THE RISING TIDE OF CONSTRUCTION COSTS

A PREMIUM ON CONFORMITY
"WHAT'S IN IT FOR ME?"

Every now and then a member asks this question in an effort to satisfy himself that he is getting some value in return for the dues he is paying. It is as difficult to measure the return on investment in a professional society as it is to itemize the benefits you receive from your church donations or from financial participation in support of your political party, or contributions to your local community chest.

We do these things because we believe in them and hope that in some small way our participation will further the cause.

Too often, society officers try to justify dues by breaking the income dollar down to show a certain percentage allocated to publications, another percentage to operations and so forth. These attempts usually fail because the intangibles far outweigh the material benefits. The only valid reason for contributing time and money to a professional society is to develop a means for providing opportunities for the profession to advance in its ability to serve its members and society in general.

Basically, we hope to improve ourselves technically thereby increasing our value to the organization that pays us, and secondly, we hope to gain more recognition, prestige or status for our profession. Why is this important? Let's analyze it this way — an individual's sphere of influence includes his family, his neighbors, his business associates, his friends in civic, fraternal and other organizations. It can add up to over 100 people. He may be the only value engineer any of these people know. Their opinion of value engineering is based solely upon their impression of the individual and how he measures up as a professional man in their eyes. The individual member therefore presents the image or "face" of our profession to his sphere of influence. The chapter does the same thing, only the sphere of influence now extends to the community. If each member averages 100 and the chapter has 80 members, it means that the total effectiveness of the chapter can amount to at least 8000 people who can receive some direct influence. Through newspaper, TV and radio publicity releases about meetings and conferences, this influence can be multiplied considerably.

Your national organization has the responsibility of spreading this influence on a national basis. In fact, our international influence is being felt all over the world where we now have five active societies of value engineers affiliated with us.

You now ask... "This is great, but how does it affect me?" I don't know how to put it any more succinctly than to answer... "right in your wallet!"

Let me demonstrate this with personal experience drawn from my previous service as national president of the American Institute of Industrial Engineers. One of their chapters was holding a one-day conference to which they invited the top executives from the local industry. I happened to sit next to the president of one of the companies and he said that he had never known before exactly what an industrial engineer did. He was impressed by the presentation he had heard and told me that he thought he might hire an IE to see if it would help his company.

One year later, this same chapter was host to AIIE's national conference and I ran into this same company president at lunch. I asked him whether he had ever hired an industrial engineer. His enthusiastic response was that he now had an IE staff of ten engineers and that his business was more profitable and more competitive. This had resulted in additional sales and his employment had grown from about 700 to over 1200.

Here is one company that now furnishes employment for ten engineers where a year earlier there were none. This story was evidently repeated at many other companies in the area because this chapter now has grown to over 160 members from about 40 at the time of the original one-day conference.

We all know that in a free enterprise society, the law of supply and demand has considerable effect on the cost of the commodity or service. The increased demand for industrial engineers has greatly increased the pay scales and broadened the opportunities available to these engineers.

It is my firm conviction that similar action by our national SAVE organization in putting on local, regional and national conferences, by making advances in the state of the art available through technical publications, and by providing knowledgeable speakers at meetings of other organizations, the image of value engineering can be enhanced and spread to many areas, thus creating a demand for VE services that does not currently exist in those areas. This too will result in increased opportunities and the resulting demand will have its effect on the pay scales of all value engineers.

This is "what's in it for you"... a goal well worth the less than 7c a day required to support your profession. I ask you, is it worth the cost of 3 or 4 cigarettes a day to build up your profession and increase your earnings potential? You alone can decide.

FRANK J. JOHNSON
Immediate Past President
Society of American Value Engineers
GUEST EDITORIAL: "WHAT'S IN IT FOR ME?"
by Frank J. Johnson

VALUE ENGINEERING AND CONSTRUCTION
by E. Bruce Connors and E. J. R. McClure

VALUE ANALYSIS AND ENGINEERING—PUBLIC WORKS
by Vincent L. Lao, P.E.

VARIABLE INCENTIVES FOR VALUE ENGINEERING
by Nathan Kantor

A CONVERSATION WITH ROY FOUNTAIN
by E. Will Dearborn

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EDITOR'S CHAIR:
The Future of Value Engineering

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OF THE SOCIETY OF VALUE ENGINEERS

MAY, 1969 • 3
In the previous issue of the Journal, we introduced the subject of value improvements in the construction industry by a description of what some members of the industry are doing to lower costs. In the article "The Rising Tide of Construction Costs—A Premium on Conformity", we will explore what happens when Architectural Engineers try to apply Value Engineering. To the veteran value engineer, these problems may not appear to be dissimilar to those he has already faced. However, these are the problems we face if VE is to be applied in the most critical economic problems facing this nation today.

E. BRUCE CONNORS and CHARLES J. R. McCLURE combine their talents to describe the problems they have encountered. Mr. Connors is President of the Connors Company, Mechanical Contractors, St. Louis and is Vice-President of McClure-Connors Corporation, Value Engineering for Construction. He is a registered Professional Engineer and a graduate of Washington University, St. Louis.

Mr. McClure graduated from the University of Maryland with a Bachelor of Arts Degree. He served in the U.S. Army for five years completing the tour of duty as a Captain in the Corps of Engineers. His practice has included extensive building programs in the institutional, industrial, and commercial fields. He is a member of Consulting Engineers Council, N.S.P.E., ASHRAE and is registered to practice professional engineering in eight states.

To anyone long associated with Value Engineering, ROY FOUNTAIN, President and co-founder of Value Programs for Industry (now a division of the Keene Corporation) hardly needs an introduction. He is a fellow of SAVE and has made many contributions to the value engineering profession. For this reason, Will Dearborn, special feature writer for the Journal,
was pleased that Roy agreed to participate in an interview. They talked of the history of value engineering, the role of the specialist, profit motivation, and cost targets.

Before forming his own company, Roy Fountain received on the job training in VE from Larry Miles, now retired from General Electric. Roy worked as a value specialist at GE and was later selected by Larry to head up the entire Value Engineering training program. He also spent three years researching the subject of value and developed a scientific approach to determining the use of value of many functions.

Roy has instructed and trained thousands of technical and professional personnel for the commercial and defense industries and for the government. He has also applied the techniques to the design of new products, to paperwork, and to the process and service industries.

Prior to his Value Engineering Experience, he was a Design Engineer at General Electric and is a registered Professional Engineer.

NATHAN KANTOR received his B.S. from the United States Military Academy at West Point in 1965 and M.S. in Management from Florida State University, School of Business Administration in 1968. Upon graduation from West Point he was commissioned a regular officer in the Air Force and served as a Contract Administrator and Value Engineering Contract Monitor, Headquarters Air Force Eastern Test Range, Range Contract Management Office, Patrick AFB, Florida. He participated in the negotiations and administration of a multiple incentive contract for the operation and maintenance of Cape Kennedy and other tracking sites supporting the United States missile and space programs. Prior experience also included the negotiation and administration of construction and R&D contracts required to support the missile and space vehicle test programs.

He is the author of the "Variable Incentive for Value Engineering" (VIVE) method for sharing value engineering savings on incentive contracts, which is under review for implementation throughout the Department of Defense. In addition to being a member of SAVE, he is a member of the National Contract Management Association. He is also the author of a new SAVE technical manual entitled "The Contractual aspects of Value Engineering" which will be available from the Society approximately July 1969.

Public Works is a ripe field for value engineering ideas. However, the problems encountered in introducing VE to the management and working level is very difficult and cannot be explained in a few simple words. VINCENT LAO stresses the need for more public education and clarification of goals and objectives to prove that value engineering in Public Works projects can be done for the benefit of all, to the taxpayers as well as the interested groups involved in the project. We can all have a share from the value accomplishment. Before there can be substantial implementation of VE ideas and know-how, top management should accelerate the emphasis and follow-up.

Mr. LAO received a B.E. in Mechanical Engineering, University of Wisconsin, 1953. He is a registered P.E. in Civil Engineering. Practical experience includes rural and urban Highway Design. He has a broad background in planning, design, construction plan details and costing. His experience includes eight years with private consultants and six years with District of Columbia Department of Highways and Traffic. He has written articles and papers for ASCE magazine and Highway Journal, related to efficiency and cost. In his article "Value Analysis and Engineering — Public Works", Vincent brings us new dimensions on VE applications.
A GREAT CHALLENGE facing the construction industry today, particularly in the industrial, institutional and commercial fields, is understanding what value engineering can do and learning how to incorporate value engineering provisions into owner-designer-contractor contract documents. Most present design contracts are based on a percentage of the construction costs and do not reward designers for holding costs to the bare minimum. Most construction contracts are firm price bids based on detailed plans and specifications or cost plus a fixed or percentage fee. Other than Department of Defense contracts, virtually none of these documents contain provisions for value engineering.

While it is undoubtedly true that most architects, engineers and contractors do strive to give the owner the maximum value, most of them are not familiar with modern VE techniques, no specific value analysis program is followed and the system actually works to discourage creative thinking and value engineering while placing a premium on conformity and tried and proven methods. The A-E had a defensive role concerning evaluation of his published plans and specifications, even though it is obvious that less than perfection is obtainable within the allocated time and money available for the design function.

Recently a prominent Mechanical Consulting Engineer attended a value engineering seminar and was so impressed with the possibilities of VE techniques that he decided to submit one of his own plans to an intensive value analysis. The plan selected was a completed mechanical design for a new hospital building which because of a change in bidding dates did not have to be turned over to the client for 30 days.

He began by challenging all previous decisions, asking his staff to be creative and try to think up new ways and different methods of handling the client's requirements. Each function of this system was reviewed and analyzed. After a careful evaluation of the alternate methods that had been investigated it became apparent that major portions of the plans and specifications should be redrawn. Several errors were found and corrected, a few items omitted, and several new features that were deemed desirable were added.

A final review of the project indicated to the consulting engineer that the value analysis had improved the usefulness of the system to the owner while at the same time reducing the cost by an estimated $100,000.00. Certainly a successful VE program.

However it had also reduced the consultant's fee by $4,000.00 (4% of $100,000) while increasing his costs by an estimated $3,000 in additional engineering and drafting time. Obviously this particular engineering firm while convinced of the effectiveness of value analysis in construction is also convinced that they cannot profitably engage in future VE programs and still use standard competitive fee schedules.

It is difficult for an architect or engineer to satisfactorily explain to a client why he should pay a higher fee and include a VE program in his project or why value analysis is desirable or even important. The client probably feels that he is already paying a rather stiff fee for professional services and has a right to expect the very best that his consultants can provide which should be perfection. He is right to a certain extent but he has really only agreed to pay for reasonable professional skill and diligence in architectural and engineering services.

A successful VE program on a construction project should return $4.00 in reduced construction cost to the Owner for each $1.00 spent in value engineering and this alone would justify the cost of the value analysis. A thorough VE program would in addition be expected to reduce to a bare minimum the number of costly and bothersome change orders so prevalent in the usual job while at the same time increasing the usefulness and utility of the project.

The biggest roadblock to VE in construction is sheer inertia. "We've always done it this way and we know..."
it works.” “We value engineer all the time anyway, it’s just common sense.” “There isn’t enough time,” “Why rock the boat,” “The costs are about the same either way.” Old habits are hard to change and most of us who have been in the construction business a long time will continue to do things the way we always have until a true VE program forces us to take a critical look at what we’re doing. Creative thinking, team effort, systematic analysis techniques and adequate funding of design are not compatible to the usual design construction effort.

A second serious roadblock to VE in construction is the time factor. Although the owner may have been contemplating a project for a long time, once the decision has been made to proceed, an early start becomes extremely urgent and a deadline is soon set for completion of plans and the starting of construction work. All too frequently the designing team is still trying to fully identify the Owner’s needs and desires and the relative importance of various facilities and functions when the deadline for completion of plans is fast approaching.

Under these circumstances creative planning and careful analysis of alternate methods becomes impractical. It is much easier to stick to the tried and true standard methods, to design by the seat of the pants, and follow up the first reason-

able solution to a problem provided it will fit the budget. Even normal plan review may become cursory. Top management insists that construction work start quickly and alternative design solutions that are not easily found or that might require major revisions to completed work are rationalized and avoided.

The Army has a saying “Hurry up and wait.” The construction industry might better have a saying “Stop, review, analyze.” Changes that are made while the design is still on paper are better and much less expensive and the time required for a worthwhile VE program isn’t necessarily long. It just might even reduce overall construction time.

Since we have gone this far without value engineering why bother to include a VE clause in the actual construction contract? The plans and specifications are all-inclusive and set out in detail what materials are to be used and how they are to be installed. Why encourage suppliers and subcontractors to suggest different methods and materials even though they might otherwise be desirable. Any suggestions for change would certainly require that the designer analyze the change and probably revise the plans if the change is approved.

The huge size of the construction industry, its pattern of craft unions each performing individual tasks, the multiple designing specialists in architecture, structural, mechanical and electrical engineering, specifications writers, equipment and systems specialists, each working on his own phase of the project and hoping he is being kept informed of work being done by other members of the team combine to make value engineering extremely difficult, but also more necessary and rewarding. And the more complex the project, the greater the need for value analysis.

The owner has the most to gain from proper use of VE in construction work. He can start by taking a little extra time and effort to carefully evaluate and document his own requirements and budget and make sure that this information gets through to all members of the designing team. An excellent time for a second value analysis would be after preliminary plans are completed and before finished plans and detailed work are started. But the most important savings can probably be made after all the work of the individual design specialists has been completed and assembled and before construction contracts are signed and work started.

A massive, well planned and coordinated, blitzkrieg approach, directed by a skilled value engineering team working closely with all the original designers, the owner and his assistants, generating creative discussions, re-evaluating previous decisions, reviewing all possible alter-

Chrysler Truck Assembly Plant—Fenton, Mo. Mechanical Contractor: Connors Co. & Kremer-Hicks (Joint Venture)
nates, exchanging ideas between all personnel would be certain to not only substantially reduce costs and the need for future changes, but also to improve the finished product and its usefulness. And if properly scheduled and directed all this could be done in a relatively short period of time.

The expense of VE analysis will be readily funded from construction economies. However, only mature understanding of the details of architectural engineering management and administration can avoid the misunderstandings and conflicts incident to review and evaluation of design and installation drawings.


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VALUE ANALYSIS
AND ENGINEERING
—PUBLIC WORKS—

BY VINCENT L. LAO, P.E.
Highway, Bridge and Tunnel
Planning, Design and
Conceptual Cost Engineer

Introduction

In May and August of 1967, the subject of Value Engineering was brought up in the U.S. Congress. Testimonies were conducted to find out what management (government agencies and bureaus) has been doing about it. Because of the fact that the art and science of VE as a formally organized approach (methodology and know-how) is new, it is being confused with the universality of the idea of cost savings or cost reduction. It is difficult to understand VE because the term is used too loosely. Intangibles are lumped in instead of separated. To make VE more effective, it must be categorized. What most people talk about is value analysis, not value engineering. Value analysis can be classified into three major areas:

1. Value Judgement
2. Management Efficiency
3. Value Engineering

A solution for the maximization of value accomplishment, coordination and feedback between each is essential. This is difficult, but it is doubtful that considerable ground can be gained for value accomplishment in Public Works if in VE we mix the three in one idea. Our emphasis should be shifted from value (intangible), to engineering. We should be concerned about how instead of why.

What Do We Gain?

In the past decade we have witnessed the formal organization and application of VE in industries and government (DOD). Many articles and comments have been written about it. Though the proponents of VE are sold on the idea, there seems to be a hard shell to crack when they try to sell it to the public, especially to people in charge of conducting the multibillion dollar business of the U.S. Government. What seems to be the major reason? There is one key question that must be answered. “What do we get out of it; the engineers, contractors, manufacturers, suppliers, workers, and every one involved in the project?” Finally we must think of the consumer, the taxpayer and the country. We all have ideals to serve our country; “ask not what the country can do for you, but ask what you can do for the country,” but until we can satisfy our self-interests, others must wait. Self-interest produces a gamut of serious problems of which the best current example is the War in Vietnam.

When we think of the war on wastes in engineered construction, we must remember that someone is benefiting from it. The engineers, the contractors, the laborers and the suppliers all get their share. It is desirable to start value analysis and engineering as early as possible so that no major interested party gets involved except the taxpayer who is paying the bill. This requires in-house staff and specialists (see Table 1 line 2). Since value analysis and engineering is a continuing process the consulting engineer and the contractor must have a share in the value accomplishment if VE is approved and applied during the design and construction stage (see Table 1 line 4, 6, 8 and 9). This will produce more cooperation from all interested parties and will help expedite value work. Because of the time schedule involved, from preliminary design to construction, it is mandatory that specialist expedite VE (see Table 1 line 2, 4, 6 and 8). The consulting engineer is

![Chart No. 1A]

BREAKDOWN OF THREE MAJOR AREAS
VALUE JUDGEMENT, MANAGEMENT AND VALUE ENGINEERING

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normally pressed with time to meet the deadline. He seldom has time or care to go out of his way to change existing standard design practices that originated from his clients. He has nothing to gain but much to lose (see realistic value accomplishment goals Table 1 line 2, 4, 6 and 8). During the construction stage, a specialist should be brought in to attain maximum value goals. This can be elaborated by case studies. The in-house staff has an important role to play in value accomplishment. The fact that he is more familiar with the origin of the policies and ideas in formulating the plan would make him instrumental in expediting certain aspects of VE. A top notch in-house VE can make a difference of as much as 10% to 20% (see Graph 1C) value accomplishment during the preliminary design concepts. The compensation for in-house staff should be commensurate with his accomplishment. We do not have this now because there is no clear-cut documentation and verification of value accomplishment. Thus the feedback is negative in terms of effort and accomplishment.

How? Before What We Get

What do we want as value engineers? A piece of the action and a small portion of the wastes which would have been lost to posterity if it weren’t for VE. Are we in it because of idealism? I believe we can have our share of the benefit if we can prove our worth. We must come up with more specific know-how and applications. There seems to be a running and skipping in our VE ideas while specific know-how and application is barely crawling behind. We need more case studies of VE applications, not only in individual ideas but also on a systems approach. We always hear the argument that value engineering has been around since man learned to trade or buy and sell. VE is claimed to be a methodology, an organized creative approach to seek function at the least cost. Everybody wants this, but the question is how, not why. We need chiefs who understand VE and more staff to do the work. How many of us VEs have done a complete VE analysis from concept and design details of plans to construction, with meaningful cost estimates and authentic verification of the results? I believe we are still oriented to piece meal VE ideas which have been very successful with consumer products and defense hardwares. We should move towards a more complex systems analysis of VE in Public Works project where many of the unnecessary costs were the result of arbitrary controls. VE-ing consumer products or defense softwares and hardwares is easier than VE-ing Public Works project because of

Chart No. 1B
VALUE ANALYSIS PROGRAM

<table>
<thead>
<tr>
<th>PLANNING PROGRAMMING BUDGETING SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEEDBACK</td>
</tr>
<tr>
<td>VALUE ANALYSIS</td>
</tr>
<tr>
<td>FEEDBACK</td>
</tr>
<tr>
<td>FORMULATION</td>
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<tr>
<td>VALUE JUDGEMENT</td>
</tr>
<tr>
<td>VALUE ENGINEERING</td>
</tr>
<tr>
<td>APPLICATIONS</td>
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<tr>
<td>POLITICAL</td>
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<tr>
<td>SOCIAL</td>
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<tr>
<td>OTHER INTANGIBLES</td>
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<tr>
<td>ENGINEERING DESIGN CONCEPT</td>
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<td>ENGINEERING DETAILS</td>
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<td>ENGINEERING CONSTRUCTION</td>
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<td>QUANTIFICATION</td>
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<td>SYSTEMS ANALYSIS</td>
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<tr>
<td>COST BENEFIT ANALYSIS</td>
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<tr>
<td>DECISION</td>
</tr>
<tr>
<td>VERIFICATION AND DOCUMENTATION</td>
</tr>
<tr>
<td>FEEDBACK TO PPBS</td>
</tr>
</tbody>
</table>

NOTE: 1. This is applicable to federal, state, local government and private business.
2. Assume management and other efficiency programs equal.
3. For comprehensive value analysis, quantification of intangibles is essential. This is during formulation stage, engineering feasibility, location and preliminary cost estimates.
4. Pure value engineering analysis starts after project approval for construction design.

Chart No. 2
PROBABLE & PRACTICAL ACCOMPLISHMENT GOALS
PEAK YEAR 1973

ASSUME ANNUAL REVENUE AND EXPENDITURES

$200 BILLION
1. 100 BILLION — VALUE ENGINEERING
2. 50 BILLION — MANAGEMENT AND BASIC PERSONNEL COST
3. 50 BILLION — VALUE JUDGEMENT

NATIONAL GOALS
ON VALUE ANALYSIS & ENGINEERING

VALUE JUDGEMENT 30% - $15 BILLION
MANAGEMENT 20% - $10 BILLION
VALUE ENGINEERING 25% - $25 BILLION

TOTAL PROBABLE ACCOMPLISHMENT 25% = $50 BILLION/YEAR

PRACTICAL ATTAINABLE GOAL 50% OF PROBABLE = $25 BILLION

(See Table No. 1 and Graph No. 1A, 1B, & 1C)
### Table No. 1

<table>
<thead>
<tr>
<th>STAGES WHEN VA AND VE IS APPLIED</th>
<th>FEASIBLE VE GOALS</th>
<th>COST OF VALUE WORK</th>
<th>ACCOMPLISHMENTS</th>
<th>INFLATION INDEX</th>
<th>BENEFITS</th>
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<td>$19.5 B</td>
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<td>$20.0 B</td>
<td>$15.5 B</td>
<td>$19.5 B</td>
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<td>$1.1 B</td>
<td>$5.1 B</td>
<td>$0.09 B</td>
<td>$90 B</td>
</tr>
</tbody>
</table>

**NOTE:**
1. It is improbable for In-House staff to attain maximum VE Goals.
2. Value Accomplishments shall not be considered as cost reduction or savings. It is pumped back to the economy in terms of productive returns and reduce inflationary pressures.
3. The benefit to the taxpayer will be in terms of maintaining the purchasing power of the dollar and increased total public welfare.
4. The most realistic time to bring in VE specialist is after preliminary design approval. VE Specialist can take part or be the consultant on pre-preliminary design, during planning, engineering feasibility, and estimates.
5. B=billion dollars.

**What Is VE? Before How**

To convince somebody about VE, we should value-analyze our current ideas. It has been quoted many times that value engineering and value analysis are synonymous; so are other terms like cost savings, cost reduction, cost effectiveness, engineering economy, etc. The basic goal may be the same, but their specific role and objectives could be different. Value engineering is value analysis, but value analysis is not necessarily value engineering. I believe this is one of the serious misunderstandings that makes VE less effective than it should have been. A review of Mr. L. D. Miles’ book “Value Analysis and Engineering” may give us some clue. Why didn’t he say “Value Analysis or Engineering”? A pictorial illustration of the functions, relations and responsibility of value analysis and engineering program may help (see Chart No. 1A, 1B, 2, 3, 4, Table No. 1, Graph No. 1A, 1B and 2). A quick glance at the charts shows that you can not value engineer politics, social problems, esthetics or any-
thing that is not in existence as an engineering plan or a product, but you can value analyze them. There should be a distinction between value engineering, value judgement and management (all three can be under value analysis), with the understanding that quantification of the intangibles may help the practice of value engineering. We must distinguish between a value analyst and a value engineer. This is the same as value analysis and engineering. A value engineer is a value analyst while a value analyst need not be an engineer. That is not to suggest that we should expel current members of the society who are not engineers but rather include them and raise the professional stature of our society. We can include economists, planners, architects, psychologists, sociologists, etc. We only have to add “Analyst” in the title, “Society of American Value Engineers and Analysts,” or vice versa. Every one can be a value analyst (to be accepted to SAVE he must be a professional), but he should not be called a value engineer if he doesn’t have a specific engineering degree that enables him to acquire the broad experience required in value engineering know-how. My major concern is to avoid diminishing the function of a value engineer, this may deprive him of doing actual value work because there is no emphasis and support from the top, who thinks they know all about VE “ideas.” Ideas are the essence of progress, but the implementation and tool of progress is know-how to do the work. He who can, does; he who can’t, teaches; and he who can’t teach, criticizes. We all have a little bit of each. The important thing is to be able to exploit our capabilities and make the most contribution to society.

Support from Top Before Success

To take full advantage of existing technology and know-how there must be emphasis from the “top,” this can be from Congress, the White House, department heads, or from the people who are the final client and beneficiary of value analysis and engineering. But before there can be a realistic and concrete emphasis, there must be a clear concept of the objectives between the ideal and the practical. Guidelines and limits must be established within practical feasibility of engineering know-how or political, social, and economic realities. Our public officials need some indoctrination on the philosophy of value analysis and engineering, from concept to applications. We all need to be assured (Continued on page 24)

Chart No. 3
ORGANIZATIONAL CHART FOR THE DEGREE OF EMPHASIS AND RESPONSIBILITIES

Chart No. 4
FEDERAL GOVERNMENT — VALUE ANALYSIS

NOTE: This will also apply to local and state government.
1. Assume $200 billion total expenditures. 2. Maximum goal 12.5%.

3. Unrecoverable waste of manpower & material resources will be $25 billion a year. All figures approximate.

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VALUE ACCOMPLISHMENT VS TIME

HYPOTHETICAL VALUE ANALYSIS PROGRAM IMPLEMENTATION & ACCOMPLISHMENT VS TIME


AVERAGE YEARLY BUDGET OF $200 BILLION

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GRAPH 1A

VE & VA ACCOMPLISHMENTS IN % OF TOTAL EXPENDITURES

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GRAPH 1B

HYPOTHETICAL VALUE ACCOMPLISHMENT VS TIME RELATED TO PROJECT SCHEDULING

CONSTRUCTION

---

GRAPH 1C

PUBLIC WORKS

HYPOTHETICAL VALUE ACCOMPLISHMENT GOALS VS TIME RELATED TO PROJECT SCHEDULING

LEAD TIME

PRELIM. DESIGN

FINAL DESIGN

CONSTRUCTION
CURRENT INCENTIVE CONTRACTS do not provide a vehicle or incentive for one of the greatest potentials for cost reduction; namely contractor suggested deductive changes. Cost-incentive formulas provide contractors a share in any savings that can be achieved within the contractor's unilateral prerogative and implemented without a contract change. Therefore, in order to stimulate the origination of contractor suggested deductive changes, value engineering clauses extend the basic sharing principles as incentive contracts. The only major differences between incentive contracting and value engineering are as follows:

a. Savings resulting under incentive contracts do not require a contract change, whereas, savings resulting from value engineering do require a contract change.

b. Under incentive contracts, savings shared between the Government and contractor are based on actuals, whereas, value engineering savings are shared on the basis of estimates.

In order to develop value engineering sharing provisions for incentive contracts, an examination of the desired criteria to be included in these provisions must be accomplished. The following criteria are considered to be the most desirable features of value engineering sharing provisions incorporated in incentive contracts:

a. Sharing should be based on actual savings rather than on estimated savings.

b. Encourage contractors to submit accurate estimates of savings, developmental costs, and implementation costs.

c. Encourage contractors to submit deductive contract changes (VECP's) by providing a substantial financial reward.

d. Provide the same degree of contractor risk as under the basic contract, and in no event, should the contractor's risk be increased due to value engineering efforts.

e. Enhance the cost-incentive features of the contract.

f. Encourage contractors to submit VECP's toward the end of contract performance, providing the VECP still results in a net savings to the Government.

It is to these ends that the Variable Incentive for Value Engineering (VIVE) method for sharing instant contract savings addresses itself. A detailed description of the VIVE method is necessary to display how the above criteria is accomplished.

Negotiated VIVE Ratio

The VIVE ratio is the most important aspect to be considered during the negotiation of the basic contract. It is through the VIVE ratio that the Government and the contractor can negotiate the desired emphasis to be placed on value engineering. The VIVE ratio reflects the increase in the contractor's cost-incentive share as originally negotiated, to the percentage savings to the Government due to the contractor's value engineering efforts. Thus, if the negotiated VIVE ratio is 1:1, and the contractor saves the Government 1% ("Percentage Savings to Government")*, the contractor's cost-incentive share as originally negotiated would be increased by 1%. In another example, if the negotiated VIVE ratio is 2:1, and the "Percentage Savings to Government" is 1%, the contractor's cost-incentive share as originally negotiated would be increased by 2%. There would be no limit to the VIVE ratio, and it could be negotiated as high as necessary to achieve the desired value engineering effort.

Instant Contract Savings

Instant contract savings shall be shared under CPIF contracts to in-
include an equitable adjustment in target cost, target fee, maximum fee, and the negotiated cost-incentive share arrangement.

Instant contract savings under FPIF contracts, however, shall be shared to include an equitable adjustment in target cost, target profit, and the negotiated cost-incentive share arrangement.

**Target Costs**

The equitable adjustment in target cost would be exactly the same for both CPIF and FPIF type contracts. For a contractor to share in instant contract savings, the VECP must decrease the target cost of the contract. If the VECP causes an increase in target cost, the contractor would not be entitled to share in instant contract savings. Thus, for instant contract savings, the decrease in target cost shall be established by determining the effect of the proposal on the contractor's cost of performance, taking into account the contractor's cost of developing the proposal, insofar as such is properly a direct charge not otherwise reimbursed under the contract and the contractor's cost of implementing the change (including any amount clause). Developmental costs attributable to subcontractors in accordance with paragraph (e) of the ASPR value engineering shall not be deductible where they are otherwise reimbursable under the contract (i.e., directly pursuant to a Program Requirement clause or indirectly through overhead accounts).

Reduction in target cost = Estimated decrease in the contractor's cost of performance - (Developmental costs + Implementation costs)

Note: If the above calculations result in a negative number then there would be no instant contract savings to share with the contractor.

**Target Fee or Target Profit**

The equitable adjustment in target fee for CPIF contracts and target profit for FPIF contracts, shall be established by underrunning the target cost by the amount the target cost is reduced as specified in "a" above. Thus the intersection of the negotiated cost-incentive share line and the reduced target cost would establish the new target fee or target profit.

**Example. Adjusted Target Fee or Profit (VIVE Method) (See Figure 7)**

Assume a contractor negotiates the following CPIF arrangement:

- **Target Cost:** $100
- **Target Fee:** $8
- **Maximum Fee:** $14
- **Minimum Fee:** $2
- **Sharing Formula:** 80/20

An approved VECP results in an estimated decrease in the contractor's cost of performance of $10, developmental costs of $2, and implementation costs of $3. The following equitable adjustments in target cost and target fee would be made:

Reduction in target cost = Total estimated decrease in the contractor's cost of performance - (Developmental costs + Implementation costs) = 10 - (2 + 3) = $5

New Target Cost = 100 - 5 = $95

New Target Fee = 8 + 20% (5) = $9

Note: The same adjustments as described above would be made under an FPIF contract for the target cost and target profit.

**Maximum Fee (CPIF Contracts Only)**

The increase in maximum fee shall be established by multiplying the contractor's share of the negotiated cost-incentive share arrangement by the instant contract savings over the full period of contract performance, assuming the proposal was implemented in the original contract specifications. Utilizing the previous example, the maximum fee would be calculated assuming that the decrease in the contract-
tor's cost of performance of $10 would be for the full period of contract performance:

New Maximum Fee = 14 + 20%($5) = $15

Cost-Incentive Share Arrangement

The equitable adjustment in the negotiated cost-incentive share arrangement would be accomplished the same way for both CPIF and PFIF contracts, and would be established by:

1. Determining the instant contract savings over the full period of contract performance (assuming the VECP was incorporated in the original contract specifications);
2. Determining the "Percentage Savings in Government Contract Savings (over the full period of contract performance)":

\[ \text{Percentage Savings} = \left( \frac{\text{Instant Contract Savings (over the full period of contract performance)}}{\text{Negotiated Target Cost}} \right) \times 100 \]

(3) Multiplying the "Percentage Savings to Government" by VIVE ratio; and

4. Increasing the originally negotiated contractor's cost-incentive share by the result of (3) above, only on the overrun side of the new target cost. The overrun side of the new target cost shall have the same share arrangement as originally negotiated.

The above computations shall be based on the target cost and cost-incentive share arrangement as originally negotiated. Changes in the target cost throughout the period of contract performance would not be considered in determining the increase in the contractor's cost-incentive share.

Example. Adjusted Cost-Incentive Share Arrangement (VIVE Method)

Assume the following to have been negotiated (either CPIF or PFIF contract):

- Negotiated Target Cost: $100
- Negotiated Cost-Incentive Share Arrangement: 80/20
- Negotiated VIVE Ratio: 3:1

Contractor's approved VECP would produce an instant contract savings of $10 over the full period of contract performance (assuming the VECP was incorporated in the original contract specifications).

(1) "Percentage Savings to Government" = \[ \frac{10}{100} \times 100 = 10\% \]

(2) "Percentage Savings to Government" = \[ 10\% \times \frac{3}{1} = 30\% \times \text{VIVE Ratio} \]

(3) Increase the originally negotiated contractor's cost-incentive share to:

\[ .20 + .30 \times .20 = .26 \]

(4) Therefore, the new cost-incentive share arrangement would be 74/26.

Illustrative Examples

The following examples are cited to further describe the intent of the VIVE method.

Example. VIVE Method (FPIF Contract) (See Figure 1)

Assume a contractor negotiates the following FPIF contract arrangement:

| Target Cost | $100 |
| Target Profit | $10 |
| Ceiling Price | $119 |
| Sharing Formula | 60/40 |
| VIVE Ratio | 2.1 |
| Period of Performance | 1 Year |

Table 4

<table>
<thead>
<tr>
<th>If Contractor</th>
<th>Total fee ($)</th>
<th>Total fee ($)</th>
<th>Total fee ($)</th>
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<tr>
<td>underruns/overruns ($)</td>
<td>VIVE (20%)</td>
<td>ASPR (50%)</td>
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<td>meets target cost</td>
<td>8.40</td>
<td>8.40</td>
<td>9.00</td>
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<tr>
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<td>8.88</td>
<td>9.40</td>
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<td>underruns by 3</td>
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<td>9.60</td>
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<td>9.80</td>
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<td>underruns by 6</td>
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</tr>
<tr>
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<td>8.20</td>
<td>8.80</td>
</tr>
<tr>
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<td>8.00</td>
<td>8.00</td>
<td>8.60</td>
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An approved VECP results in the following:

1. The VECP would be implemented after half of the contract period of performance would be expended, thereby reducing the contractor's cost of performance (for a six month period only) by $5.

2. The decrease in the contractor's cost of performance would have been $10 if the VECP was incorporated in the original contract specifications.

3. Developmental costs equal $1.

4. Implementation costs equal $2.

Based upon the above approved VECP, the following equitable adjustments would be made in accordance with the VIVE method:

(a) Reduction in contractor's cost of performance - (Developmental + Implementation costs) = 5 - (1 + 2) = $2

(b) New Target Cost = 100 - 2 = $98

(c) New Target Profit = 10 + 40% = $10.8

(d) Instant Contract Savings over a full period of contract performance = Estimated decrease in the contractor's cost of performance - (Developmental + Implementation costs)

\[ = 10 - (1 + 2) = 7 \]

(e) "Percentage Savings to Government" = Instant contract savings (over the full period of contract performance) × Originally Negotiated Target Cost

\[ = 7 \times \frac{100}{100} = 7\% \]

(f) "Percentage Savings to Government" × VIVE Ratio = 7% × \frac{2}{1} = 14%

(g) Increase in the originally negotiated contractor's cost-incentive share

(h) Net cost-incentive share arrangement = 54.4/45.6 or after rounding, it would be 54/46.

Example. VIVE Method (CPIF Contract) (See Figure 9)
Assume a contractor negotiates the following CPIF contract arrangement:

- **Target Cost**: $100
- **Target Fee**: $8
- **Maximum Fee**: $14
- **Minimum Fee**: $2
- **Sharing Formula**: 80/20
- **VIVE Ratio**: 3:1
- **Period of Performance**: 1 Year

Assume the same VECP results as specified in the previous example. Therefore, the calculations in (a), (b), (d), and (e) would be the same for this example, which are as follows:

(a) Reduction in target cost = $2
(same as previous example)

(b) New Target Cost = $98
(same as previous example)

(c) New Target Fee = 8 to 20%
(2) = $8.4

(d) Instant Contract (Savings over a full period of contract performance) = $7
(same as previous example)

(e) "Percentage Savings to Government" = 7% (same as previous example)

The first desired criteria for a value engineering provision is that sharing should be based on actual savings, rather than estimated savings. It must be assumed that the contractor’s underrun or overrun position prior to the value engineering change will not change as a result of the value engineering effort. To reduce the contract target cost due to a VECP should have no effect on his underrun or overrun position. If the value engineering savings never materialize, then under the VIVE method, the contractor resumes the same fee position as if he never submitted the VECP. This is also true for the ASPR sharing method shown in Figure 4 and Table 1, where it was assumed that the ASPR V.E. share was equal to the cost-incentive share. If, however, the ASPR V.E. share was greater than the cost incentive share, then the contractor would be in a better fee position even if the proposed savings never materialize (see Table 1). Often, the implementation of a VECP actually costs more than the proposed savings. Even if the actual savings is greatly offset by implementation costs, the ASPR V.E. method will still guarantee a minimum fee greater than was originally negotiated. Under the VIVE method, however, the contractor would lose fee exactly the same way he would under the originally negotiated arrangement. This is exemplified by Figure 10 and Table 7 when under the ASPR, the contractor’s guaranteed minimum fee is at least $2.40 as compared to the $2.00 under the VIVE method and as originally negotiated.

The second criteria is to encourage contractors to submit accurate estimates of savings, developmental costs, and implementation costs. Under the ASPR method for sharing instant contract savings, the contractor’s tendency would be to under-estimate V.E. savings when his cost incentive share is greater than his V.E. instant contract share. Conversely, the contractor’s tendency
would be to over-estimate savings if his cost-incentive share is less than his V.E. instant contract share. Under the VIVE method, the contractor earns his V.E. share by submitting acceptable VECP's. Thus, the greater the savings, the greater would be the contractor's share. If the contractor should under-estimate instant contract savings, then the share he earns would be directly affected and would necessarily be underestimated also. Therefore, the contractor would earn less fee for any underrun than if he originally estimated a large savings. The VIVE method also protects the Government from over-estimated savings, since the contractor would lose fee for any savings that do not materialize to the same extent as under the originally negotiated arrangement. The net effect, then, would be for the contractor to estimate as large a savings as possible without putting him in jeopardy of an overrun position. In effect, an accurate estimate of the savings, developmental costs, and implementation costs would provide the contractor with the greatest benefit.

The VIVE method encourages contractors to submit deductive contract changes (VECP's) by providing a substantial financial reward, and also enhances the cost incentive features of the contract. These two criteria are of a major importance in motivating contractor value engineering efforts, and stimulating savings with respect to the cost-incentive provisions of the contract. The adjustment to target cost and target fee (or target profit) under the VIVE method is handled as if the contractor experienced an underrun, except that a formal contract change must be executed. Thus, the contractor initially increases his fee by the same percentage as an underrun in the amount that the target cost was reduced. From this point, the contractor then earns additional value engineering fee by the calculations increasing the cost-incentive share arrangement. Figure 10 portrays the change in the cost-Incentive share from 8/20 to 76/24 as a result of an acceptable VECP. Thus, for any under-run the contractor earns an additional fee or profit because of his value engineering efforts. Also, the more value engineering he performs the greater would his cost-incentive share be. This process stimulates the contractor to underrun and perform value value engineering, because his underrun would then be worth more fee as a result of successful value engineering efforts. Also, note that his cost-incentive fee gets progressively larger due to the new share arrangement resulting from successful value engineering efforts. Simply stated, a contractor can earn additional fee or profit on an existing under-run if he performs value engineering. The more he performed value engineering, the more his cost-incentive fee would increase, thereby providing an incentive for the contractor to underrun and also perform value engineering. The amount of emphasis desired for this interaction is easily controlled by the negotiation of the VIVE ratio.

The VIVE method provides for the same degree of contractor risk as under the basic contract, because the overrun portion of the incentive arrangement is exactly the same as originally negotiated. Figure 10 shows that the overrun portion of the incentive arrangement from point c is exactly the same as originally negotiated. Thus, if the savings never materialize, the contractor experiences no greater risk than if he never submitted the VECP. Also, the Government is protected by not incurring an extra fee obligation for a VECP that produces no savings. For a fixed-price incentive contract, the current ASPR method reduces the ceiling price by the Government's percentage of the instant contract savings. If the savings do not materialize, the contractor assumes a greater risk because of his value engineering efforts, thereby reducing his motivation. Under the VIVE method, the contractor is rewarded for his value engineering effort, given an additional incentive on the underrun portion of the incentive arrangement, while maintaining the same risk with respect to overruns.

The last criteria is to encourage contractors to submit VECP's toward the end of contract performance as long as it still provides a net savings to the Government. This is particularly significant when the contract is not conducive to any future acquisition savings provision as specified in ASPR. Toward the end of contract performance, contractors are not particularly motivated to perform value engineering, since the ensuing reward is relatively insignificant. Under the VIVE method, a future acquisition “type” method is built-in when the adjustment in maximum fee (only for CP-IF contracts) is made and in the determination of the “Percentage Savings to Government.” These calculations consider the instant sav-

(Continued on page 24)
A CONVERSATION
WITH
ROY FOUNTAIN...

E. WILL
DEARBORN
Special Feature Writer

DEARBORN: Roy, you've been in Value Engineering for a long time.
FOUNTAIN: I started to work for Larry Miles in 1952. I was trained by him.
DEARBORN: That was during that period when Miles was forming the concept that became known as value engineering.
FOUNTAIN: Yes. Larry was given a job by the vice-president of purchasing who recognized that a lot of the times during the war they were forced to substitute materials or go out of business on particular products and one of the most notable ones was refrigerators. Up until that time I guess every refrigerator manufacturer made shelves out of stainless steel and they were told by the War Production Board that stainless steel could no longer be used. Curiously enough, aluminum was available but they had tried aluminum a number of times before and now were forced to use it. They finally found out how to use it and now every refrigerator manufacturer in the United States uses aluminum for shelves. As a matter of fact, one of the other things that was noted when a lot of these substitutions were made was they actually got a higher quality more durable product and at a lower cost.

The Vice-President of Purchasing noticed that this happened frequently and he started out with rather simple but good thoughts that if this happened so often by accident that we should try to make it happen on purpose. He got Larry, who himself was a former school teacher, and an electrical engineer to take on this assignment. Larry's first activities were centered around finding out where substitutions has been forced and where we did come up with a better product at lower cost. He documented these; then went back to try to see what it was that led to the change; how we could have made the change sooner; and if there was any technique involved. He identified a number of techniques which he organized into a teachable group and they were so called the twenty techniques of value analysis.

DEARBORN: Is there a difference between value analysis and value engineering?
FOUNTAIN: If you want to try to make a distinction between value analysis as being applied after the fact, and value engineering applied before the fact, then I think that's fine if that's a useful distinction. But, in too many cases we talk about terms and names rather than the specific techniques that lead to the results.

DEARBORN: Is there such a thing as pure Value Engineering?
FOUNTAIN: I don't even like to make the distinction of pure value engineering, or a value engineering project, or value engineering anything else. What we're really looking for is results. And, what we call it is not really so important, but the thing that is important is the technique that we use. We shouldn't have to make any kind of a distinction whatsoever, these are value engineering techniques—the technique of identifying the function, how to evaluate a function, how to establish standards of values. These techniques are applied prior to the design release.

DEARBORN: Value Engineering then is a method, a set of techniques, a result-oriented plan as opposed to a technical skill such as mechanical engineering or electrical engineering.
FOUNTAIN: Yes, value engineering like other management techniques is more abstract, let's say, than algebra or geometry.

DEARBORN: I take it then that there really is no term "value engineer."
FOUNTAIN: Yes, there is, without question but really you need to go back to say why have any specialty whatsoever, why even have an engineer, why not just have a manager. In many small businesses, that's all you really have. What happens when the business gets so big and the field of knowledge gets big enough then you finally specialize, so the first thing you know you have an engineer. The next thing you have to do, you have to have a mechanical engineer and you have to have an electrical engineer. Why? Because no one man can perhaps accumulate all this knowledge. The next thing you have is a metallurgist, and you may have a chemist and a physicist and so on down the line. The only reason for this specialty really is the field of knowledge gets so big that one man can't know it all.

DEARBORN: Now you've got me confused.
FOUNTAIN: Really the ideal situation would be to have everybody know all there is to know about value engineering. It's too bad that everybody couldn't have all the knowledge that they really should have so that we didn't have the specialist at all. I'm sure as society gets more and more complex that we're going to have more and more specialists including specialists in value.

DEARBORN: What would a specialist in value be trained in? What would he have to know to be truly effective

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as a specialist? Would he just have to know the techniques?

FOUNTAIN: I think a good analogy is a metallurgist. What does a metallurgist have to know? He has to have a good knowledge of metallurgy. Then what does he have to do? He has to communicate that knowledge so it can be used. What is required to communicate it? It's required that the man to whom he's going to communicate this knowledge also has some knowledge of metallurgy. Thus we have every engineer trained in metallurgy to some degree, but we also have a specialist to whom this engineer can go. They couldn't even talk to one another unless they had some common knowledge. Therefore, I think in value engineering you've got to have an engineer, who has some knowledge in value. For the more specific and complex, more difficult situations, he may very well go consult a value engineer, who really relies on his knowledge of value engineering and supplements the knowledge of the person who needs help. Back to my old analogy of the metallurgist. Why did the metallurgist succeed? He succeeded first of all because the people he deals with had some knowledge of metallurgy and this guy has a great deal of knowledge in metallurgy. He does not go around after the fact pointing out faults in places where somebody used the wrong material, he consults with people ahead of time so that they do use the right materials, they have enough respect for his knowledge that they go and consult him before they make the decision. This is the kind of situation that you need. I think that you also need a management climate that says, "we want you to use these techniques if they're useful to produce a profit, and a better profit."

DEARBORN: Value Engineers have been referred to as "cultists." Do you think that the label has been attached because Value Engineering received its greatest push simultaneously with a number of image building cost reduction programs initiated by the Government?

FOUNTAIN: I don't know really how the word cultist and value engineering got together but I think it's extremely unfortunate. I don't think it's a cult, it's no more a cult than any other good tool that you would want to mention. Algebra is not a cult, differential equation is not a cult, materials, productivity is not a cult, production control is not a cult. I think that's a very unfortunate expression and there's no need for it and I don't think it accomplishes anything. One of the things that psychologists say that some people are motivated by pleasing methods and some people are motivated by pleasing results. A lot of value engineers I think have probably had the name tag of cultist hung on them because they were very interested in the pleasing methods that they were using, but they didn't follow through to really get the pleasing results.

DEARBORN: I think that the "cult" term has grown in the absence of evidence supporting a body of knowledge regarding the value engineering activity.

FOUNTAIN: There is a body of knowledge that you can point to, and I think with a lot of the people who are labeled cultists the only thing they can point to is a discussion about what you should call it and a discussion about the value job plan and such things as this when they have really no knowledge to support them. And, to that extent they were labeled cultists. The body of knowledge starts with the fact that you work on functions, not things, you then define a function as two words, a verb and a noun, to keep the specification separate. There are ways of identifying functions so that the function statement will not have an implied solution within it. There are methods used in creativity which really value analysis cannot lay an exclusive claim to. Really, value engineering, or value analysis, is a collection of good, sound, common sense techniques. I have been accused of teaching organized common sense, and if I had to teach anything I think that's exactly what I'd like to teach.

DEARBORN: We've established, to use your words, "the ideal situation would be to have everybody know all there is to know about value engineering." We have suggested that the field of knowledge is such that there could be value specialists just as there are metallurgists, aerodynamists, structures . . .

FOUNTAIN: Materials, production, contracts.

DEARBORN: Yes. Let's talk for a moment about the design engineer . . . the man who conceives and creates our products. Why should he be concerned with profit?

FOUNTAIN: I don't believe anybody can be a good engineer or good purchasing man, good accountant, good anything else, unless he's concerned with profit. We have to be in this day and age. Since profit is the final objective, I don't think you could do any job well unless it's considered.

DEARBORN: Do you think that the average design engineer is motivated by the profit or loss statement at the end of the year?

FOUNTAIN: No, and I'm glad you asked that question because if I could, I'd like to tell a personal story. At one time when I was a design engineer, I worked with a marketing man who broke all the rules in the book. They would have fired him except they couldn't get along without him. He made too many sales. This marketing man would go out and make
a sale, he had already made up in his own mind, how much profit he wanted to make on the sale. He would go to the financial people and tell them about the sale that he had made, and how much money he would like to make. He would ask the financial people to run the figures down to give him the cost, in order to make that money. This marketing man would then come to me and say I have sold so many units of this item. I have sold them for this price, and I want to make 20% and that means you have to design it so that we can make them for this cost. If you do that, we'll make so much money, so much profit. He said now, if you could make them for a lower cost, we'll make this amount of profit and I'll sell "X" number of more units. If you make them at a still lower cost, we'll make this much money and I'll sell "X" number of units. Generally speaking it has been my experience that engineers get satisfaction from one thing, and that's in making a product that works. Very often they have no idea how much it costs nor its contribution to company profit. While I worked with this man, this man who broke all the rules in the book, who never went through my boss or through his boss, I got twice as much satisfaction because when I went home at night, I got satisfaction from having designed the product that worked and I also got satisfaction because I knew how much money, how much profit, I had contributed to the company. I think this must be done, we must measure everybody on their contribution to profit, and the man ought to know what that contribution is.

DEARBORN: You were motivated.
FOUNTAIN: I was motivated.
DEARBORN: You had a target . . . a cost target.
FOUNTAIN: I had a profit target.
DEARBORN: Not a cost reduction target.
FOUNTAIN: Profit targets. Very often they are interpreted in terms of cost. For example: one company was losing its share of the market, losing its profit margin. They knew the cost of the product; they knew the price they could get; they knew what profit they wanted. They translated this profit and the price into a new cost and said "this is the new cost objective." In this case they assigned value engineering trained people to attain that objective. It was a cost objective but it was derived from a profit objective.

DEARBORN: Should you operate on targets or value standards for the function?
FOUNTAIN: They should be one and the same thing.
DEARBORN: Pretty obscure though to talk about value standards and functions . . .
FOUNTAIN: Wait a minute, the cost target again is a term that needs explanation, it means something different to every person. Most cost targets that are set by industry today are really what I would call the maximum allowable costs, by that I mean that somebody has sold something, they want to take a certain percent profit and that establishes a maximum allowable cost. And that, therefore, is called the cost target. The kind of target that I'm really looking for is what I choose to call an attainable cost, perhaps a minimum attainable cost, and it is certainly different than the maximum allowable cost. It can be substantially different. Now, having established an attainable cost, through the way we do cost targeting, we can also establish the manpower requirements and everything that's required to get there. Having done that, we can decide, O.K., our targeted cost objective for this year is a 10% profit. We can make 30%. Do we want to employ the manpower to reach this objective this year? Or, do we want to do it in steps? Many commercial companies for example will do it in steps, because by doing it in steps they can reduce their peak manpower loads and they can also introduce changes on the timely fashion and since many companies copy many other companies, they'll introduce a change at a certain level; hold it at that level until their competition copies and as soon as they copy, they have new designs already to go, they introduce it to the market and they drop the price. Thus their competitor is caught off balance, he never gets to recoup for the cost of his advertising, and the cost of his engineering, or anything. The successful company, and there are several of them around that are doing this, will actually have targeted what is an attainable cost out several years in the future. This is done on a planned basis, and they are completely in control of the situation.

DEARBORN: I don't feel that our product line lends itself to that sort of manipulation.
FOUNTAIN: I'm really glad you brought this up. People say our product doesn't lend itself to cost targeting. You can do it, and one thing we can really offer in value engineering is an improved process by which you could arrive at a more realistic target and one in which you have more confidence. If you want to take it a little bit further, it's what you would really like to do is to get it to the point at which engineers, let's say working on a landing gear . . . we got this kind of a cost target because the company said this has to cost so much. Now let the engineers use the techniques of cost analysis and function evaluation and establish for the management what would be in their estimation a realistic obtainable cost, and tell them what kind of manpower is necessary to do that.

"I had a profit target"
OUNCE (Concluded)

DEARBORN: Why then have we in large industry consistently failed to establish targets for use during the design creation phase?

FOUNTAIN: I think in many cases, we have not known how to define the targets, in the beginning. We may have value engineering training, but still do not explain how you do it. But, we're saying it ought to be done in the beginning, but in some cases that's all that we can say. We haven't had people telling other people exactly how to do it. Again, when you say targeting I hope we're talking about the sophisticated kind, not that we knew all there is to know about it today, because I think better systems will be developed, but some good approaches that can be used today are not being used.

DEARBORN: What characterizes those companies which have successful value engineering programs?

FOUNTAIN: I think that a lot of them who are very successful first of all have good training programs, they have people trained in using the value engineering techniques. They have a management who understands how to establish targets which include not only performance and delivery and all the usual things but also cost or profit as well. By the targets that are established the men are actually required to use all of the best techniques that they have available which includes value engineering. As a result of this, these men tend to do a better job.

DEARBORN: What sort of a value engineering organization works most effectively?

FOUNTAIN: I think basically organizations that have as their objective the providing of service, consultation, guidance, training and leadership, all of which may occur simultaneously, have probably been the most effective.

Mr. Lee E. Sheehan
Vice President and General Manager
Honeywell, Inc., Ordnance Division
600 Second Street North
Minneapolis, Minn. 55343

Dear Mr. Sheehan:

It is my great pleasure to inform you that by a unanimous action of our National Board of Directors, you have been elected as a National Honorary Vice President of our Society.

The work you have done and the success you have achieved by supporting value engineering in your company demonstrates again the high potential of value engineering as a management tool for profit assurance.

Cordially yours,
Frank J. Johnson
National President
10 March 1969
CREATIVITY
PROGRESS AND POTENTIAL
Edited by Calvin W. Taylor

PURPOSES for BOOK
Present Background for Knowledgeable Decisions & Actions

STRUCTURE of BOOK
Current Knowledge

Research Needs & Leads

EXTENSIVE BIBLIOGRAPHY
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PERFORMANCE PREDICTION
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EDUCATION AND CREATIVITY
E. Paul Torrance
Legitimate Concerns of Education about Creativity
Current Efforts to Develop and Communicate Needed Information
Creative Thinking in the Early Childhood Years
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Inhibitors & Facilitators
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ENVIRONMENT AND TRAINING FOR CREATIVITY
J. H. McPherson
Training Methods
Aspects of the Industrial Research Climate that Affect Creativity
Variables Involved in Criteria of Creativity
Detailed Consideration of What is Measured
Methodology in the Criterion Problem
Control Variables

Calvin W. Taylor
1. Describe intellectual characteristics of creative people
2. Investigate preverbal & nonverbal manifestations of creative thinking
3. Factors responsible for creativity drop
4. Develop programs designed to nurture creativity
5. Incorporation of creativity-research findings in admission practices
6. Suggest design of school experiences to foster creativity
7. Determine instruction techniques which encourage creativity
8. Develop materials and procedures for teachers
9. Enlarge test tasks and observations used to predict creativity
10. Explore new frontiers in education which may be important to creativity
11. Evaluate education of teachers for development of creative, stimulating teachers
12. Design industrial programs changing attitudes towards creativity
13. Inaction of creative people and line organization
14. Determine environmental factors which promote creativity
15. Conduct pilot program in industry which promotes and encourages creativity under scientifically controlled situation.

A NEW CONCEPT IN BOOK REVIEWS by W. J. GariSS

OF THE SOCIETY OF VALUE ENGINEERS MAY, 1969 • 23
VARIABLE INCENTIVES

(Continued from page 18)

ings that would have ensued if the value engineering change was incorporated in the original contract specifications. The resulting effect is that the maximum fee and the new cost-incentive share arrangement compensate the contractor for his efforts by increasing his fee potential for underruns. The full period of contract performance was considered in the examples cited herein, however, any period can be incorporated depending upon the particular contract and the incentive necessary to motivate value engineering efforts.

Significance

The most significant aspect of the VIVE method is that it brings value engineering into the entire cost incentive structure, thereby producing favorable trade-offs to both the Government and the contractor. The fact that these trade-offs are available, and that they have a significant impact on the cost-incentive share arrangement, increased emphasis with respect to value engineering must result. Contractors are actively and enthusiastically engaged in working incentive contract trade-offs, and the VIVE method provides still another beneficial trade-off which could not be neglected by a profit oriented contractor. If the VIVE method is appropriately applied to an incentive contract, the contractor can increase his fee potential under the cost-incentive sharing provisions, and the value engineering provisions to successfully reduce the Government's over-all costs.

Summary and Conclusion

Summary

The whole purpose of value engineering is to stimulate the origination of contractor suggested deductive changes. In order to provide such a stimulus, the contractor shares in any resultant savings to the Government, thereby creating motivation in terms of a monetary reward. Notwithstanding, the value engineering program has not enjoyed the success that incentive contracts have, even though their basic principle is the same. The reason for this lack of success is not because of a limited potential for savings, but because of the lack of com-

munication between value engineers and contract administrators in both Government and contractor circles. In order to eliminate this apparent misunderstanding, this text separated value engineering as an "engineering technique" from value engineering as a "contractual concept." In so doing, the contractual requirements and methods for sharing value engineering savings have been developed and analyzed.

Once the technical and contractual requirements of a VECP are met, the contractor is entitled to share in instant contract, collateral, and future acquisition savings to the maximum extent specified in the value engineering clause. The current methods of sharing value engineering savings, described in the ASPR, are primarily based on estimates rather than actual costs. This condition produces certain latitudes available to a contractor and tends to cause either an under-estimated or over-estimated VECP conducive to contractor interests only. We have tackled this problem directly in the area of instant contract savings for incentive contracts. Estimating collateral savings is not such a great concern, because the Government should have a better capability to verify and produce accurate estimates in the collateral areas. The VIVE method makes certain contractual adjustments based on estimated savings; however, the contractor's ultimate share is based on actual savings, if any.

Conclusion

Once value engineering achieves the full status of an authentic and beneficial method for increasing profit or fee, contractors will enthusiastically participate in value engineering efforts. This status has not yet arrived. The Variable Incentive for Value Engineering method of sharing instant contract savings provides a significant impact on the cost-incentive provisions of any incentive contract. Thus, contractors must truly evaluate the impact of value engineering on the total fee or profit potential of the contract, and to analyze the significant trade-off possibilities resulting from the VIVE method. Yet, even though the contractor is increasing his fee or profit potential, the Government remains the prime benefactor by reducing its over-all costs. Therefore, the inclusion of the VIVE method for sharing instant contract savings in conjunction with current ASPR methods of sharing collateral and future acquisition savings will significantly motivate contractors to engage in value engineering efforts to the benefit of himself, the Government, and ultimately, the taxpayer.

VA/E—PUBLIC WORKS

(Continued from page 12)

that no one is going to lose, but everybody has something to gain. This is not easy to understand, but somebody with authority and responsibility must start explaining, otherwise no matter how we manipulate our economy by fiscal or arbitrary means we can not stop the rapid erosion of the value of our dollar. We must utilize our man-power and material resources for productive and functional returns instead of using them to produce wastes. Wastes that offset supply and demand and create a vicious inflation spiral.

Conclusion

To improve value accomplishments in Public Works projects:

1. We must clarify our objectives and concentrate on know-how and applications instead of talking in generalities.

2. There must be emphasis and implementation of policies from the top.

3. Specific authority and responsibility for VE programs must be established.

4. Formal VE education and public information must be supported and accelerated by the government.

5. Guidelines, criteria and manuals or handbook for value engineering design, techniques, and estimates must be developed in each major engineering field. A tentative general guide could be Mr. L. D. Miles' book on "The Technique of Value Analysis and Engineering."

6. VE objectives can almost always be tailored to personal objectives, for the benefit of all.

7. Material waste (natural resources) and the labor that goes into it, is the major cause of inflation.

8. Granted that we can have most of the major requirements and quali-
fications for VE applications, the remaining key to success is expeditious analysis. We must have effective policies and implementations to circumvent bureaucratic red tapes.

**Supplementary Comments**

ACCOMPANYING CHARTS and graphs are shown to give a total picture of the concept of *Maximum Value Accomplishment Programs* and Goals for the United States of America, approximately 25% of the total budget. This includes federal, state and local government. In private industries and in countries like West Germany and Japan, the maximum value accomplishment goals could be as low as 5%. This difference could be largely due to the fast pace of American progress and affluence. Generally, the government can only reflect the prevailing wasteful practices of the private citizenry. However, if we are confident that we can pay one tenth of the cost of accomplishing value goals, we would all be that much better off. We should demand from our public officials to do VE. To dramatize the issue, it should be poignantly brought to the attention of our legislators and top management in the executive branch of our government, that while we are clamoring for more funds (taxes) to spend on needed programs, at the same time we are wasting money to nobody's benefit.

We know that there will always be wastes. What we are interested in is how much? For example if 10% of $200 billion is our minimum goal for value accomplishment, this would be 20 billion dollars a year. Assuming 10% cost of implementation for value accomplishment and allowing 20% profit for interested parties, would leave us $14 billion net return that can be plowed back to the economy for useful purposes. The value of the dollar is directly strengthened. The dynamic consequences of supply and demand in man-power and material resources is relatively kept in balance to reduce inflationary pressures.

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**LETTER BOX**

To: Managing Editor  
The Journal of Value Engineering

I am compelled to go on record as deeply concerned about the Journal. I have just reviewed the third issue and find that it has, indeed, changed from issue one and two; but the change is not for the better.

The Journal of Value Engineering should present to the world the image of a professional society. Ours does not.

The articles, all authored by officers of the Armed Forces or contractors for military equipment, represent a bias which will unquestionably cause further disenchantment with the Society from the non-military segment of the Society. A further comment: only one of the four is an original article, unreleased elsewhere.

Of the two features, one is an inaccurate, poorly researched, writer's pitch for plant manufactured homes. The other is acceptable as content for a professional journal. The glossary on page 30 is also proper content, as filler material.

Finally, and happily, your editorial on pages 28 and 29 addresses itself to a real problem of today's society; and reveals, in contrast to the remainder of the Journal, a knowledge of what VE is and does.

Well, what can be done to identify and correct these defects? I presume that you are doing your best, I know, further, that you are putting a great amount of time into the Journal. The tragedy that you are failing to produce a professional publication is a result, therefore, of either ineptitude (and I doubt this) or lack of support.

Do you need help?

Very truly yours,
Ted
Theodore C. Fowler

xc: Harold J. Smith
Frank J. Johnson

Dear Mr. Fowler:

I, too, am deeply concerned about the Journal. Your comments about the third issue of the Journal are well taken.

YES—WE NEED HELP ! ! !

We need more readers like yourself who will take the time to express what they want to read in the Journal. We need members who are willing to serve on the Editorial Staff.

We need authors who can contribute to the continued development of Value Engineering.

With this list of needs one could develop a sense of pessimism about the future of the Journal. As expressed in the Editor's Chair this issue, I am confident about the future of Value Engineering. This future will be realized thru the efforts of a dynamic, creative Society of American Value Engineers. It is from this Society that a professional Journal will be built.

. . . W J G . . .

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THE FUTURE OF VALUE ENGINEERING

When one is asked to write about the future he is reminded of the utility of such things as crystal balls, Weejeie Boards, astrology, and soothsayers. How convenient it would be to peer into the future. Yet, we as engineers are continually projecting into the future and are visualizing products which will be in existence. The attributes of this product are defined in the early conceptual phase. The element which allows predictions to materialize from these concepts or ideas is planned human action. Without it, natural laws define the future.

As one can describe a future product by taking into consideration planned human action, so we should be able to describe the future of Value Engineering. After all, value engineering is a systematic process to assure values in products.

Since VE is product oriented, let us first try to project the requirements for products. Present experts in the field of population predict an exponential growth in population. This population will live longer and expect more in terms of material goods or wealth. We need only to look at the revolution occurring today within lower income groups and minority groups to verify these expectations. The natural resources of the world will be consumed at an ever increasing rate. If the needs of the larger population are to be met, then the efficiency of production must be increased. This of course to us means that the role of value engineering will be more and more significant.

I think we should note here that as the basic needs of people are met, the needs grow and become more complex. Man's primary concerns until the industrial revolution revolved primarily around food, shelter, and clothing. As these needs were satisfied, other needs and wants became manifest until today, society's needs include transportation, entertainment, recreation, education and a host of others. As one tours the modern shopping center, he feels that the world is gadget happy. There most certainly will be an increasing market for products to satisfy human needs.

The future with the increased demands for consumer products may change this society from one which is predicted on waste to one predicted on the conversion of matter and energy. Our industrial complexes have been achieved to a large measure by waste. We design automobiles, dishwashers, washing machines for obsolescence. This assures a continuous turnover in the market place. Most things produced may be classified as disposable. A new concept of value may be introduced in that products will be required to perform the intended function reliably over ever-increasing life spans at the lowest possible cost.

For the past twenty years, a sword of Damocles in the form of nuclear weapons has hung over our heads. We have devoted a substantial percentage of the gross national product to defense systems. This has detracted from the availability of consumer products within this nation. There is one thing that perpetuates the necessity for weapons — want, the lack of satisfaction. We have never been able to produce enough to satisfy even the wants of the people of our nation. Want satisfaction throughout the world is a far cry from where we are now. The population continues to grow, the needs continue to increase. Peace will be possible in an age when there exists political, economical, social and psychological systems which assure the production and distribution of required goods. Crime and wars might become a relic of the human past. Right now, this is a pipe dream. But I believe the value engineer can play a vital role in achieving the utopia. He will not contribute a great deal however, if he does nothing more than try to help the designer reduce direct labor and material dollar costs of a specific product. The Value Engineer must move out into the field of economic and into politics. He will have to develop general and specific theories of value. He will become familiar with the dynamics of productivity and distribution.

Another principle that operates in assuring the future of Value Engineering is that it creates its own need.

The very process of always comparing the value of a function with the cost associated with the function demonstrates the continuous need for Value Engineering.

I am pleased to see the efforts being exerted in the commercial applications field. SAVE has launched on a three year campaign to stem the tide of poor values. I am reminded of McNamara's five-year cost reduction program. The sixteen billion dollars saved only assured continuation of the DOD Cost Reduction program. I am not confident that we can do anything more in three years than to scratch the surface or expose the gold mine below. This is, however, dangerous and tricky water. As the cost of the products diminish, we must also provide the new products which when produced will consume the manpower we saved on the previous product. Persons or families in our society can survive in only two ways — wage earners and relief. Which category one is in depends on what economic level he is willing to settle for. The seed of discontent has been sown. Less and less people are willing to settle for meager existence. Hence, provision must be made for their employment. It can't be done by producing everything at least cost with an attendant increase in the numbers of different types of products and substantial increases in quantity.

From this analysis of the future of value engineering based on the demands for products in the future, we may conclude that VE not only will survive but is necessary for survival. Value Engineering will not meet its challenge unless its scope and concerns are expanded. Fruitful areas for inclusion are general and specific theories of values, dynamics of productivity and distribution, new economic — political — social — and psychological theories, and the design of products replacing conservation of material and energy with extended service life.
Parameters for Articles

LENGTH: 1500/2000 words (6 to 8 typewritten pages, double spaced, with art)

ART: Camera ready or glossy prints

AUTHOR: Must furnish clearance for publication from his organization, a brief résumé in 75-100 words, an information abstract in less than 100 words, and a complete return address with ZIP code and telephone number.

SUBJECT: Should be VE oriented or related and should contribute to the continued development of VE

PROPERTY: Use of trade names, company names and proprietary terms should be avoided

SUBMISSION: To the Managing Editor
Willard J. Gariss
2541 Perkins Lane W.
Seattle, Washington
98199