

VALUE ENGINEERING: IF IT IS SO GOOD, WHY DOES IT REQUIRE A LAW?

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ABSTRACT

A law has been passed and has become part of the Government's directive to all agencies that they shall perform Value Engineering on all their programs. This paper discusses the history of the law starting with the inclusion in government contracts under the Value Engineering Clauses, the Executive Orders, and finally the Public Law signed by the President as part of the FY96 Appropriations Bill. The paper describes Function Analysis, the fundamental basis for Value Analysis/Value Engineering, how it promotes problem solving by making clear the problem definition, and through generation of Creative Discontent for a Multidisciplined Team of problem solvers. Actual problems are presented for illustration. The obvious benefits of VA/VE are discussed and an attempt is made to answer the question, "Why does it require a Law?"

INTRODUCTION

Value Engineering and Value Analysis (VA/VE) has been around for almost 50 years. It began as an outgrowth of observations made as part of the War Production Board activities during World War II in the United States in which the materials which had to be substituted for other, specified materials that were in short

supply, worked as well if not better and just as often cost less. Study of the observation resulted in the recognition of the importance of Function in the decision making process; that the function of the part or material was what was ultimately required, and by considering Function, alternative parts or materials could be specified. In the ensuing 50 years, Value Engineering has had modest recognition and growth in the United States and around the world. Practitioners in the field have a belief, respect and confidence in the Value Engineering process. Function Analysis and the Value Methodology, we all know, offers the best problem solving methodology that we have experienced. Yet, it has not had overwhelming acceptance, and the practitioners and its organization cannot understand why? As a consequence, and also as a result of a good deal of effort, it has now become a Law of the United States Government to have the methodology included in all government activities, so that the benefits of use of the methodology will be realized. But, if it so good, Why did it need a law? The obvious benefits to be derived and the accumulated history of successes, should all have made the superiority of this program self evident. Since it has not, an objective examination of the situation might result in some insight that would be useful to define the problem and allow for creativity to be used to remedy the situation. The objective of this paper is to present some ideas which may be the beginning of a new dialog.

VE INCLUDED IN PUBLIC LAW #104450

After much diligent effort for many years by members of SAVE, notably by Hal Tufty and John Hoving, involving education and lobbying effort with Congress such as VE Days and Congressional Receptions, the requirement for use of Value Engineering/Value Analysis by government agencies has been put into law. On Saturday, 10 February, 1996, President Clinton signed Public Law #104450 (formerly S-1124), the National Defense Authorization Act for Fiscal Year 1996. Within that law, section 4306 requires that: "Each executive agency shall establish and maintain cost-effective value engineering procedures and processes." Through inclusion by President Clinton of the VE requirement in the 1996 Public Law, a major milestone has been achieved. Recognition by the executive branch of government has made agencies begin to look into "what's it all about". In addition, some congressmen have asked agencies that are within their committee's area of interest to report on the efforts with regard to Value Engineering.

However, the hoped for burst of activity in Value Engineering has been slow in coming. Outside of the Department of Defense and US Army Corps of Engineers, where there have always been significant VE activity, the other government agencies might be as busy figuring out how to avoid the use of VE as they are involved in applying VE to their overall activities, or so it may seem. Although we would have expected more, it should perhaps not have come as a surprise. Laws are made to be followed to be sure. But unless the people that are to follow the law clearly understand the benefits to them, the response could be less than dramatic.

For example, Value Engineering does not fall directly into "getting the job done"; it is not project task oriented. VE is a management tool, a methodology that requires planning and organizational and procedural changes - not too easy to accomplish. VE makes people change the way they do things, and therefore is challenging to the status quo. A brief examination of the history of use of VA/VE in government is of interest.

HISTORY OF GOVERNMENT USE OF VE

Value Analysis/Value Engineering began in industry, in 1947-48 at General Electric Company.¹ The finding of the importance of

Function was made while reviewing observations of members of the World War II War Production Board concerning experiences they had in the management and procurement of materials and parts for the war effort. Of the many things that they observed and reported, one was that when substitutions had to be made for parts and materials which were specified, but not available in the time needed, more often than not, as the story goes, the substitute parts and materials worked as well if not better, and cost less. The answer to the question "How come?", was not known. At the General Electric Company, it was decided to look into this issue so that perhaps this obvious benefit could be accomplished on purpose, instead of by accident. Mr. Lawrence D. Miles, an engineer at General Electric Company, was assigned to the purchasing department to study the reason for the observed phenomenon. He discovered that it was not the part or material that had been specified which was needed, but the FUNCTION of the specified part or material. Mr. Miles wrote his book, "Techniques of Value Analysis and Engineering" which was published by McGraw Hill describing the technique and its application. He began to train GE suppliers in the techniques of Value Analysis - then the training spread to the other GE employees. From there the tale is history.

The Government use of Value Analysis started with Buships in 1954. The story is told that it was then that the name Value Engineering was applied to the methodology. The Navy wanted to contract with General Electric for training of personnel in value Analysis but did not have the money for "analysts". The Navy did have funds for "engineers", so the name, Value Engineering, was adopted, and stuck - with some problems associated with this name which will be discussed later in this paper. The following list indicates the succession of use of VA/VE in the US Navy, US Army and US Air Force:

- o 1954 BuShips - Design Phase; "Value Engineering" (VE) introduced
- o 1956 Army - Watervliet Arsenal
- o 1961 Air Force - Value Engineering was introduced to the ASPR.

The executive department issued Office of Management and Budget (OMB) Circular, A-131 "Value Engineering" in 1993 (superseding a 1988 release) in which Value Engineering was

made a requirement for all government agencies. It had a loophole: the phrase "where applicable" was left in the final version of A-131, which allowed many government agencies to duck out of fully employing VA/VE.

And now: Public Law #104450; the 1996 National Defense Authorization Act is intended to spread VA/VE to other agencies of the government. The law calls for the agencies to: establish VE programs; encourage internal programs; and encourage contractors.

If one looks at the earliest use of VA/VE by the government (1954), it is seen that over 40 years has passed since it was first introduced. Although the savings attributed to VA/VE are significant, the magnitude of potential savings have never been reached.

For example, the area of the government that has the greatest activity in VA/VE is the Department of Defense (DoD). Approximately \$1 Billion is saved each year - out of a budget of hundreds of Billion of dollars. An Army Materiel Command (AMC) commander in the early 1980's set a goal of 3% or 4% of budget, to offset inflationary increases. This goal was not reached, and in fact 1% was hardly reached, during that period. However, identified/proposed savings of 10% are not unusual for any individual VA/VE project/workshop, and we are accustomed to seeing return on investment (ROI) figures of 10:1 or more. Were VA/VE applied widely, and implementation vigorously pursued, a magnitude of savings of 10% could be reasonably expected across the board.

Recently an analysis was made of the percentage of DoD government contractors that were ever involved in VA/VE effort on their contracts. The number was disappointingly small. (Out of about 2500 contractors at one Army facility with a very active program, fewer than 100 contractors were able to be counted - less than 5% in a period of about ten years)

The objective of the above is to point out that it appears that more and greater saving through greater application of the Value Methodology (VM), is obvious. Yet it did not happen, before the Law, and maybe will not happen even after the Law, and we need to find out, "Why?". (It should also be pointed out that the law will only apply to government contracting and would not be expected to affect other areas of application of the methodology.)

VA/VE METHODOLOGY

The VA/VE methodology is essentially the application of a structured problem solving procedure with Function Analysis used to help define the "problem". Structured problem solving can be defined as a process composed of various steps designed to lead a person, or a team, through a number of steps of information gathering; problem (or problems) definition; solution speculation; selection of the best solution (or solutions); and then implementation of the solution. In early work, during the 1950's, I was taught Problem Solving as part of a Conference Leadership training program sponsored by the company in which I was employed. The procedure/process of problem solving was defined as:

1. Identification of the Unsatisfactory Situation (Unsat Sit);
 2. Problem(s) identification;
 3. Brainstorming for Solutions;
 4. Selection of the best solution;
- and finally:
5. Recommendation of the solution for action.

It is obvious that the above listed problem solving procedure closely agrees with the (5 step) VA/VE Job Plan as defined by Larry Miles:²

1. Information Step;
2. Analysis Step;
3. Creativity Step;
4. Judgment Step;
5. Development Step.

The "Information" step and the "Unsatisfactory Situation" step are both data gathering steps where all the available information about the object of the study/workshop is gathered.

The "Analysis" step and the "Problem Identification" step again have the same function - to identify the problem - in the two lists. In VA/VE, this step is where Function Analysis and FAST diagramming are applied to the object of the study/workshop. Cost information is used to develop a cost/function relationship. This is to be used, for example, to compare the Cost of the function with the Worth; the cost of functions not on the Critical Path of functions; to reveal any mismatch and other important Cost Visibility results. The "problem" is then clearly revealed - or better, it reveals itself. The problem now

revealed so clearly allows the multidisciplinary team to focus its attention to the problem. Creativity needed in the next step is enhanced by such clear visibility of cost relationships - Creative Discontent spurs the Creativity of the team participants..

Both the "Creativity" and the "Brainstorming" steps are identical, as are the "Judgment" and the "Selection of the Best Solution" steps. Also the "Development" and the "Recommendation for Action" steps are identical.

It is clear that the single most important element added by Larry Miles to the problem solving process was the use of Function. Function Analysis, the ordering of functions into Basic, Supporting and Secondary, and the use of the Function Analysis System Technique Diagram (FAST) provides a powerful method for understanding the relationship of functions. The development of the cost/function relationships and the additional cost visibility this provides, promotes clear problem identification - since the cost of the Basic Function can be readily seen by this method, as well as the cost of the supporting functions, the comparison is apparent, as are any mismatches. The team can then focus on the supporting functions to find alternative (and perhaps less costly) ways to accomplish, or even eliminate, those functions. An important outcome of Larry Miles' work was the finding that Unnecessary Cost existed and could be found and eliminated in so many of the projects studied. As we consider that fact, it causes one to wonder, "how and why did Unnecessary Cost get included in the product?" One important tenet of the VA/VE methodology is to assume that everyone did the best that they could under the circumstances in which they worked at the time.

Function Analysis is found to be applicable to more than just the cost reduction of products such as manufactured or constructed items. Function Analysis is important to the understanding of processes and procedures and, as such, has been applied to health care, transportation, retail organizations and numerous other areas. In fact, as we progress in our application of the Value Methodology, it is becoming apparent that the Value Methodology has more areas of application than most of the practitioners thought and may almost be unlimited in its application.

Through my own experience with using the process over many years, and in varied applications, such as: manufactured items; bridge

and railway construction projects; building and facility construction, planning and maintenance organizations; computer software and other software projects; government contracting; and others, my conclusion is that the Value Methodology is a "people business". The procedure used in VA/VE projects can be described is a search to uncover why people made (or make) the decisions (such as this part over that part) they made at the time of the original decision. We are familiar with all the reasons why unnecessary costs are created - lack of an idea; temporary circumstances; insufficient information; not enough time; etc. They are generally all "people" reasons. In general again, most things are done and decisions made without using Function Analysis and cost (or time, or weight) considerations which could have allowed for alternate choices to be considered. We also are aware of the affects of Habits and Attitudes on decision making - also "people" reasons. So, my conclusion is that VA/VE is a "people" business. It is not Engineering, and by itself does not involve technology - there are no differential equations in VA/VE.

Where does this conclusion lead? It leads to the thought that, as in so many things that are "sold" one must understand the product and the customer. Yes, VA/VE must be sold - in order to obtain more SAVE members; in order to promote VA/VE in the education community; in order to better have VA/VE accepted universally.

We have struggled with the name and label "Value Engineering" for a long time, actually since its inception in the 50's and 60's. This has driven many groups away from the acceptance of the concept; groups such as the Procurement activity which feels uncomfortable in what they might perceive as a project better handled by engineering/technical people who can understand the design concepts. A step in the right direction has been to change the name/label to "Value Methodology", because that is what VA/VE is: a structured problem solving process/procedure that uses the Value Methodology to help define the problem or problems.

WHY DOES IT REQUIRE A LAW?

So we finally can come to the question, "why does it require a law?" The motivation of SAVE to push for a law stemmed from the observation that the Value Methodology was not being used to the extent that we would have

liked, and actually expected, based upon its superior problem solving capability. We observed that VE went through many cycles - it flourished in the government for a while, but then had to be reinvigorated over and over again. In government contracting, the VE clauses in the ASPRs and then the FAR regulations, provided incentives for contractors to share in cost savings, up to 50% at times. In individual companies, this did for a time provide the necessary incentive to start a program of VE. Also, in government contracting, there were mandatory VE incentive clauses that were used, but they too, did not have staying power. It is true that there were always individual cases of companies and organizations that saw and realized the benefits of performing VA/VE in their organization, but these are not widespread. In most cases, the longevity of VE was not realized - as the personality who had been assigned to lead the VE program left the organization, the program was seen to decline.

Let me make it clear, that the success in having VE become a law was a tremendous effort by a whole team of people. The effort took a long time to accomplish and is obviously a positive step. The recognition by the government of the benefits of VA/VE and to make it a law that is intended to apply it across the board, is commendable.

But, we can't stop there and feel that the job is done. It is felt that making a law requiring VA/VE to be done might solve all the problems. Once an organization had to perform VA/VE, then they would see the benefits and continue it on their own. This may or may not happen that way.

In discussions with a former DoD VE Director³, he offered the following.

“ Perhaps passing the law is mostly posturing for political gain. If the law turns out to be ineffective, it will take more laws to eliminate or adjust it. That will be a very complicated process and most of the players (elected officials, staff, etc.) will be long gone. If VE is so great. WE DON'T NEED A LAW (except for those who see it as a guaranteed source of income - which won't happen). The bureaucracy will find a way to either over implement (to annoy everyone) or ignore it. There are no penalties. If the law does not lead to successes in VE,

which will be blamed, VE or the law?.....The law can be used to embarrass agencies who do not implement VE as effectively as some political opportunists think it should. VE will incur enmity instead of support.”

The purpose of the above is not to argue that we do not need a law, but to indicate that there are question still to be answered , and that there is more to be done. In examining the acceptance of the law by those that are to implement it, the following issues need to be considered:

Fear of Change - Change creates concern in people. It threatens their security and makes for an uncomfortable environment. We deal with this in every VE workshop. It will be present in the implementation of a new law.

Profit Concerns - Our business environment is almost totally concerned with profit. Cost reduction, through VE or other methods, threatens the profit motivation. As long as profit is a function of costs, cost reduction tends to reduce profit. The major thing that drives cost down is competition, which almost is an accident in government procurement. This is the main reason that the VE Incentive clauses offer to share VE savings with contractors.

Credibility - VE does not, in and of itself, enjoy great credibility with the majority of our customers; the contractors and government personnel who are very skeptical about VE and its claims for huge savings and Return on Investment. This is not news to the VE community, and is not really affected by the law.

Capitalistic System - In looking for the reason why the VE program has not “caught fire” in the United States, as compared to Japan and other countries where VE is being used sometimes widely, we have not come up with any real answers. Some may say it is our culture as compared to theirs. This may explain it. However it is not a satisfactory explanation, because, how do we change our culture? And, do we want to? The Capitalistic system which is a part and parcel of our culture, as was said above, is profit oriented, and that is a big factor. The United States is also a culture of individuals - not necessarily team players, and VE needs to rely on teamwork for its success with the Job Plan. Our country had difficulty adopting to the teachings of W. Edwards Deming⁴ and the “Total Quality Management” (TQM) philosophy in the same way and for the same reasons as stated

