EVALUATING BRAINSTORMING IDEAS:
"The Making or Breaking of the VE Workshop"

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ABSTRACT

The speculation phase, if successful, will result in 400 to over 700 ideas relating to a variety of functions and approaches to satisfy those functions. This paper describes a systematic process of reducing and filtering this large number of ideas for proposal development. Also described is employing the "Product Performance Profile" concept, a unique evaluation process, to grade and select those proposals that have the most positive impact on resolving the problem or opportunity under study.

INTRODUCTION

The Planning Phase, sometimes referred to as the "Analytical" or "Evaluation Phase", is that time when judgement is applied to the creative process. This is the screening, sorting, combining process that brings project requirements, features and function characteristics into transition from idea to solution. However, applying judgement does not mean that the roadblocks suppressed during speculation now become valid. The positive attitude developed during speculation must be sustained throughout this and subsequent phases if the job plan.

OVERVIEW OF THE EVALUATION PROCESS

The Planning Phase deals with the judging and selecting ideas against quantitative criteria that are valid to the problem or issues being analyzed. Judgement will be applied to thin and sort out ideas leading to the evolution of proposals that will result in implementable solutions. In this phase there will be a transition from divergent to convergent thinking. We want to remain open-minded while we go through the judgement of ideas, sort the ideas into proposals and finally, come up with recommended proposals for the solutions sought.

The roadblocks mentioned earlier can still act as "killer phrases" and should be avoided. Roadblocks will tend to take on a different form during the Planning Phase. Judgements starting with "no, because ..." should be avoided. This opening is a negative response and should be treated as a roadblock. If left unchallenged, this opening will discourage discussion by closing the door to further analysis to modify the unacceptable element of the idea or proposal.

Many ideas can be made to work if certain problems are overcome. A problem should not be the cause for rejection until it is objectively evaluated. Therefor, judgement responses should encourage challenges by beginning with "yes, if ..." This translates the problem to an issue and invites further speculation on how that often small, unacceptable part of the proposal can be resolved.

A "yes, if ..." response will often surface very practical solutions that would otherwise be rejected as being unrealistic. Ideas and proposals should be accepted or rejected based on the feasibility of implementation, given the objectives and parameters of the solution sought, rather than emotions. One idea may be very sensible if a minor sub-problem can be resolved. Unless the requirements have been identified for implementation, rejection is based on roadblocks, prejudices, favoritism, or other unrelated causes. For some ideas the "yes, if ..."answer is obviously impractical for meeting the requirements of the solution. For others, the feasibility of the idea is not as obvious and requires more in-depth discussion. The "yes, if ..." answer may indicate that a modification of the idea will eliminate or minimize an implementation problem. The "yes, if ..." approach encourages the exploration and use of idea where the "no, because ..." response discourages ideas.

EVALUATION PROCESS IN THE PRE-EVENT

The pre-event is a very important crucial step in the VE process. The success or failure of a project can hinge on how well this step is conducted. In the evaluation process the objectives of the project are established with the Executive Steering Committee. The principle issue or question asked of the Steering Committee is, " What is your expectations of the VE Workshop and what is your definition of success for this event?" The answer to this question will determine the criteria from which to measure the ideas generated in the Speculation Phase. In addition, priorities, ranking and weights will defined the criteria in support to the goals and expectations of the workshop. This determination signifies, to the teams and facilitator, the most important management concerns and their relative ranking.

DETERMINE GO/NO GO

The ideas generated in the Speculation Phase were spontaneously produced with no judgment as to their validity or quality. Only their relationship to the function at issue being

examined was considered. With a large number of random ideas, the task team must now reduce the ideas to a meaningful quantity before evaluating the surviving ideas against the solution criteria. This first step involves asking if any team member objects to setting the idea aside. If a single team member objects, the idea is saved without further qualification or discussion. It is important to note that in this process step, it only requires one member's unqualified support of the idea to keep the idea alive, at this point in the process. The ideas that have been eliminated are those lacking any support or interest in perusing the ideas further.

CHAMPIONING IDEAS

At this stage in the evaluation process we are looking for a champion who is willing to speak for the idea when it comes up for discussion. The objective discussion that follows will include the pro's and con's of the idea, how it will contribute to the solution of the problem and contribute to achieving the goals and expectations of the Steering Committee.

Without guidelines there is a tendency to champion all of the remaining ideas. To aid in the selection process it is important that team members refer back to the problem statement, goals and expectations before championing an idea. Those ideas that do not have a champion will be removed to join those previously eliminated and will no longer be considered in the evaluation process.

GUT FEEL INDEX (GFI)

The "Gut Feel Index" utilizes the underlying theory of the Delphi Technique, which was developed by the Rand Corporation and modified for the VE evaluation process. The Delphi Process says, in part, that the evaluator should be insulated for the voting preference of other team members allowing the evaluator to focus on the merits of the idea.

The GFI involves giving each member of the team a deck of cards ranging in value from 1 to 10. The idea champion explains the idea and answers questions from the team. A pro and con discussion is encouraged. After the discussion, when the team members agree that they understand the idea, they are ready to vote using the GFI cards.

The individual vote is based on three qualifying parameters:

1. Can the idea be made to work?
2. Will it contribute to the goals?
3. Can it be implemented in a reasonable time and at a reasonable investment?

At a signal from the facilitator (or champion) all team members expose their cards simultaneously. This reduces the chance that one member's opinion will dominate the others. To avoid "sitting on the fence", the number "5" is eliminated from the GFI deck, requiring a favorable or unfavorable vote. The voting card increments, from 1 to 10, omitting the 5, is a reflection of the voters confidence that the idea can contribute to the achievement of the technical and economic expectations of the workshop. Before totaling the votes, if one member voted exceptionally high, and another low, as compared to the other team scores, the voters are asked to justify their vote. The reason for this step is to ensure that those members fully understand the idea as presented. The vote is then retaken, summed and averaged to one significant decimal place. The computed team score is the confidence level of the team. As an example: If the team average is 7.4, it indicates that the team feels the idea has a 74% probability of success.

Based on the Delphi principle, the GFI contends that when the individual team member quantifies an idea on its merits, the average rating of the team, especially if they represent a qualified mixed disciplined team, will predict the probability of successful implementation within acceptable accuracy limits. A "qualified" team means that the disciplines represented bear directly on the problem, and the individuals on the team are drawing on their knowledge and experience in casting their vote.

The team must now determine the level of acceptable confidence as determined by the lowest acceptable team score. The cutoff does not have to be the same value for each function category considered. After the team decides the cutoff number, every idea below the cutoff will be eliminated from further consideration. The ideas that survive this step in the evaluation process will be sorted and combined into proposals for the next evaluation step called "Product Performance Profile".

PRODUCT PERFORMANCE PROFILE

Following brainstorming, screening and selecting the best ideas and combining those ideas into proposals is a critical step in the Value Engineering procedure. This is no time to ask "what criteria do we use to determine the best proposal"? That issue should have been resolved during the pre-event, or the VE project selection process.

Too many Value Engineers consider cost reduction as the most important, or worse, the only evaluation factor. Cost reduction is important, but how important is it relative to other business considerations? More significant, if you subscribe to the philosophy that it is the customer that determines the value of products and services, how important is cost (or price) reduction relative to other attributes that customers considers valuable?

This brings 3 key issues in focus. First, which attributes shall we use in developing and evaluating VE proposals? Second, what is the relative importance of the attributes? And third, what is the best way to display the evaluation results?

Product Performance Profile addresses the 3 issues in a structured format and can be used across a broad market spectrum, or for improving the business practices within a business enterprise. The consumer products market is selected for presenting the Product Performance Profile in this paper.

DEFINING VALUE ATTRIBUTES

In his paper "Defining Great Products", Peter Marks[1] describes 8 buying patterns, or attributes that determine a product's success in consumer markets. These attributes are: Price (or where applicable, Cost), Availability, Packaging, Performance, Ease of Use, Assurances, Life Cycle, and Standards and Social Acceptance. Peter Marks describes these buying patterns in an acronym he calls "$ APPEALS", made up of the first letter of each attribute.

It is important to note that all market areas have attributes that define buyer patterns which should be understood by Value Engineers and integrated into the proposal development and evaluation process.

A first step in using the attributes as an evaluation process is to understanding their meaning .

PRICE:

Except in a commodity market, lowest price does not necessarily represent best value. Buyers must be assured that the price they pay does represent "the best" value, by their perception of value.

AVAILABILITY

This describes the when, where and how of the customer's want. Purchasing convenience, a helpful sales staff, and seller reputation are additional factors that influence "Availability".

PACKAGING

Vision is the dominant sense making the product configuration, or form a powerful buyer preference. The package, or the product's physical form and geometry, is what the buyer sees.

PERFORMANCE

This attribute describes how well the product performs its intended function(s), or the margin by which a product will do its job. It is that instrument that achieves the users wanted functions and describes how well those functions perform.

EASE OF USE

Ease of use engages all senses (looks, feel, sound, smell). This attribute may be intangible, but it could represent the ultimate expression of understanding what the customer really wants.

ASSURANCES
Assured performance in terms of quality and reliability under foreseeable conditions is an obvious description of "Assurances". However, this attribute includes social acceptance in addition to quality, reliability and service.

LIFE CYCLE COST
The cost of ownership best describes this attribute. This not only includes the expenses incurred following the purchase of the product, but it also considers the resale value and disposal cost of the product.

STANDARDS AND SOCIAL SANCTIONS
This considers external influences that affects the purchase decision. "Standards and Social Sanctions" includes social factors, product evaluation publications, political pressures, status, image, industrial standards, and government regulations, to list a few.

The descriptions of the above attributes can and should be narrowed to better reflect the specific consumer market and products being evaluated within those markets. Although the buying behavior pattern in the purchase of a camera and an automobile are about the same, the description of some attributes would differ as they relate to those products.

QUANTIFYING ATTRIBUTES

Once the Steering Committee and the V.E. Task Teams have agreed to the definitions of the attributes, the attributes should be further tailored by expressing them in measurable terms.

Not all attributes can be quantified, but it is important to have measurable attributes that support those measurable goals that determine the success of the project. Depending on the narrow definition of the attributes; "Price", "Availability","Performance", "Assurance", and "Life Cycle" can be expressed in measurable terms. "Ease of Use", "Packaging" and "Standards and Social Acceptance" are also important attributes but are more often subjectively evaluated because they are difficult to express in quantitative terms.

RELATIVE RANKING OF ATTRIBUTES

Although all attributes are important in the evaluation of VE proposals, they are not *equally* important. Determining the relative importance of the attributes is best determined by the customer. For VE Projects that impact products or services, customers are often unavailable, but can be well represented by marketing , sales, and distribution sources.

VE projects concerned with improving the company's internal technical or management processes also have customer sources that are described as cognizant approval sources. As "customers" they are the best and often only source to evaluate the relative importance of the attributes.

The "Paired Comparison" process commonly used by Value Engineers is an excellent way for customer sources to determine the relative importance of attributes because it not only results in a priority listing of attributes, but each attribute is assigned a numeric value , or "weight"

Figure 1 shows the attributes of a product, their total score (69) and their total weight (100) expressed as a percentage. The reason the score is normalized as a percentage totaling 100 will be explained as part of Figure 2.

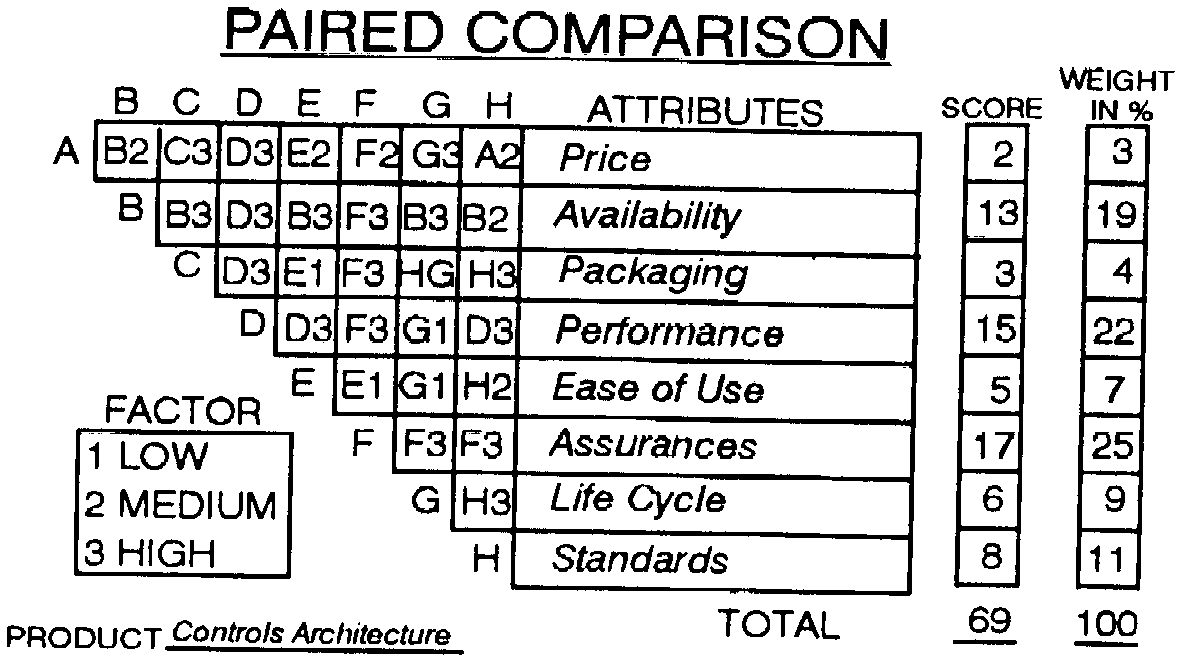


FIGURE 1

The effectiveness of the Paired Comparison process is that it allows for the analysis of a number of factors by only considering 2 attributes at a time. This avoids the confusion of attempting to juggle 8 or 10 attributes at the same time. As an example; in figure 1, Price (A) is compared to Availability (B) by asking, "In this situation, which would you consider more important, Price or Availability?" Then, how important would you consider the difference, low (1), Medium (2), or High (3)?"

In this example, Availability was considered more important than Price by a medium (2) importance factor. This is indicated by noting "B2" in the first square. After all attributes have been paired and evaluated the total number of points earned by each attribute is posted in the "Score" column, totaled, and normalized to 100 percent.

Determining what attributes constitute project success, the definition of the attributes and their evaluation by paired comparison, should be resolved before the start of the VE Workshop Seminar. The importance of resolving these issues early is equal to the Steering Committee defining the goals and objectives of the workshop prior to its start.

Progressing to the Evaluation Phase of the VE Workshop, the ideas resulting from the creative process have been screened and combined to form proposals that would best achieve the goals of the workshop, as described above. This is where to apply the Product Performance Profile.

GRAPHICALLY DISPLAYING THE ATTRIBUTES

Figure 2 shows the 8 attributes displayed in a star, or spider, configuration with each attribute divided into 10 segments. These segments define the goodness of each attribute with 10 being best and 1 being worst.

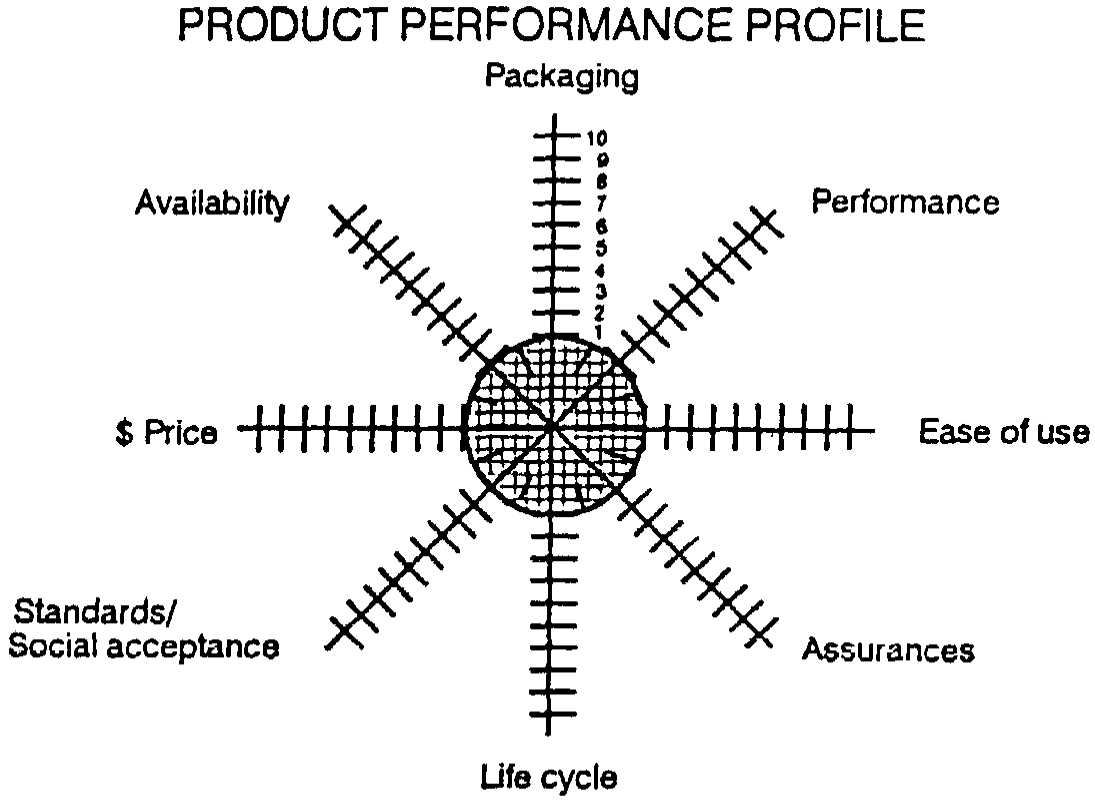
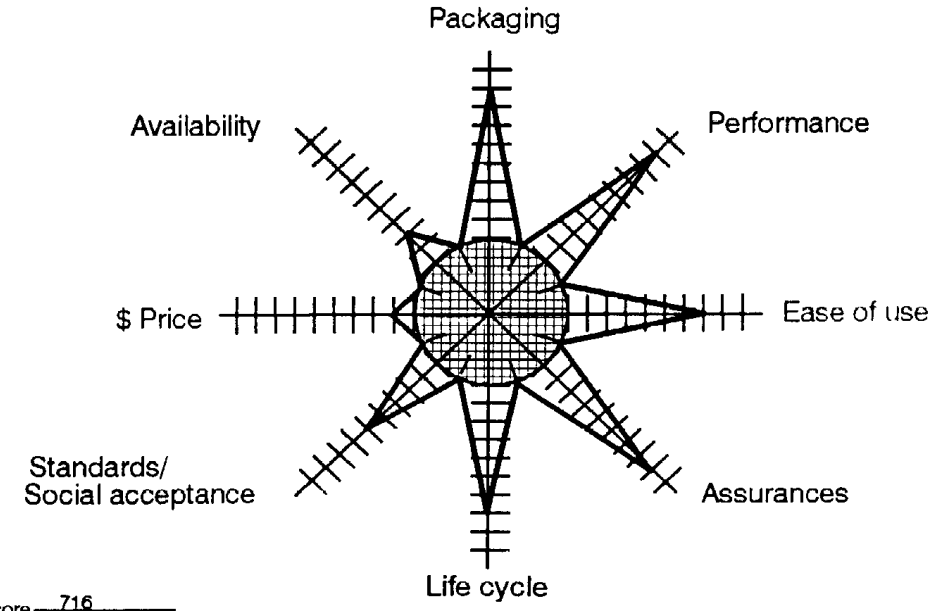


FIGURE 2

DEFINING THE EVALUATION ELEMENTS

The center circle represents the entry level that each attribute must achieve or the entire project fails. That's why the lowest attribute segment is 1, not zero. As an example; if the project received a 10 in all but one attribute, but scored zero in "Availability", it would indicate that the project wasn't at all available and would therefor fail. Or, if the project received top scores except for "Ease of Use". A zero would indicate that the project couldn't be used, and would fail. A"1" indicates the worst possible condition of acceptability of each attribute, below which the entire project would fail.

PRODUCT PERFORMANCE PROFILE



Score 716
Target 700

PRODUCT *Controls Architecture*

	ITEM	Price	Avail.	Package.	Perform.	Ease/use	Assur.	Life cycl.	Standrds.	TOTAL
A	WEIGHT	3	19	4	22	7	25	9	11	100
B	AVAILABLE POINTS	30	190	40	220	70	250	90	110	1,000
C	YOUR SCORE	6	57	36	198	56	225	72	66	716
D	COMPETITOR'S SCORE									
	DELTA (B)VS(C)=	24	133	4	22	14	25	18	44	284

FIGURE 3

With reference to Figure 3, since the score was normalized in the Paired Comparison process to total 100 (Ref. row A. Weight), and each attribute is divided into 10 segments, the total number of available points (Ref row B) is (100 X 10 =) 1,000. By filling in the weight values of each attribute in row A, it can be shown that although the star is configured symmetrically, each leg of the star (or attribute), has a different weight. The value of each increment on an attribute is equal to the weight of that attribute, as determined by the Paired Comparison process (Ref. Figure 1). The total available points that can be earned in each attribute is found by multiplying the weight by 10 and posting the results in row B, (Available Points). An advantage of normalizing is that it develops standards. Regardless of the type, number and individual weight of the attributes, their total weight will always equal 100, and the total available points will always equal 1,000.

EVALUATING PROPOSALS

As the team discusses and rates the merits of each proposal in terms of the governing attributes, scoring them from 1 to 10, the attribute grid is marked on the graph to configure the points on the star. That score is multiplied by the attribute weight (Ref. row A), and the answer noted in row C, called "your score". The "total" column at the end of row C indicated the total number of points earned by the proposal, or the proposal's score.

The example that follows (Ref. Figure 3) is a modified analysis sheet taken from a VE study of a Controls System Architecture. The Controls System was part of a large capital communications system. The justification for some of the attribute weights were based on the following rational. Price received a low weight because Project Management ruled that the cost of the Controls System shall not exceed 15% of the total system cost which was assigned a very conservative target cost. This reduced the significance of the price attribute.

The 15% price limit also determined the number 1 increment on the price attribute. The team then decided that the most optimistic cost would be 5% of the system cost, which located the number 10 increment. The range from 5 to 15 % was divided equally between the 10 increment spread giving a weighted value to each increment of the attribute.

Packaging also received a low weight because the controls were integrated into the total system. The evaluation was subjectively determined by the functional response and visual effects of the controls. Also, Ease of Use was rated relatively low because industrial ergonomic standards determine the type and placement of controls.

Conversely, Assurance, Performance, Availability, and Standards were rated relatively high because they represent the primary customer concerns in this market area. Quantitative units of measure were also assigned to evaluate the proposals against these attributes.

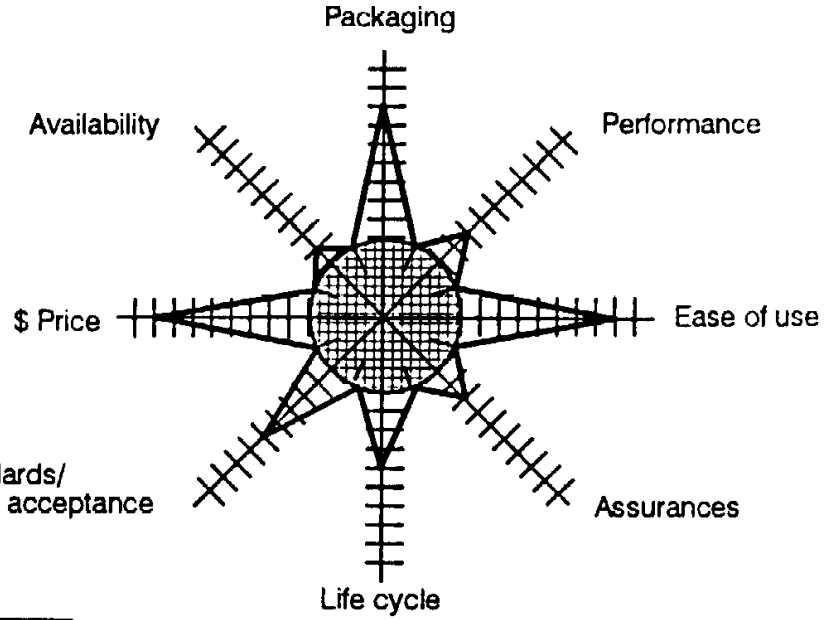
SETTING TARGETS

Note that this Controls Architecture proposal earned a total of 716 points out of a possible 1000, against an aggressive target of over 700 points.

Judging from the 5 diverse case studies where the authors used the Product Performance Profile, a target of 600 to 650 points seems to be the entry level of proposal acceptability. However, The target should be determined by the Steering Committee as part of the Paired Comparison process.

Establishing a target for total earned points allows the team to revise and upgrade their proposals by focusing on improving the high weight attributes.

PRODUCT PERFORMANCE PROFILE



Score 412
Target 700

PRODUCT _____

	ITEM	Price	Avail.	Package	Perform.	Ease/use	Assur.	Life cycl.	Standrds.	TOTAL
A	WEIGHT	3	19	4	22	7	25	9	11	100
B	AVAILABLE POINTS	30	190	40	220	70	250	90	110	1,000
C	YOUR SCORE	27	38	32	66	63	75	45	66	412
D	COMPETITOR'S SCORE									
	DELTA (B)VS(C)=	3	152	8	154	7	175	45	44	588

FIGURE 4

In the hypothetical example illustrated in Figure 4 above, using the same attribute weight value as in Figure 3, the graph indicates that the proposal did fairly well in the Price, Standards, Life Cycle, Ease of Use and Packaging attributes. However, the total earned points of 412 fell short of the 700 point target. The reason for the low score becomes apparent when looking at the attribute weights. The more important high weight attributes received poor scores.

Focusing on improving the high weight attributes such as; Performance, Assurance, and Availability could earn the needed points even if a trade-off against the other attributes are required. As an example, if performance was improved from 3 to 7 (or +4) and Assurances was improved from 2 to 5 (or +3), but it required a higher price, reducing the Price grid from 9 to 6 (or -3), the result would be a net +154 points (or, [4(22)] + [3(25)] - [3(3)] =154) raising the total earned points to (412 + 154) = 566. Additional trade-offs in this direction could conceivably result in achieving the target value.

A CASE STUDY

The case study that follows describes the application of the Product Performance Profile to a large communications system for a multi-national client. This project was selected because of the client company's creative application of the Value Engineering principles and the effective use of the Product Performance Profile.

During the pre-event phase a senior management core team was led through the development of the yet-to-be-designed FAST (Function Analysis System Technique) model of the communications system, referred to as "the product". The team then grouped and enclosed like functions which identified 6 task

teams needed for the VE Workshop to design and develop the product. Clustering the functions not only determined performance measurements by team, but tracing the critical path lines through the team boundaries graphically illustrated the impact of one team's decisions on the other teams. This encouraged the teams to network with each other to ensure that one team would not "win" at the detriment of the other team's goals.

The senior management team then selected 8 attributes titled; Cost, Features, Manufacturability, Ease of Use, Life Cycle Cost, Development Cost, Reliability, and Time to Market. The attributes were then ranked and weights assigned using Paired Comparison. A target of 600 points was established to reflect the total product's "passing grade".

During the 4 week period between the end of the Pre-event phase and the beginning of the VE Workshop a design team, made up of the representatives of the 6 VE Task Teams, configured a "Strawman" product to be used as the base VE project configuration. The Strawman was configured by selecting subsystems from a number of existing "like" products.

A favored (Fortune 500) customer was invited, and accepted the invitation, to address the VE Task Teams and discuss their product needs, requirements and constraints at the opening (Information Phase) of the workshop.

DAY 1

When the customer team arrived they were briefed on the attributes selected for proposal evaluation, without disclosing the attribute weights. The customer team was then briefed on the Paired Comparison process and asked to comment on, and evaluate the attributes from their priority prospective. The result was compared to the client's evaluation. The correlation of the top 3 attributes; Reliability, Features and Cost, accounting for more then 50% of the total weights, were within 10%.

The customer gave the attribute "Manufacturing" a zero because, as they explained; "We are interested in the performance of the system, not how it was produced".

The compared results and their close correlation of the significant attributes provided the customer and client company with the bases for a very constructive dialogue concerning the current and future use of the system, and the shared rational for the priority listing of the attributes. More important to the client company was the dialogue channels opened and the building of customer confidence that the Product Performance Profile initiated. The process also built marketing and engineering confidence that they were on the right track in defining and designing a product that would satisfy most of the market's buying patterns.

DAY 2

The following day the strawman design team presented their concept to the 6 VE teams. The customer team was not invited to participate further in the VE Workshop process. All 46 team participants evaluated the strawman proposal using the weighted attributes established by the core team. The results were fed into an computer algorithm, designed by the core team, which sorted the attributes, averaged the inputs, and configured the star on the graph. By lunchtime the results were presented and distributed showing the strawman's score of 496 against a target of 600. The teams took the remainder of the day off for recreation and to contemplate the Speculation Phase scheduled for early the following morning.

The third and forth day of the VE Workshop deviated from the "normal" job plan flow. Each of the two days began with brainstorming, then evaluation and proposal development.

DAY 3

On the third day the VE Teams were told to select their 2 best proposals for presentation to the team assembly, by late afternoon. Individual score sheets marked the ratings of the 46 VE participants to each of the 12 proposals presented. The score sheets were collected and processed at the end of each presentation. Following dinner the evaluation results were presented to the VE assembly showing a net score of 576. This indicated an 80 point improvement over the baseline Strawman configuration, but 24 points short of the 600 target. The presentation and graphical display also pointed to "Cost" and "Time to Market" as the two high point attributes that should be addressed to achieve the target.

DAY 4

The fourth day was a repeat of the third with team focus on the 2 target attributes and the functions driving those attributes. The evaluation at the end of the fourth day netted a final score of 665, or 65 points over the target.

Because of the Support Team's effectiveness, more then 80% of the Steering Committee presentation visuals were complete that evening. The following morning was devoted to developing a presentation strategy, completing the remaining visuals, and conducting a dry run presentation.

DAY 5

The formal closing described the results of the VE Workshop that included system configuration, benefit/risk analysis, investment requirements and implementation schedule, was presented following lunch on the fifth day. The Steering Committee approved the funding authorization and implementation plan, which also included as assessment of those team proposals that were not presented for evaluation.

Product design completion and release is scheduled for the fourth quarter of 1994. This case study will be tracked and reported to those interested as a follow-up to this paper.

CONCLUSIONS

Developing creative ideas and proposals is an important part of the VE equation. An equally important part of the equation is to ensure that the evaluation of VE Proposals are based on those parameters that define success. The evaluation parameters must reflect the attributes judged important by those who also judge value, and the ultimate value judge is the customer.

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