth manufacturer, such that

$$\text{PR(N)} = \text{C(N)} + \text{P(N)} = \text{C(N+1)}$$

where C(N+1) is the cost to the (N+1)th user or buyer.

If the (N+1)th end user is willing to pay C(N+1), it is in the interest of the manufacturer N to reduce C(N) so that P(N) can be increased for him, provided of course that Performance, Reliability and Quality of the item remains constant, or improved further, if possible. To achieve the above end, there are four approaches available.

- (a) Keeping the Cost of Production C(N) constant, increase the selling price PR(N). This has got its own repercussions on the market demand pattern, and any price enhancement is normally linked up with a fall in demand.
- (b) Keeping the Selling Price PR(N) constant, reduce the cost of production, by using various conventional methods of cost reduction, like Method Study, Material Management, Preventive Maintenance, and many other Productivity Techniques. It has been observed that more often than not, such a cost reduction approach has resulted in a substandard quality

product which again had been rejected in competitive market, in favour of a better performing alternative.

- (c) The third alternative is a simultaneous combination of the above two i.e., (a) and (b).
- (d) Reduce the Price $PR(N)$ and reduce the cost of Production $C(N)$ in a higher proportion. Considering all the above four alternatives and simultaneously taking into account the behaviour of the market, one has to realise that the user wouldn't mind a higher price, if, he is satisfied that the additional performance which he will get, will more than compensate the additional price which he would pay for that product. Analysing the pattern of criteria based on which the $(N+1)$ the user pays PRICE , $PR(N)$ for an item or service, it has evolved that, one pays the price for the following factors.
 - a) Not the immediate performance but the OVERALL LIFE PERFORMANCE.
 - b) Ego satisfaction
 - c) Salvage or resale worth of an item
 - d) Sentimental attachment

All the above considerations and facts indicate that a time has come when one should start thinking about the VALUE of an item and not the PRICE or COST because VALUE takes into account the above mentioned four criteria, for which the MARKET i.e. the USER is ready to pay a Price.

1.2 THE COST : PRICE & VALUE :

THE COST :

Although the term Value is used very commonly as a synonym to Cost or Price, but in the context of VAVE it is an entirely different word. To highlight the difference between the three terms, we must consider the total system. For the

purpose of this chapter our system would comprise only two elements viz. the Manufacturer at one end and the User at the other end. In this system, the manufacturer produces a certain item by consuming some material, use of machinery and labour, power and by carrying certain overheads as a necessary (subject to question) part of the set up. For all these items we give a generic name viz. The INPUTS. For the inputs are available only against a payment made or promise to pay, it becomes a commitment of the manufacturer, which sooner or later he has to pay. As this amount has got no relevance whether the product is sold or not, it is independent of the market, and this remains a fact. This part would form (and is called) the COST of the product or service.

THE PRICE :

Once the item has been produced, the MANUFACTURER adds a certain amount of profits (in some cases even at a loss) and puts the items in market for sale. This amount which he expects in return for the product is called the PRICE of the item produced or serviced. The PRICE is always a matter of policy.

THE VALUE :

Now, once the product or service is available in market, there comes the USER to purchase it. He may or may not purchase the item. His decision TO-BUY or NOT TO-BUY depends on the following criteria.

- a) The Need for the Product
- b) His Paying Capacity; and
- c) Alternatives/Substitutes available in the Market.

Given a choice, the buyer might decide not to buy an item by spending money. The decision TO-BUY is only taken when he knows that by not having that item, he is sure to lose something else. Unless this loss is more than the price, he is paying he would never decide in favour of buying. Larger the difference between

the loss and the price, more would be the saleability of the item. He knows that by spending a certain amount of money for buying it (the Price-Pr(N) he is going to save something else equivalent to W i.e. the loss, and that

$W \geq PR(N)$

but never when,

$W < PR(N)$

This notation W would be called as WORTH of that item; and the relationship between W & P is the main deciding criteria for the saleability of an item. This relationship is what we call as the VALUE of the item.

The decision to BUY an item product or service would be taken ONLY IF.

$W \geq PR(N)$

or

$(W/PR(N)) \geq 1$

and this relation $W/PR(N)$ or WORTH to PRICE ratio is termed as VALUE. Although we are using the term PR(N) (Price) here in context of the user but that actually is his cost 'C(N + 1)' because that is what he is incurring to get the WORTH or the functional requirement achieved. Even the manufacturer, while producing the item has the same criteria for his own INPUTS (the COST which is the previous man's PRICE).

This means that the Value V can be improved. If W/C_{n+1} is improved and in turn the profitability of the organisation goes up. Of course the V can also be improved by improving the W for the item or a better combination of both so that

$V_1 = W_1/C_1$ &

$V_2 = W_2/C_2$

In actual situations when Value Analysis is to be carried if $W/C < 1$, it is a strong case for application of VA.

In a manufacturer-user system, we see that the whole system comprises very many manufacturers producing something to be used by the next man to manufacture something else and so on. The process starts with the ultimate END USER, because, he is spending his money to procure the final output.

Cost, by its very nature is a constant figure under a given set of operating conditions. The Price is changing depending on the demand and supply theory, whereas a Value changes from case to case for the same item depending upon the NEED and the WORTH of the item.

COST & PRICE are the DOMAIN of the MANUFACTURER or PRODUCER whereas VALUE is the DOMAIN of the USER or BUYER.

To differentiate between the three terms and to understand the basic difference between the three terms and to understand the basic difference between them, let us take an example under three different operating conditions.

Example : A polyester shirts

Total cost of production and distribution = 60 Rs./piece

Selling Price = 90 Rs./piece

Condition 1 : Manufactured by a local firm

Money equivalent of VALUE which you would be prepared to pay is say Rs. 75/-, which would mean that you would prefer to buy the cloth and get it stitched, for about Rs. 75/- than buying a ready made one for Rs. 90/-.

Condition 2 : Unavoidable circumstances and urgency of need, where you don't have time to give and wait for stitching : Value Rs. 90/- equivalent.

Condition 3 : Some one close to you presented this to you after buying for

Rs. 90/- and one of your friends is offering you Rs. 90/- for it.

Here the question is whether you would sell it for Rs. 90/- or more or less or will not sell it at all.

This decision depends on various conditional parameters. Let us look at the following matrix :

Case	Sum offered by your friend	Your decision to sell	Consideration
1.	90/-	No	The additional amount is not compensating for the sentimental attachment with the shirt or the person who has presented it to you.
2.	100/-	No	
3.	120/-	No	
4.	150/-	May be yes	Not decided but weighing the pros and cons.
5.	175/-	Yes	Decided that the amount Rs. 175/- is equivalent or more worthy than the sentiment attached with the shirt or the person who has presented to you.

But had you yourself bought the shirt for Rs. 90/- you might have accepted to resell it for only Rs. 90/- or may be Rs. 95/- because you know that you can again replace it for the same sum as it is available readily.

This is only one of the tens of thousands of cases where you or anyone relates the money equivalent to the worth of the items, all factors considered.

AND SAME IS THE CASE WITH, AND BEHAVIOUR OF, YOUR CUSTOMER WHEN HE PREPARES HIMSELF TO PAY A RUPEE EQUIVALENT OF SUM OR SERVICES FOR YOUR PRODUCT OR SERVICES.

VALUE ANALYSIS :

VALUE ANALYSIS is a systematic approach to segregate the different parts of the VALUE, and eliminate by gradual process those parts of UNNECESSARY COSTS, which, neither.

- a) increase the function,
nor
- b) provide esteem or ego satisfaction
nor
- c) enable the resaleability
nor
- d) provide sentimental attachment or urge to possess.

At this stage we must examine the definition of FUNCTION. Function is defined as the purpose for which a material, a part, a product or a service is required. Once we come down to the purpose of which a part or a product is required, it becomes easier to suggest alternative for achieving the same purpose.

1.3 HISTORICAL DEVELOPMENT:INTRODUCTION AND DEFINITION

The first VALUE ANALYSIS (VA) program was established in the General Electric, USA by about 1947, since then the programme has received

considerable attention and many successful applications have been reported. Though the technique started with analysis of purchased items it has been extended to manufactured items as well.

The idea behind Value Analysis is not new. The approach to the problem essentially differs from that of the other Cost Reduction techniques. A customer when buying a product weighs its functional and other features (appearance, attractiveness, get up) against its price and judges the VALUE of the product. Manufacturer in turn, in order to enhance the VALUE of his products must ensure that he offers all the necessary functional features at the lowest possible price. This functional approach is the basic criteria of VALUE ANALYSIS. It tries to obtain a "FUNCTION" and "NOT" the "PART", at a lesser COST.

This has the fundamental base, as the USER is not at all interested as to how the part looks like, or what it is made of, as long as the DESIRED FUNCTION is performed to HIS satisfaction along with the required level of Quality & Reliability.

TO THAT EFFECT, VALUE ANALYSIS IS A FUNCTION ORIENTED APPROACH AND NOT A PRODUCT ORIENTED APPROACH.

The conventional methods adopted by the industry for Cost reduction are centered around the product itself, which offers much lesser scope for Cost reduction.

Many examples can be given to illustrate this. In short a few of the causes can be summarised as :

- I) Rush jobs continue to be done the same way even after emergency is over.
- ii) Lack of keeping pace with progress in technology.
- iii) Lack of communication between different departments (each looks from his own view point).

- iv) Lack of consideration of any application information available elsewhere.
- v) Value is not capable of accurate measurement - it is only comparative.
- vi) Impact of new products and change in tastes and styles not being continuously taken note of.

VALUE means different things to different people.

To a Designer, Value means Reliability of Performance.

To a Financier, Value of product is the financial returns it can bring,

Whereas

To a Customer, Value is a comparative assessment between the performance, other esteem features of a product and its price.

The fundamental principle of VALUE ANALYSIS is this to analyse the functional and other features and ensure that they are acquired with the lowest possible cost.

Measurement of VALUE is not easy. It has to be evaluated only by comparison. It is the lowest cost combination of design materials, Processes which will equally reliably give Performance, Esteem, and other required functions expected from the product.

VALUE ENGINEERING is the stage where the concepts of proportionate functions and their proportionate costs are taken care of at the basic design stage.

VAVE is a generic name given to this technique of VALUE ANALYSIS and VALUE ENGINEERING.

1.4 AREAS FOR APPLICATION OF VAVE

Although it is believed that VAVE can be applied in all spheres of activities of an organisation and of course, it is a fact but the difficulties faced in application phase have to be realised. Looking into the Aristototle's classification of seven types of values, we can realise that excepting in the case of ECONOMIC VALUE, all others are highly subjective and fully individual oriented rather than group or society oriented. The seven classes of values propounded by Aristototle are :

- 1) Economic Value
- 2) Political Value
- 3) Social Value
- 4) Aesthetic Value
- 5) Ethical Value
- 6) Religious Value
- 7) Judicial Value

The following table shows a comparative analysis and applicability of these different classes

VALUE CLASS	TYPE OF ACTIONS (EXAMPLES)	EXPLANATIONS & ANALYSIS	CAN VAVE BE APPLIED?
ECONOMIC	A Product or Service bought at a given Price.	Within a given framework and conditions alternative products or services can be found so as to serve the required function at a much lesser cost.	YES.
POLITICAL	People are normally wedded to a particular philosophy thereby have a certain political following and way of thinking.	People have been to be changing their alliances and philosophies so as to join others in some cases even with a diagonally opposite view point, just to gain power. The price one pays in such manners depends on his or her	Subjectivity is involved to a large extent and exact VALUE cannot be ascertained.

		own standing and influences. Under the same circumstances, two individuals from the same political wing have compromised at two different prices. (Need not necessarily be in the cash form but even in kind form).	
SOCIAL	Spending a certain amount to attend own brother's marriage (which is a major social function)	If one is close by, he might take leave from work and join the occasion with family. If the distance is far (but within the country) he decides to join the occasion along because of travel cost and other expenses. If the person is in America and the marriage is in India, he might as well decide not to join the occasion because of very high cost involved. Also in the same circumstances one brother might join the group whereas other might decide not to join	High subjectivity is involved and the VALUE of not joining the function cannot be evaluated.
AESTHETIC	Hobbies of individuals are involved. a Picasso painting is purchased at astronomical Price one, whereas a diamond studded gold ring is bought by the other	For the other person the painting may not be worth that amount and he feels that the decision was foolish. in the second case other person might feel that instead of spending money in diamond studded ring he could have as well bought deluxe Maruti Car and Colour TV with a VCR attachment.	Value cannot be judged as the functional requirement cannot be qualified in general. The individual has spent his money and that is his lookout.

ETHICAL	Secret information not to be revealed : An employee of one organisation should not work simultaneously for competitor, etc.	It has been observed that there is a class of patriots who can lay their life for the nation, but at the same time there are others who pass on secret security information to other countries, etc.,	Highly subjective criteria hence VALUE of ethics cannot be judged.
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RELIGIOUS	Communalism and values prevailing, A person following a particular religion forces other to convert to his own religion but he does not want to change his own religion.	For gains some people change over to a particular religion (both for cash & kind in return). It is easy to convert some but a bit difficult to convert some other.	Purely based on individual's own look and his own value system.
JUDICIAL	Judges lay a certain penalty for given crime like Rs. 50,000/- or 3 months. R.I.	For the same type of cases the penalty amount and the equivalent R.I. period changes. The same person committing the same crime a second time will have a more severe punishment.	From case to case the details are different and hence no fixed amount.

A FEW MORE CAN BE ADDED TO THE ABOVE LIST WITH EQUALITY
 AMBIGUOUS SITUATIONS : LIKE

SENTIMENTAL VALUE

HOBBY BASED VALUE

CRAZE OR FASHION VALUE etc.

From the above table, it can be clearly seen that Value Analysis effort can be very effectively made when it concerns the Economic Value. In other cases it should be left to the individuals, who are the best judges in their own cases. The only scope in these cases is that when it concerns an organisation's need, a better approach would be that a team of experts decide about the VALUE of these decisions, wherever possible, so that the subjectivity can be reduced, if not completely eliminated.