

ROCK ISLAND ILL

11/17/65 -1  
65-11

HOW STARTED

HELP SUCCESSFUL OPERATIONS  
EXCELL IN COMPETITION  
AND EARNINGS

USE ALL IN HOUSE SKILLS <sup>AND</sup>  
TECHNIQUES -

MODIFY, ADD OR SUBTRACT  
~~IF~~ IF AND WHERE NEEDED

WINNE -

PURCH V.P. ERLICHER <sup>WILL ALLOW US TO MAKE THE CONTRIBUTION</sup>  
~~WE ARE ABLE~~  
~~GET TO~~ PRECISELY WHATS  
NEEDED

MFG V.P. TRAIN 1000 MEN - MFG TOOL

GEN MGR - THIS COVERS BASES I OUGHT  
TO COVER - BUT CANT  
GET TO - ITS A MANAGEMENT  
TOOL

THEY WERE ALL RIGHT

STILL THEY WERE ALL WRONG

WHAT IS REAL?

RESEARCH REPORT  
NUMBER 1001

UNDERSTANDING THE MANAGEMENT OF VALUE ENGINEERING

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OBJECTIVES OF THIS PAPER

- I. Understanding what Value Engineering is and is not.
- II. Knowing levels of achievement.
- III. Knowing how to increase achievement.

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I. UNDERSTANDING WHAT VALUE ENGINEERING IS AND IS NOT.

1. Objective of Value Engineering.

The objective is to provide step by step procedures and measurements which will result in the use of the best combination of ideas, approaches, processes and materials to achieve the maximum of results for which each dollar of cost is intended. Stated another way -- to provide step by step procedures and measures which will maximize the benefits received for each dollar spent.

2. Similarities.

Value Engineering is a system which has one specific purpose, which uses available technologies, procedures, and methods; modifies and uses others; then establishes a few which are new in order to effectively provide single purpose results -- the efficient identification of unnecessary cost.

2.1 It is similar to the automobile which has the purpose of transporting weight under specific conditions. It uses existing wheels, engines, fasteners, ~~materials and functional products~~ <sup>by</sup> the score in one specific system to accomplish one specific result. To achieve this result many existing parts were used as-is, <sup>then</sup> perhaps the wheels and the engine and many other parts were modified, and certainly a few new parts were needed. All were integrated into one effective system.

2.2 Another similarity is the airplane which, in some terms, has the same purpose as the automobile. However, its function is more precisely defined as transporting weight greater distances in shorter time. It uses many of the components of the automobile: the wheels, the engine, the control systems, etc. However, to efficiently accomplish its exact purpose, many of its components are modified and a few new ones, such as the wings, are included in the system. Furthermore, as high efficiency in

OBJECTIVE  
STEP BY STEP  
MEASURES

SIMILARITIES

SYSTEM  
ONE PURPOSE  
OLD TECH  
MOD. "  
NEW "

AUTOMOBILE

AEROPLANE  
TRAINING

accomplishing single purposes is achieved by improving systems, it was found that specific training must be provided. Men who use the airplanes must know its capabilities, its specific needs, its strengths and its limitations. They must use it correctly, else it would not be as effective as the automobile and would be decidedly more damaging.

- 2.3 Another similarity is the jet. Like the automobile and propeller plane, it has the task of transporting weight. However, when it becomes vital to transport weight rapidly over great distances, the specific systems used in the automobile and the first airplane are modified. The jet uses thousands of the same components. However, a few, again, are modified; motors, controls, wing shapes, etc., in order to produce efficient results of a high order of magnitude in this one specific area. Again, as we progress in effectiveness for accomplishing specific tasks, we must progress in training men to utilize these increased potentials.

JET  
TRAINING  
ENVIRONMENT  
RUNWAYS

Another very significant item now becomes clear, namely the "environment" in which the new system is used. The runways which had become well understood and were "common practice" for the use of the propeller plane are no longer adequate. A new environment was created with specific understanding of the needs of this new system. Anyone who endeavors to develop the potentials of this new system without having the proper runways -- the proper environment -- will, of course, find that it is worthless and probably will be involved in major or minor disasters while arriving at this conclusion.

- 2.4 Another similarity is the piano which is a system put together to accomplish one specific purpose. Its components are commonplace; wood, wire, and hardware. Its components are properly selected and properly arranged to accomplish one specific purpose -- with very high efficiency. In some cases the existing components were not satisfactory for this purpose and had to be modified. Some of the strings for certain notes -- in other cases special wires -- were created specifically for this one system and properly put into its place. Again, in order to achieve its results, understanding of its system and training in its use is necessary. Here we readily comprehend the importance of developing the skill in using this system. We readily appreciate that used without special knowledge and training, and without the development of proper skill, it is a nuisance and should be chopped into firewood forthwith.

PIANO  
ALL TONES  
SELECTION  
SKILL

We see a new and important similarity in the piano. To effectively accomplish its specific purpose, it must have enough range, enough components, enough variety, enough approaches, to allow a person with training and skill to properly play any needed piece of music on it. However, this does not mean that every key is used in playing every tune. It is similarly known by all that to be an effective single purpose system, Value Engineering must have in its approaches, means for dealing with the most complicated weapons system, the simplest individual part, the non-hardware procedures, etc. An important similarity here, then, is that those with training and skill will use the precise techniques and approaches of the system which are needed to efficiently advance the particular project which they have.

Another similarity is to sheet music which is a plan showing precisely how each type of accomplishment is to be achieved. It is in detail, step by step, showing what must be done, when it must be done, and precisely how it must be done in order to achieve an efficient and effective overall result.

One more similarity will prepare us to put each of the items of understanding in its proper place: The telephone. The telephone is a system of common components, of modified components, and of a few very specific components created for its precise purpose. It accomplishes that purpose with overwhelming effectiveness as compared with other means for accomplishing that exact purpose.

Consider now a telephone in which one or two very small wires or parts are omitted. It might be made worthless or its efficiency might be reduced by 90% or by 50%. It is sometimes said that the needed wire which does not exist is the most important wire in the system. This similarity will grow in meaning as it is seen that often very small inclusions of some necessary understanding or information or procedure or step in the process of cost oriented decision making yields extremely large benefits.

3. Differences.

3.1 When some of the good procedures which have traditionally been used to improve cost oriented decision making -- good industrial engineering practices, good "design for function" engineering practices, good purchasing practices, etc., are occasionally called "Value Engineering," this is misleading. They are a good part of the overall system to be

SHEET MUSIC  
DETAIL  
STEP BY STEP  
ALL INCLUSIVE

TELEPHONE

SHORT A WIRE OR TWO  
MOST IMPORTANT  
LARGE YIELD FOR  
NEEDED PART

DIFFERENCES  
INDUSTRIAL  
ENGRG

ETC -  
NOT V.E.

ENGINE - IS NOT  
AUTOMOBILE  
NOR AUTOMOBILE  
"SAME AS  
ENGINE"

correctly and thoroughly when needed. The engine is not the automobile, the wings are not the airplane, just as industrial engineering is not Value Engineering.

- 3.2 Good purchasing is not Value Engineering.
- 3.3 Good engineering is not Value Engineering.
- 3.4 Good management is not Value Engineering.
- 3.5 Good quality control is not Value Engineering.
- 3.6 Good maintenance is not Value Engineering.

Each is an entity in itself and a part of good operation just as the wheels are an necessary part of an airplane and they must function precisely and correctly for the overall system to be efficient, but the "wheels" are not the "airplane."

EACH  
NECESSARY

4. Reasons required.

→ 4.1 Tradition.

Although each man believes -- some more than others -- that he is always looking for a better way, experience shows that most decisions are either governed or heavily influenced by tradition. "How has it been done in the past?" What experience have we had? What data do we have (What feelings do we have) to base this decision upon?

4.2 Habit.

Each man, technical or non-technical, is influenced very heavily by his habits. How has he decided this before? Much will again be done as he has done it before because, due to habit, many decisions are practically automatic, although each will say and believe that he is objectively searching for a better approach.

4.3 Attitudes.

Each decision making individual, often the person who makes the decision as to whether even to investigate a situation or not, has accumulated varying shades of attitudes toward every approach he has ever experienced or been somewhat identified with. As a result, an overpowering tendency exists to avoid certain types of approaches; to avoid thinking in certain directions; to avoid searching in certain directions. One of these directions might prove the "key" to this project but it would not have get into the study.

Accumulated  
shades of A.

4.4 Limiting the risk of personal loss.

4.4.1 Experience has shown that decisions are a very personal factor. In most cases they are made on a personal basis. The governing criteria is the minimizing of personal risk. In any organization, although men believe they are dealing objectively, when it comes to choosing approaches which deviate from the past, an inner fear of additional personal risk is often the deciding factor in the decision.

4.4.2 Minimize fear of embarrassment. For decision making men in technical and management work, it has been found that fear of immediate embarrassment is a far stronger motivator than the possibility of improved products, process, or service results at a future date.

4.5 The "easiest" way.

From earliest childhood men are taught to accomplish their assignments the "easiest" way. It is very correct to do so. The awkward boy does things the "hard" way. Therefore, in a business or technical career, men have been basically schooled by attitude and habit and practice to accomplish their assignment the easiest way. This is the "easiest" way. From a personal viewpoint and below the highest management level, personal viewpoints usually control decision making. To follow an established path and "be done with" the task quickly in a manner that will require no explanation, no teaching, is such an attractive procedure that it is common.

4.6 Short range versus long range.

Although the most significant benefits often result from long range actions which produce long range results, the short range work, the short range tasks, the short range choices, are drastically stronger motivators.

4.7 The skyrocketing of technology and of need in the last one or two decades.

As never before, men are confronted with a new situation. The organizations, the procedures, the methods of NEW YORK accomplishment which have grown and have been tried and proved throughout the years have been made totally inadequate by the incredible skyrocketing of technology, of systems, of available procedures, etc. With this skyrocketing has come the specific need, increasing at a rate hitherto unperceived. It has therefore become essential to have a positive plan which will cope with this rising technology and rising need in the area of economic factors.

LITERATURE TO IMPROVE  
NEED POTENTIAL  
STRATEGIC

SHORT RANGE

CHILDHOOD  
DURKWARD BOY  
DO IT AS HAS BEEN  
GET DONE  
NO TEACHING

DECISIONS  
PERSONAL  
RISK  
OBJECTIVE  
RISK OF PERSONS  
DECIDES

conduct current. Study the limits under which each function must operate. Secure enough information and question enough assumptions so that the function desired is specific and totally understood.

### 7.1.2 Separating functions.

Start with the total function which the customer wants and wants to pay for. Make it precisely clear and understood, with critically reliable assumptions clear and sharp, then divide it into the major groups of sub-functions, that is, functions which must be accomplished in order to achieve the total or main function. Proceed to identify each of these sub-functions with the same precision and clarity as the overall function. Next sub-divide into the functions which are necessary to accomplish each sub-function. Identify each of these sharply, question each, identify its real task, improve its information and assumptions. Further divide, continuing the process until it reaches individual parts.

### 7.1.3 Grouping functions.

Do not too long study individual parts and totally separate functions, but rather group into functional groups, functional assemblies, each with a specific, well defined and well understood purpose. Group in different ways to provide the necessary supporting functions, and finally the total function required.

By now the problem has been broken into a series of specific problems. It is becoming apparent precisely which problem must be solved in order to unlock large opportunities in the larger problem. Furthermore, the information and the essentials have been tightly screened and improved so that the next stage of the work will be on the "right" problem.

## 7.2 Solving the problem.

### 7.2.1 The Job Plan.

Now with the basic functions to be accomplished in mind, with a good understanding of precisely the degree and under what conditions each is

to be accomplished, with a good basic consideration of the objective situation, with an idea of the precise specific problems which, if solved, would provide lower cost, better solutions, the five step approach of the Job Plan is used. This approach organizes all resources for problem solving, whether the problem is large and involved or small and specific. The steps of the Job Plan are repeated until the needs of any situation are met.

**Step 1. Information Step.**

What is the starting point? What is known? What is believed? What is done? Why is it done? Where? By whom? When? For what cost? What are service factors? What are maintenance factors? What are other customer factors? Why done this way? What changes recently made? Etc.? Etc.?

100% Information finding — no interpretations, no analysis, no idea generating now — what are the facts? If not absolutely sure that a statement is true, write it as a "belief".

**Step 2. Analysis step.**

What are the meanings. What are the total problems? The individual problems? The reasonable goals and plans? What are the key problems to be solved first? What solutions seem reasonable? What end result is reasonable? What steps — first, second, third, — are indicated? What additional information is required? Etc.? Etc.?

**Step 3. Creativity Step.**

The vital process of creative thinking has been given the treatment it deserves and requires by Alex Osborne and associates during the past fifteen years. Books and training are available to the reader, hence will not be elaborated here. It proceeds by jelling up the precise problems which require better answers, then by deferring judgment, establishes many new relationships between elements of pertinent knowledge. Its definable and teachable procedures result in far more effective thinking toward the solution of the problem.

#### Step 4. Judgment Step.

What approaches show promise, what are cost advantages of each? What are advantages and disadvantages? Which is ready now for development? Which should be referred back to another information and/or analysis and/or creativity cycle? What disadvantage becomes the new problem?

#### Step 5. Development Step.

The "better answer" is usually 50% to 90% ready to use when it comes out of the "Judgment Step". Make it 100%. Get firm quotations, get material, technical data. Make and test specific principles when necessary. Establish three alternative means of solving any remaining problem that appears difficult. Get others with different fields of knowledge to work on the key problems.

#### 7.2.2 Recycling.

Specific problems which, when solved, will allow significantly better cost oriented decisions, have now been brought into clear view. The Job Plan has been used. As a result of the Creativity and the Judgment, solutions which would be excellent excepting for one or two specific precise details have been found. These precise points then become the new problem and are re-cycled through a problem solving Job Plan.

#### 7.2.3 End Generalities.

It has been found that probably the greatest reason for stopping beneficial cost oriented decision making is the general statement. General statements must be given "zero" credence. What is the specific situation? What precisely does this do? Under what precise conditions? Precisely how often? Precisely what metal did not work under precisely what conditions? Generalities maintain the status quo. Specifics support new and better solutions.

#### 7.2.4 Recognize and end Roadblocks.

The definite and proper treatment of roadblocks is just as vital as the proper treatment of

the technical factors involved. One roadblock or stopper anywhere in the entire process can greatly reduce or end the possibility of results. These roadblocks or stoppers appear in securing and understanding of the problem, in securing information, in learning what the customer really wants, in learning how to bring the best out of specific materials or specific processes, in getting good, creative ideation, in getting samples, in getting tests, in getting interpretations of test material.

Roadblocks which stop the small, individual steps are just as damaging as the roadblocks which stop approval. Each must be recognized and dealt with in a manner that ends or minimizes its destructive potential.

### 7.3 Integrating the Contribution.

#### 7.3.1 Understanding the environment.

Any environment -- a management group, an engineering group, a maintenance group, a manufacturing group, or other -- has developed a practice for accomplishing certain results by a certain pattern of procedures. This can well be compared to a system of piping in which there are various sizes of pipes, various junctions, and various differing and parallel circuits in the system. Normally a definite flow or output which varies between some customary limits has become by usage the "accepted." Each element in the environment, were it animated so that it could talk, would feel that an effort to secure double the output would cause strain and pain in its part of the piping system. Similarly, when it is proposed to secure better products for perhaps half the cost, each element is understandably apprehensive and operates on the basis of "feeling" which are decidedly negative. The specific environmental situation must not be confused by the fact that each person will say, and believe, "we certainly do want to eliminate all unnecessary cost and I will do everything in my power to help." Experience has placed an interpretation on this statement that what is really meant is "yes, I believe there is a considerable of unnecessary cost in

what we are doing, of course it is not in my part of the operation because I have had it studied so carefully, I will certainly consider it part of my responsibility to help you to find it -- in the operations of others -- and will provide such support as I can to help end it.

### 7.3.2 Informing the "Environment".

It is just as vital to build the environment when the Value Engineering System is to be used, as it is to clear away the trees and extend the runway when the jet is to be used, altho' much more difficult. Environmental communication must start by showing "what it is". Then, at the proper rate, this understanding of "what it is" must be deepened. The reaction will be "We are already doing it-- we do that all the time." Some "how it works" is included but this bears so closely into the work of the individual work of the men in the environment that it at once starts to produce feelings of insecurity and fear of embarrassment. Then antagonism grows. Therefore, the "how it works" communications must be handled very professionally.

### 7.3.3 Getting acceptance of the "Environment."

Because there are techniques in the Value Engineering System to assist in the development of better cost oriented decisions in the work of management, of engineering, of manufacturing, of purchasing, of sales, of accounting, and all others, the environment views this to be and "feels" this to be a competitor. The basic situation felt then, is one in which we are saying: "Here is a competitor; we believe he has some techniques in your area which are a little better than yours; accept him, give up some of your space and you nutriment to him, and learn to love him." In this mental framework it can well be understood that gaining acceptance requires a considerable period of time with very carefully chosen, scheduled, and presented communication. It has been found that acceptance is promoted by developing the technique and method in a considerable depth.

Hence, the task of informing, orienting, providing understanding to, securing the acceptance of, and action from managers at all levels, and men who have not had the precise training, is one which requires much planning, real skill, and real art.

If these techniques and approaches are properly "grown," however, so much potential exists that it is probable that, considering the present rate of need, weapons of ever increasing complexity can be provided without increase in cost to the economy for the next decade.

<del>II. Knowing levels of achievement.</del>	}	<del>Being developed. To</del>
<del>III. Knowing how to increase achievement.</del>		<del>Be added later.</del>

L. D. Miles

Govt HdW -