1967

DAY 1

overall good

1 How Program
2 Day 1 Q
3 Day 1 Ans

8 to 9 - Good to excellent

1 HAND OUT OUTLINE

2 IDENT. SELVES
NAME
CO
ACTIVITY
} on BLACK BOARD

3 WHAT would you like to achieve?
Jim write on paper

4 A LITTLE REVIEW
1941 - #2,000,000 recs -
Punch
Winner
John Liggett
How worldwide
German, Dutch, French - Japanese

mul cont

5- 1st A FEEL FOR WHAT IT IS
2nd HOW TO manage it -
A week from now - hope you can answ. Ques.

6- what is it
communication - Bear
PICTURE is many - doubs of point
what it is by what it does
electricity
gravity

7 WHY IS IT?
WHAT IS DIFF. { Fighting a fight
Winning it?
TIMING - ~~all~~
a little better strokes - punches
Coaching for champions

8 Value your city
art
emotion

1967
~~Day~~ 1

9 warm blood

10 negative comments
avg fault finding
neglected products
after the ~~Scot~~ artists

11 mgr new design }
change of life } Train 600

VP 15 min 2 hrs - Train 2000 -

12 where is contrib. needed

mktg Engr ED MC MO P mgt -

~~Extra Cost~~ Term Board | Extra 200 yd | Extra cost

9:00 Down 15 1st restaurant needed change of pace used Q was OK

13 VE is like
auto
plane
set
[piano]
Telephone

14 So How does it work

~~14 Arrangement of Tech~~

will see its function based
arrangement of tech
3 samples
establish opp cost by comparison
Tie clasp - button board

Not used

1967
Dog 1

[secure Sarthot cost

15 Some Questions
Give out 46 questions
Some one read ~~answers~~ question -
Dom read ~~questions~~ answers -

16 give out answer sheet

17 ASSIGN - oddl -

A Count + Hand in
~~my nearest feelings now concerning~~
~~what VALUE is~~ -

B what would help me most?

18 How many vitally concerned got VECPS - ? 6

19 Review
System
One purpose
If Dont need lower cents dont use it.
If DO - it will get them.
Must deal with feelings
since Diff approach
application -
Hostility

Excellent 20 Function Zone
Tie - clip - button - nail

1967

Day 2

Will hand out so you can refresh -
Review system develop from need etc

very good

1 Check attendance in Red -
Red Tuesday -

2 Collect Papers -

3 Coaching of champions - Page 165

4 Task To be accomplished and
maintanance of group spirit

2 hr class period break to lighter vein
ea 20 min -

5 Series of steps - one purpose steps
Dont judge 1 step - Surgeon

6 Function
BLACK BOARD
Light fixtures
Refrigerator
Cement

7 Becoming objective

8 Evaluate Function -
Refrigerator - no -
aeroplane - no
Part of Prep - yes

STuds -
doublenuts Page 55
Cement -

9 Now 2 chairman
Function of Table legs
Motor Shaft

1967

Day 2

LDM ~~Motor shaft~~ -

10 Function in meas terms
Legs - # support
Motor shaft

11 Dust cover -
in text Page 249 A-40

12 Now - Maintain group 18" .3 sec
drop penny 30" .4 sec
48" .5 sec -

13 Now make solvable
Disposal

		angle
grind	4	3
energize	5	5
control	2	1
Contain	3	2
Prod opp	1	1
	18	12

14 Refrigerator -
cool
Insulate
etc

15 Radio story by functions/cost.

16 TV Knob

17 Summary Functions

18 Give out Questions -

19 150 cover fat women - room & figures

~~20~~ Supreme Court - open W. Bernard - not courage

1967
Day 3

Excellent

Give out 2 Papers
second on Function
one on groups of functions

Today will cover
grouping of functions
soluing system

MAKE SOLUABLE

DISPOSAL	COST	Require	Tentative Solution of Function
grind	4	3	
move	8	5	
control	2	1	
contain	3	2	
Provide App.	1	1	
	18	12	

Refrigerator - group divide
cool
insulate
etc

Radio Story

1967
Day 3

20 Go where habits take us
Refrig - mixer elec. shaver - 5 carloads -
Motor screen

21 Honest wrong beliefs -
chromeplated screws
blocked knowledge -
Kirlian
$5.00 tools

22 Leclinfo
Radar spot focuser -

---

23 In Purch
Buy Function -

Doublenut
Refrig magnet

24-a Mountain group - page 196 Psychiatrist
-5 2 13 yr old boys - bound pleasure
$5. - . 50¢
would not want $5.00 worth -

25 Waterwheel jobs - Punch

26 Review Punch process
27 = 4 some purchases -
28 Train some people
29 Get support for them

30 Review The Todays lessions

#967
Day 3

Solve it

Job plan

15,000 ave women

Supreme Court

give out paper

Peruse it for 5 min

Discuss it as a whole

Go thru ea step

Info

Maintenance (from page 2)

1967
Day 4

STACKS UP VA BOOKS - Tell-for Cutter book

Give out 1 Yesterdays Report
" " Jos plan with Mgt Measure

Give Readers digest

ASK FOR ANY QUESTIONS

DO DUST COLLECTOR JOS plan

told of Tell Topless story

Give out Govt Books
allow 10 min to peruse -

Tell regulator Story
For maintance "Hand It with Rope" story

FIX IT STORY
Doesn't work - Isn't sold or Costs too much -

Discussions of
"Philosophy"
For Maintance - I & check,
Discussions of
"Fear of embarassment"

Questions for Day 2 3 & 4
answers " " "

Remind - 8 AM Steve Movey Fri
9 AM SAT US incentive Cont.

Day 5 1461

SELF IMAGE Agree on "Facts" - open attack on self image
1/3 unworking coat after good work -

"FIX IT" STORY -
work - sell - profit

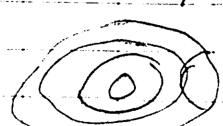
Discussions of philosophy
1¢ Check
" " fear of embarrasment

[warm blood

Questions 3-4-5
Hang it with rope
[Presidents concepts

give out 2 papers

Remind - Tomorrow 9-10 Incentive Cont.

[mgt reality 

[Ins. $16 - 6
Blind people
Born ~~Deaf~~ elite

Day 6
1967

Excellent

Summarize
PURE
FIND AREA OF NEED
CONSTRUCTIVE ATTITUDE
EVERY NEEDED APPROACH
KNOWLEDGE - SEARCH - CREATIVITY - IMAGEMA

Thru something to Function

ORGANIZATION -
CTEXT
REQUIRES KNOWLEDGE OF IT
SOMEONE SUPPORTING IT
TOP MGT BELIEFS GOVERN
AMT ITCAN BEUSED
WITHOUT Mgr + Man Environment.

Read "what I wants"
That men handed in
answer

Manager Concepts

RATE COURSE

SHERWIN QUESTIONAIRRE

DAY 6 QUESTIONS

LAST 50MIN - PARDO CAMEON GOVT INCENTIVE
CONTRACTING

Managing the Use of Value Analysis
and Engineering Techniques

L. D. Miles
March 23, 1967

CLASS OBJECTIVES

C. D. James

To establish those factors which are necessary for implementation of an effective government-industry value analysis program.
To explore the functional placement and level of responsibility aspect of the value engineering function.

Paul Beemer

From course on Value Analysis I hope to determine whether we can achieve further significant savings in the production of concrete and steel pipe products.

W. W. Huber

A correct understanding of value engineering fundamentals. The ability to effectively apply value engineering not only to production items but also to items in the development stage.

A. J. Little

From this course I hope to achieve a scientific approach to motivating, organizing, and working with a small department of engineers and supporting personnel on products designed at a very minimum manufacturing cost in a highly competitive business.
I am concerned primarily with relatively simple, very large volume products in the general electromechanical field. Interactions of Engineering with other departments such as Purchasing, Manufacturing, and Q.C. in this area is of interest.

R. D. Kruidenier

I would like a clear definition and understanding of what is "value analysis and engineering." I believe the term is often misused and gets confused with cost reduction programs, etc. Value engineering vs. cost, quality and reliability I hope will be covered. In brief, I would like to go away knowing more about the subject than when I arrived, and after our first class this objective is assured.

Al Erreca

At the conclusion of this course I am hoping to have a better idea of how to:

1. Approach cost reduction programs
2. Implement cost reduction programs
3. Determine responsibilities in cost programs
4. How to assign specific responsibilities in cost programs.

W. Gabbe

I would like to investigate value engineering procedures with the goal of possibly applying these techniques to the Facilities Engineering function. How can value engineering be used to aid in evaluating capital expenditures? (E.g., additions, expansions, replacements, etc.)

Value Analysis & Engrg. Techniques
Class Objectives

Robert Fouke	I would like to learn enough about Value Analysis to encourage its use in our operation.
Earl Lawver	I would like to apply Value Analysis to "one shot projects" like a new facility to produce paper.
(no name)	I would like to obtain the following from this course: 1. Managing value incentive contracts 2. Evaluating organizations 3. Measuring and evaluating service provided by contract.
D. Wroughton	I would like to see if Value Analysis can be applied to R&D at least to the extent of helping assess how much data is needed on a given test or series of tests. In other words, the data collecting part of R&D. This is related to the eternal question of how much is enough, how good is good enough (e.g., in quality control). This is also something I had hoped to get in the Engineering and Management Course. I gather that it will not be dealt with in Value Analysis but it does not seem to be dealt with elsewhere either.
Ted Beuke	I'd like to learn about application of value analysis/ engineering to management systems/operations as compared to hardware items. Also, what, specifically, are the qualifications for an analyst--special training, etc.
K. Antonsen	Through this course I hope to learn to realize areas in which value engineering and analysis can be applied, specifically in a field that does not necessarily involve volume production, but of necessity is extremely competitive. More specifically, in our business we are currently in a transition where a) we have to convert from a laboratory attitude to a "hardware" phase, an event that b) occurs at a time the competition has a heavy lead, and where c) in order to stay in the business we cannot afford to give the customer more than he needs but has a right to expect (i.e., high quality for the least amount of money).
(no name)	I am chief engineer of a relatively small company, 300 employees and $12 million sales, which purveys our product to industry-- either OEM or user. Our engineering department consists of approximately 35 people--designers, drafting, testing, model makers, etc. I want to learn how to apply Value Analysis to our situation.

Value Analysis & Engrg. Techniques
Class Objectives

Ed Yasinko

It is my desire to learn how value engineering techniques can be applied to a transportation system. Namely, a pipeline system. Although discussions will probably center on the manufacturing industries, each phase in this industry appears to have a counterpart in the transportation industry.

Roger Kadala

Our Western Division (± 6000 workers) was recently reorganized to reflect the results of a study in which it was discovered that the operating organization had more maintenance people than the whole maintenance organization.
The new set-up put Maintenance at the same rank as Operations: Maintenance Operations covered 2nd and 3rd echelon maintenance; second echelon or field maintenance was established as a result of having taken it away from the operators.
I'm in charge of the planning and scheduling for the Field Maintenance Organization (± 800 people). Can Value Engineering help in chartering a course or courses of action for our organization at its inception so that later value engineering won't be required?

Richard Bentley

My personal interest in this course is to acquire an understanding of the methods of Value Analysis that will allow me to apply the methods to my own program. Effective cost savings over the next year during which some 20 million dollars is programmed can be of enormous value to me and my company, not to mention the customer, the U.S. Air Force.

Phil Reinig

1. How to apply to "one shot" design--fabrication construction program.
2. How to get people in my organization to use it. (Several have taken courses in Value Engineering.)
Our function is to design and supervise construction of facilities and systems to perform scientific experiments. Cost of these jobs ranges from $20,000 to several million dollars.

John Grady

Lead proposed groups to specify competitive configurations in pre-design phases.
Lead (Phase 1B-II) design teams to project and enhance profit expectations through hardware development.
Participate in negotiations with an awareness of rational expectations in program cost and return development.
More effective use of team and corporate resources throughout proposal and project efforts.

1967

complete set

#1

1967

1967 Engineering and Management Course

L. D. Miles
Miles Associates

THE MANAGEMENT OF VALUE ENGINEERING AND ANALYSIS

Program and Suggested Reading

I. Understanding Value Engineering and Analysis

Reading Suggested: (Preparation for following day)
Scan entire textbook "Techniques of Value Analysis and Engineering"
Read Chapter 1

II. Techniques and Approaches

Functional Penetration

Making Situations and Problems Solvable

Reading Suggested: Chapters 2 and 3

III. Techniques and Systems for Solving These Problems

Job Plan

Problem Solving System

Reading Suggested: Chapter 6
Articles - "Philosophy of Value Engineering and Analysis"
"Effect of 'Fear of Embarrassment' on Decision Making"

IV. The Decisive Effect of the Human Element in the Decision Environment

Reading Suggested: Chapters 8, 9, and 10

V. Work Elements to be Managed in Value Engineering and Analysis

Reading Suggested: Chapter 11
Articles - "Organization for Value Engineering in Research and Development"
"The System"

VI. Indicators and Measurements

Management Factors

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QUESTIONS APPLICABLE TO DAY I

1.1 Is analyzing of bids Value Analysis?

1.2 Is analyzing a design for labor and material content Value Engineering?

1.3 Is questioning the customer on his real functional needs Value Analysis?

1.4 Is studying materials flow in a plant Value Engineering?

1.5 Is getting suggestions from suppliers Value Analysis?

1.6 Is shutting down an idle machine when it is not being used Value Analysis?

1.7 "I see so much of what we have already been doing in this Value Engineering I get the feeling that it's a motivating scheme of some fellows trying to make a name for themselves by doing what we've always done--but calling it something different."

1.8 Isn't the main purpose of Value Engineering to draw more attention to the importance of getting lower costs?

1.9 Is applying better processes Value Engineering?

1.10 Is studying material substitution Value Engineering?

1.11 What makes Value Engineering unique? Why a separate discipline? Why not just a part of engineering like any of the other dozens of engineering work areas?

1.12 Does Value Engineering work better on high volume items?

1.13 Does Value Engineering work better on hardware than on maintenance or service?

1.14 We used to find a good supplier, then deal almost exclusively with him. Now I insist on three bids on everything over $100. Is that Value Analysis?

1.15 Our suggestion system asks for everybody's ideas, keeps them on their toes, keeps them thinking. Is that Value Analysis?

1.16 As a purchasing agent if instead of accepting the best quotation I negotiate with the supplier for better prices, is that Value Analysis?

1.17 I'm a salesman. If I sell a standard item instead of causing the factory to make something different, is that Value Analysis?

1.18 As a salesman, if I stop taking a customer to lunch, is that Value Analysis?

1.19 If I as a salesman rearrange my time and route so that I call on my customers with less traveling expense and traveling time--is that Value Analysis?

1.20 If as an engineer I use a new material that makes just as good a product at lower cost, is that Value Engineering?

1.21 If I design out labor, is that Value Engineering?

1.22 If I keep all of the utility of the product but eliminate some of the "gingerbread," is that Value Engineering?

1.23 If we are having field failures and I design in some more quality, is that Value Engineering?

1.24 As a process engineer, if I find a process that reduces costs, still keeps quality, is that Value Analysis?

1.25 If I study the manufacturing line and find I can rearrange work stations and make the product on one floor instead of two with large savings, is that Value Analysis?

1.26 If I can improve work flow and reduce overtime, is that Value Analysis?

1.27 If by better plans with different job rotation or work scheduling, I can reduce idle time in the factory, is that Value Analysis?

1.28 Couldn't we say that as production engineers we are doing Value Engineering every day?

1.29 If I benefit the company by shipping scarce items first to the customers who need them most, then completing shipments to others, is that Value Analysis?

1.30 If as a manager I have two engineering departments and can combine into one reducing the payroll and still get the same good results, is that Value Analysis?

1.31 If as a manager I see men who are not doing their jobs well, hire teachers to teach them and, as a result, increase output substantially, is that Value Analysis?

1.32 I study and measure the similar work of two groups. Then, by causing each to also use the better approaches of the other, I get 25% more results. Is that Value Analysis?

1.33 What do you mean by value?

1.34 How does Value Analysis or Value Engineering relate to "appropriate performance at appropriate cost"?

1.35 What is the difference between producibility and Value Engineering?

1.36 Do I understand that the words Value Analysis and Value Engineering have exactly the same meaning?

1.37 Is Value Engineering evolution or revolution?

1.38 Is there Value Analysis work to be done in marketing area?

1.39 Since Value Analysis is trying to get reliable function the lowest cost way--if necessary, change in the design or manufacturing--wouldn't nearly every engineer or manager say that was what he was trying to do?

1.40 What "need" does Value Engineering fill?

1.41 Is it applicable to an entire missile system?

1.42 Is it applicable to a communications expense?

1.43 Is it used to study labor practices?

1.44 Is it applicable to a small company?

1.45 How does the use of Value Engineering affect quality?

1.46 What is the difference between Value Engineering and good design Engineering?

"Managing the Use of Value Analysis and Engineering Techniques"
1967 Engineering and Management Course

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ANSWERS APPLICABLE TO DAY I

1.1 No - that's purchasing.

1.2 No - that's engineering.

1.3 No - that's marketing.

1.4 No - that's manufacturing.

1.5 No.

1.6 No.

1.7 To the eagle, the DC-3 does resemble the jetliner, but their results are nonetheless very different.

1.8 No, "attention" doesn't necessarily get results. It's not the "attention" given to golf that counts--it's knowing exactly how to make each shot and doing it that way.

1.9 No.

1.10 No.

1.11 Unnecessary cost must be prevented or removed where it normally grows. Some of it comes from management actions, some from engineering, some from manufacturing, some from marketing, and some from purchasing. Engineering can't come to grips with and remove the cause when it's in other areas. They can when the deficiency is in their own area.

1.12 No.

1.13 No. All expenditures are for the accomplishment of a function. Sometimes this money is spent through hardware to accomplish functions; other times, through service to accomplish functions; and still others, through an organization or group of people to accomplish functions.

The approaches and techniques are applied similarly regardless of which medium is used to move from the cost to the function.

1.14 No - that's purchasing.

1.15 No.

1.16 No.

1.17 No.

1.18 No.

1.19 No.

1.20 No.

1.21 No.

1.22 No.

1.23 No.

1.24 No.

1.25 No.

1.26 No.

1.27 No.

1.28 No.

1.29 No.

1.30 No.

1.31 No.

1.32 No.

1.33 Appropriate performance of customer functions at appropriate cost.

1.34 Keep appropriate function performance. Cause appropriate cost to be secured.

1.35 Value Engineering is an overall system which determines who must do what and when and how much to meet proper economic objectives.

Producibility, I would say, is knowledge and technique for utilizing machine and process resources efficiently.

1.36 No. They cover precisely the same approaches and techniques--the same system. When parts of the system are used in the non-engineering sphere, the system is called Value Analysis. When the system is used by men who are professionally qualified engineers in the sphere of engineering work, it is called Value Engineering.

1.37 Evolution.

1.38 Yes. Also in the engineering, manufacturing, purchasing, and procedures type of work.

1.39 That's right, but systems or technologies are not defined by what they are trying to do--but rather by what they accomplish. The truck and the ship and the DC-6 are all trying to transport weight a distance--so is the jetliner. Each have different jobs. Each is a different "system." Each does poorly--if at all--on some jobs. On the others, it is efficient.

What we're saying is that Value Engineering is a system to use if costs are a problem, that it causes different thinking, get better criteria to the established decision-makers at the proper time.

1.40 Primary pressures in most operating groups are to "make it work" and to "get it shipped." Secondary emphasis at the "do-it" level is "make a profit." While the pressure for profit may equal the pressure for quality and shipments at the president's level, it becomes definitely secondary and tertiary in important decision areas. A healthy business is as vital as a good product. The Value Engineering technology provides a competent base for necessary planned actions to assure appropriate cost.

1.41 Yes.

1.42 Yes. The purpose of any communications expense is to accomplish a function which can be spelled out as precisely as the function accomplished by the shaft on a motor. The same thinking processes in the Value Analysis system are used in the same manner with similar results.

1.43 No. There already are technologies such as time and motion study, work simplification and many others in this field.

1.44 Certainly is if they need more earnings.

1.45 Good quality and good value come hand in hand. Good quality is the result of a thinking process which has developed the right approaches and methods for accomplishing the functions needed. Good value is the result of a thinking process which has developed the right approaches and methods for accomplishing the functions needed. Hence, as the Value Analysis techniques are used, better solutions are developed and better quality is a normal by-product.

1.46 Value Engineering or Analysis identifies the area in which more results must be achieved, regardless of which technology has inadequately contributed. Its search techniques and problem solving system will--if help is needed in that area--assist in getting the required results. The task of design engineering is quite different and well-known.

L. D. Miles
Miles Associates

QUESTIONS APPLICABLE TO DAY II

2.1 What determines the right cost?

2.2 Is associating costs with functions Value Engineering?

2.3 Is assigning appropriate cost or "value" to a function, i.e., evaluating a function, Value Engineering?

2.4 What do you consider to be the appropriate cost for a function?

2.5 Does Value Engineering obsolete cost considerations that have always been used in engineering?

2.6 Is naming functions in two words Value Engineering?

2.7 Is dividing function into basic and second degree Value Engineering?

2.8 Why does it matter what the precise name of a product function is?

2.9 Are value standards practicable?

2.10 What is a value standard?

2.11 Where do we get value standards?

2.12 When should we really start Value Engineering on a product?

L. D. Miles
Miles Associates

ANSWERS APPLICABLE TO DAY II

2.1 The state of the art and the offerings of competition.

2.2 Generally, yes.

2.3 If arrived at by analysis.....No.
If arrived at by comparison...Yes.

2.4 The lowest cost that will reliably accomplish it to the full satisfaction of the customer.

2.5 Generally, no. There is only one great truth. It all fits together. We know parts of it here and there. We use part truth until we know more truth. Value Engineering adds new truth for the engineer, usually supplements the truth he already has, and sometimes replaces less complete truth.

2.6 Yes.

2.7 Yes.

2.8 It doesn't. What matters is the precise and applicable thinking process that tends to relegate habits, in-house processes, in-place ways of doing things to the lesser place of importance where they belong and promote thinking on the basis of functional needs and wants of the customer.

2.9 Yes.

2.10 Generally considered to be a relationship between function and cost--expressed in dollars.

2.11 At the present time, so far as I know, we make them ourselves.

2.12 If lower costs are needed--today--whether it is in production or in prototype or in management committee as a package of functions the customer wants which they expect to provide in a new product or service.

Now, with the specific similarities, the differences, and the reason the Value Engineering system is needed clearly in view, some of the more important procedures will fit into a proper pattern.

Make more objective.

Establish procedures, techniques, and systems which will highlight the objective data available or obtainable on the specific situation.

Get into basic factors.

Reduce each consideration to extreme basics in order to as far as possible retard the effect of tradition, habit, attitude, etc. What are the absolutely basic factors which are being dealt with?

More clearly see and understand the basics. Study these basic factors more deeply. Divide them into sub-basics or parts of basics; regroup them into different basic factors; associate other basic factors with basic factors. Build up a logic, an understanding, and insofar as practicable, a "feeling", all based upon basics.

Divide into mind sized steps.

The individual requires a view of his objective but he then must have steps, one at a time, which are "his size" so that he can deal with them and reach the objective. Each step must be made on a basis of basics -- objective material -- pointed precisely toward the objective, then followed by other steps which will, when accomplished, achieve that objective.

Improve the information.

It is traditional for each man to gather a considerable amount of information before starting an important project. Experience has shown that he does not gather enough; that there is usually very pertinent information which he does not have. At the same time, a part of the "information" which he does have and which he believes, is not totally true.

Improve the assumptions.

Considerations are carried out in the framework of the information and assumptions at hand. Experience has shown that vital assumptions are not 100% correct. Certain assumptions are made which further investigation shows to be faulty. Improved assumptions are very essential.

Cause search.

Today, no one library, laboratory, or professional group of any type contains all of the information which would have a beneficial bearing on an important problem. The amount of this which becomes available and can be used in creating the best solutions is directly dependent upon the skill of search. Experience shows that search can be decidedly improved.

Cause creativity.

In possession of basic thinking work divided into mind sized steps, with improved information, with improved assumptions, some significant results of search are practical. Specific sub-problems can now be attacked with intense and skillful creativity. This, in essence, is combining bits of knowledge into new combinations in a directed framework which will promote solutions to the specific problem steps.

Overcome roadblocks or stoppers.

The experienced have learned to expect a whole family of stoppers to immediately confront the consideration of a new approach, the test of a new approach, or the use of a new approach. These roadblocks arise from the reasons of need pointed out in Section 4. They must be recognized for what they are and individually dealt with. Their roots are usually not in the basic situation but are from extraneous situations.

Cause better cost guides to be developed.

There are two overpowering requirements for competing in today's military or industrial competitive race. One is the securing of appropriate performance and the second is the securing of appropriate cost. For a few decades, very good aids and measures have been provided to aid decision making in the task of getting appropriate performance. Now, as it becomes necessary to achieve much higher standards in the amount of performance which is secured per dollar, the same sort of guides or measures are needed for cost oriented decisions. The Value Engineering system contains procedures for the establishment of measures which are not based upon experience and tradition, but are rather based upon inherently basic and pertinent factors. Other guides and measurements are based upon appropriate search and comparison. The quality of the cost oriented decisions is in direct proportion to the quality of these cost oriented measures.

Cause more cost decisions from basic and objective data.

L. D. Miles
1967

TECHNIQUES OF VALUE ENGINEERING AND ANALYSIS

I. Making the Problem Solvable

Identifying functions.

Precisely what function or functions does the customer need or want and want to pay for? Precisely what function does each element or each group of elements accomplish? Precisely what degree of this function is wanted by the customer? Precisely what degree is being accomplished?

Name the functions with a verb and a noun such as: support weight; enclose volume; 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.

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 over-all 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.

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.

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PROBLEM SOLVING SYSTEM

Introductions

Information Step

Analysis Step

Creativity Step

Judgment Step

Development Step

This approach organizes all resources for problem solving--whether large overall or small. It is repeated until the needs of any situation have been met.

Descriptions

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 made recently? Etc.? Etc.?

100% information finding--no interpretation, no analysis, no idea generating now. What are the facts? If not absolutely sure that a statement is true, write it as a "belief" or opinion.

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 first solved? What solutions seem reasonable? What end result is reasonable? What steps--1st, 2nd, 3rd--are indicated? What additional information is required? What are the assumptions? Are the assumptions now valid? Etc.

Creativity Step

Of enormous importance, but a discipline separately taught, hence not included in this course.

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 problems? Etc.? Etc.?

Development Step

The "better answer" is usually 50% to 90% ready to use when it arrives here. 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 field of knowledge to working on the key problems.

(Textbook "Techniques of Value Analysis and Engineering" - page 26, phases 5 and 6; page 31, items 5, 6.)

Relationships

All parts are interdependent.

Information is useless unless we have a plan to use it to meet a need.

Analysis is worthless unless we have an objective, a plan and valid and complete information.

Creativity is economically valueless unless we have a need, a plan, and essential information, analyzed for understanding and stated as a precise problem to be followed by judgment and development.

The benefits of judgment (if any) are limited by the substance which is to be judged.

Development is "busy work" unless the alternatives meet the need.

These five steps constitute a "sub-system" which experience has proven produces superior results.

This system will be repeated in many variations and accomplish surprising results.

L. D. Miles

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QUESTIONS APPLICABLE TO DAY III

3.1 "I don't see anything 'sharp' or 'brilliant' in the techniques which should do so much better than we've done before." Why is it better?

3.2 Why do you put so much emphasis on the job plan?

3.3 Isn't good creative thinking Value Engineering?

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ANSWERS APPLICABLE TO DAY III

3.1 Sam Snead appears to swing very easily--and to do little that we wouldn't do. But he knows how to do it, to do everything right, and he's doing it.

3.2 It's a simple plan. It gets results. When significant parts of it are omitted, results are drastically cut or eliminated.

3.3 No.

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PHILOSOPHY OF VALUE ANALYSIS AND ENGINEERING

Philosophy is the body of general principles that provides a rational basis for understanding anything. We shall discuss here the general principles that furnish the rational basis for value analysis and we shall investigate the premises from which these principles have evolved.

What is back of the techniques of value analysis? What caused this organized approach to be developed in our economic system? What realities are responsible for creating the need for it? One phrase suffices to answer all three questions, namely, "costs which are too high."

Costs are the direct product of people and depend on their logic, attitudes and feelings, knowledge or lack of it, creativity or lack of it, and environment. To minimize cost, we must deal with the causes. To deal with the causes, the organized approach called "Techniques of Value Analysis and Engineering," was created. I shall not discuss the techniques themselves but shall emphasize only the principles involved.

As related to his decision making, each engineer, manufacturing man, buyer, or manager is triply oriented:

1. He is a logical person.
2. He is a "feeling" person.
3. He is an environmentally influenced person.

Costs Arise Because of Logic and Feelings

The decisions of each person are the result of a compromise between logic and feeling. His immediate environment influences the compromise.

1. He believes a decision is right if in harmony with his logic.
2. He feels a decision is right if in harmony with his feelings.

3. He is content in his work and decisions if the decisions of his logic are in harmony with his feelings. He feels frustrated to the extent that his decisions must, for reasons of logic, be made counter to his feelings. Hence, he has a strong tendency to decide along lines of feeling without intense logical exploration, which might develop an opposite logic.

For example, consider the following sequence of events:

1. Product has failed in field repeatedly and the company has been embarrassed. It needs a different switch.

2. Engineer creatively develops one, using a new principle.

3. Manufacturing works out the way of making it, and $10,000 in temporary tools are approved by management to try it.

4. It works. All feel pride before peers for successful accomplishment. Managers and immediate superiors feel and act in a commending manner. All are very pleased with job and selves; both logic and feelings are in total harmony.

5. Later (perhaps a year, perhaps five), competitive pressures require switch functions for lower cost and the engineer is assigned the task because of his "experience" in the area. He knows more about it.

6. He attacks with vigor. Keeping the main operating principles of his former approach, he can change a few parts, improve some tooling, eliminate a few obvious uncontributing costs. He gets 20% out.

7. His logic says the changes are good. His feelings say the changes are fair. He has even now made some slight inroads into his earlier model, which was a proven success in the eyes of himself and his peers. His feelings don't like it. He is uncomfortable about it. He wishes it could have been left alone.

8. Now it becomes necessary to remove much more cost from the total product. He is asked, "How much more can we, by pulling all the stops, get out?" His logic says, "a little." His feelings say, "none." He says, "possibly a hard maximum of 5%."

If this engineer is to benefit the company's sales and earnings by a 50% reduction, he must have a new approach. Since the deterrent is his feelings, which have by now stopped aggressive search by his logic, the solution must come through an approach that deals with his feelings.

Dr. Graves, eminent psychologist at Union College, tells us that logic does not change feelings, that feelings, being emotions, can be communicated with only in emotional terms. Therefore the approach created must emotionally communicate in order to release the man from his past publicly proven work and allow his feelings to become reorganized in a new situation that may remove one-half to three-quarters of the cost. This emotional approach must be based upon logic drawn from the task at hand so that the new adjustment of feelings will be such that the cost objectives are reached.

Now, at this point, a strong manager may say:

"I'll fix that. I'll tell him that instead of 40¢ he must do it for 20¢ or he's fired."

Then the engineer will be emotionally involved. This may help, but unfortunately it runs afoul of another basic truism of the human: "What a man does not believe credible, he is not motivated by." A good man will probably quit, not wait to be fired from what he feels is an impossible situation.

So, to be effective in aiding the individual to remove one-half or more of the cost, the approach must:

1. Be based upon the logic of the task.

2. Communicate emotionally.

3. Be credible to the individual.

Now our hard-headed business manager may say, "I'll short-cut all that by assigning a competent man who has no past involvement with the situation to this task." In cost reduction, and for the reasons just made clear, this will actually produce much better results much faster. It will eliminate the necessity for emotionally communicating in credible terms with the men assigned.

The serious problems of this method, however, must be faced. Men just cannot and should not be abandoned like a used Kleenex after a good job has been accomplished. There are not usually equally challenging though different tasks that can be exchanged between these good men. This method, used sufficiently to get good results, may be decidedly disruptive to the organization, for in some types of work, continuity of certain types of experience may be almost necessary in order to assure undeviating quality.

It is therefore often very desirable in cost-oriented work to keep the same men in engineering and manufacturing and purchasing and to create an approach that will work in harmony with their nature, rather than counter to it, so as to achieve reductions of cost of 50% or more without decrease in quality.

Thus the required compromise between logic and feeling made necessary a planned approach that would communicate emotionally and credibly to individuals on the job so that body, mind and spirit could be used to accomplish the drastically lower cost objectives. The esoteric will recognize this in the value analysis techniques.

Emotional communication is by case study and involvement. One of hundreds of case studies often used in teaching describes a quantity of one on which

costs were reduced 90%. A laboratory containing very large X-ray equipment for metal exploration was being built. To protect adjacent areas, technical men included a partly encircling concrete wall in the specification drawings, according to their science, custom, and practice. It was 14 feet high and 7 feet thick. The best bid to construct it was $50,000.

The manager of the entire plant asked the manager of the laboratory for a written guarantee that if he later moved the laboratory, he would "take the concrete with him." This he was reluctant to sign. The situation forced exploration by construction men who had no past involvement in radiation protection.

Their questions, "What is it for?" "What is its function?" "What else will accomplish that function?" brought the alternative of an earth wall into being. It cost one-tenth ($5,000) of the best bid but was totally functional.

Although the objective result was the saving of $45,000, was this an experience of logic or of emotions to the men involved? The answer is, "both." For the manager it was logic; to the construction men, logic and emotion; to the men who specified the original concrete, emotion; and to others to whom this story is told, emotion.

This type of case study communicates to feelings, and prepares men to accomplish other results of a new higher magnitude.

Approaches and techniques must be created that will allow men to change their own feelings. They are included in the value analysis techniques.

But it is not enough for the whole man to "want" to operate at lower costs. How can he do it?

Costs Arise Because of Knowledge or Lack of It

It has been said that if the decision maker, be he engineering, manufacturing, or purchasing, were in a room surrounded by all knowledge in the world that might bear upon his decision, then he would make the optimum decision. This is nonsense, since:

1. He wouldn't know precisely what knowledge he needed.

2. He wouldn't find much of the information that was there.

3. He wouldn't get the needed combinations of knowledge from different sources usefully associated.

4. He would be just a little better off than the man usually is on the job (because the knowledge would be there, not 1,000 miles away).

What was lacking? First, a better method for defining his problem in terms of exactly the knowledge he needs. Second, a system of search techniques that would bring up this knowledge when he needs it. Techniques must be, and are provided, in the value analysis system that will do both.

An example of the first is the extreme orientation to function, in customer's terms. What "function" does the customer want? Does he mean the terminal board which he says he wants? No! Basically he wants only a suitable means of making connections. Already the knowledge needed has changed from "terminal boards" to "means of making electrical connections." Does the customer want the spring that he says he wants? No! Rather he is seeking a means for returning the shelf to a preferred position. Similarly, would he want the electronic gear he has specified? No! The need is for something that will accomplish the function specified. An efficient system must send the decision maker searching for the knowledge he needs, not the knowledge he thinks he needs.

Men learning value analysis techniques have often fretted at the insistence on naming functions in two words and have often had animated discussions of a few hours' duration about exactly which two words best named the function the customer wants from an assembly or part. Later they would enthusiastically proclaim that although they still didn't agree on how to name it, they now "saw it in a different light," and that their searches for knowledge and use of creativity assumed an entirely different orientation.

An efficient system of techniques, after establishing precisely the areas of knowledge needed, must include effective search techniques. Even if all needed knowledge were in one room, which it is not, an effective search system would be required.

Responding to this need, the value analysis system includes specific search techniques for reaching out into other local areas, other distant areas, other technical areas, other nontechnical areas, other industries, other areas of men's activity, efficiently to find the relevant knowledge. We have two examples of one approach:

1. Use industry specialists to extend specialized knowledge.
2. Utilize and pay for vendors' skills and knowledge.

But this is not enough, and the value analysis system is intended to fill in the voids further with creativity.

Costs Arise Because of Creativity or Lack of It

Einstein said that when there is a problem to be solved, "Creativity is more important than knowledge."

To meet real life situations, the techniques of value analysis must:

1. Provide logic.
2. Communicate emotionally in credible terms.

3. Provide new identity of knowledge needed.

4. Provide search techniques that will find that knowledge efficiently.

5. Cause creativity that will usefully combine the knowledge from diverse sources.

A chemical not yet compounded does not exist. A metal not yet developed does not exist. It's not because they couldn't be, but just because the required combination of creativity and knowledge have not yet been brought together. Similarly, an idea not "thought of" does not exist. The necessary combinations of creativity and knowledge have not yet been associated.

To accomplish the functions that the customer wants for half or a third of the historical or expected cost, a situation must be created in which the necessary creative ideation and essential knowledge are blended extensively and intensively. This is seen in the value analysis system by the strong and continuous emphasis on the skillful use of creativity throughout all parts of the job plan. More on this vital subject is not included here because it is well treated and documented by Osborn, VonFange, and others.

Still, creativity is not enough to complete the search and thus we turn to environment.

Costs Arise Because of Environment

Of course, few environments exist that would not accept a fully developed, fully debugged, fully tested, fully service-proved change which would keep all customer factors at half-cost. But significant improvements are not born full grown. Resources, money, and men must be committed without assurance of results. Creative ideation, knowledge searches, exploration, and basic tests precede results. Of the creative ideation, 99% is worthless; 90% of the knowledge searches are useless; 75% of the basic tests fail. Meanwhile the designs and

practices of the past are working perfectly, performance-wise.

Environment Unsafe - Hence there develops, to some extent in most environments, a "feeling" that men who press hard toward vastly better ways for accomplishing functions at lower cost are dreamers, and that they in fact lost essential touch with reality and have their feet in the clouds and their heads out beyond thin air.

This takes the tangible form of occasional derision of the newest idea creations and especially of the continual stream of worthless ideas, useless knowledge, and failing tests.

The environment is often "unsafe" mentally and socially for activity that would produce large accomplishment. Only small, traditional-type cost reduction activities can comfortably live.

Environment Hazardous to the "New" - "Environment," as used here, includes the managers of a man and his peers:

"Get out today's production; improve the process if you have time."

"Lick that engineering performance problem on the production line; develop a new approach later, if you have time."

"We made this change to save $8,000; it has already cost us $25,000 in field failures." But the ten changes that worked out well in the field, saving $300,000, don't become conversation.

These are the pronouncements heard from management of the business. All communicate to the feelings of men. What do they say?

"He who sticks hard to the proven past, causing no unexpected problems, is without guile and a benefactor to his company. He who deviates from that proven present brings all manner of unexpected tragedies to his associates and company, and is without virtue."

To the extent that the "environment" in which men work is unsafe for the creative and hazardous for the new, all work in decreasing costs is retarded or stopped. An efficient system for preventing or reducing cost must, then, also deal effectively with this environment. It must change it.

Steps of Value Analysis Job Plan

To explore a few steps of the value analysis system and study the interface at which the system takes root from the general principles that constitute the philosophy, reference is made to the value analysis job plan.

Step 1: Information - This step is gathering the information and framing the knowledge which will be the base for the entire logic of the situation. The framework for additional needed knowledge is broadened.

Step 2: Analysis - What are the meanings? What are the total problems, the individual problems, the reasonable goals and plans? What key problems should be first solved? Precisely what will meet the needs of the business?

Step 3: Creativity - Top grade creativity positively essential. Taught elsewhere, hence not described here.

Remaining Steps - In the remaining steps of the job plan (judgment and development) will be found activities that deal with the environment, communicate emotionally in credible terms, identify additional areas of knowledge needed, and provide effective search.

Conclusion

What then, in conclusion, is the philosophy of value analysis? What are the general principles that furnish a rational basis for its system of techniques? The answers are contained in the following outline.

1. It is important to continuously reduce costs; that is, to increase continuously the amount of the function to the customer per unit of man's labor and nature's materials.

2. Since the amount of cost is the result of the decisions of people, a study of decision conditions is the starting point.

3. The decisions of people are controlled by their:

   (a) Logic

   (b) Attitudes or "feelings"

   (c) Knowledge or lack of it

   (d) Creativity or lack of it

   (e) "Environment"

4. A system is needed that will:

   (a) Take its logic from the task

   (b) Communicate emotionally in credible terms

   (c) Identify areas of knowledge needed

   (d) Provide efficient knowedge search

   (e) Integrate creativity effectively

   (f) Change environmental factors

This, then, is the system of value analysis, the essential approach to costs reduction through understanding of function and coordination of man's emotional response with knowledge, creativity, and environment.

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QUESTIONS APPLICABLE TO DAY IV

4.1 Is the task of getting much better costs technical or "people"?

4.2 The Value Engineering I've seen results in "horse sense" constructions and solutions. Why do we have to have Value Engineers to get common sense used?

4.3 Isn't Value Engineering a crutch for low competence, poor training, or lack of experience?

4.4 Wouldn't varied work assignments under competent people in the long run teach a man Value Engineering?

4.5 Doesn't good Value Engineering work even carefully handled usually embarrass someone?

4.6 Isn't it embarrassing for a good engineer to call on a Value Engineer, therefore admitting a deficiency in himself?

4.7 How can Value Engineers operating as such avoid making the engineers feel uncomfortable in their work with them?

4.8 When value engineering a product, how do you overcome the "not-invented-here" complex?

4.9 Do you believe that the good use of the Value Analysis system returns $10 for $1? If you do, why all of the delay and talk; why don't thousands of managements use it at once and well?

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ANSWERS APPLICABLE TO DAY IV

4.1 People.

4.2 "Common sense" is uncommon and hard to come by. We are psychological individuals. Our studies take the line of our feelings, beliefs, and ideas. Many objective alternatives are not developed at all. All of those which are developed are further colored by our experience, our attitudes, our fears, or our hopes. The results are not objective solutions.

4.3 No.

4.4 No.

4.5 Yes.

4.6 Depends on his boss and his peers. If they still think that an engineer can handle his traditional job and, ignoring specialized help, achieve superior economic objectives--the answer is yes. When they learn the depth and vitality of the contribution available, they would criticize him if he didn't use it.

4.7 They can't, entirely, but the engineer's boss can end much of it. He can keep them from feeling uncomfortable while working with specialists in heat transfer, vibration, stress analysis, value engineering, or other. This is one reason why the degree of accomplishment with Value Engineering is so controlled by the manager's attitude.

4.8 You can't. The manager of the business must cope at least reasonably with it or results will be cut drastically.

4.9 Responsible people deviate from their normal life patterns and accept something quite new that affects them only in two situations:

Situation 1. Extreme need focused directly upon them.

Situation 2. They must have seen unmistakable proof in their frame of reference.
They must understand how the results were achieved.

It isn't easy to get an opportunity to prove it in the frame of reference of millions. Furthermore, as we can see here today, it isn't easy even in the face of proof to communicate understanding.

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THE SYSTEM

Value Engineering is a System, like a telephone, an aeroplane, an automobile, composed of...

many familiar parts,
a few modified ones and
a few new ones.

But, instead of parts, it consists of approaches, understandings, techniques--for one sole purpose, "the efficient identification of unnecessary cost."

All of us realize and "feel" the futility of trying to get good results with the telephone--which is a system of parts--with even one wire or connection absent.

No one would attempt to drive an automobile--another system--with one wheel short; although we do occasionally attempt to drive them with gasoline absent.

Our secretary would dish up a rather "unusual" letter if she were forced to type on a machine lacking only one key.

Yet when it comes to performing our cost oriented work, it is customary--not even the exception--to use only the approaches and techniques we've learned, which would certainly be short one-tenth to perhaps one-half of the approaches which would propel toward a solution. We don't miss the remaining techniques we need, but don't have, because we don't see others using them.

Thus, when we mentally compare the results we get against the results possible, it's like comparing the effectiveness of a telephone with all parts in place to one lacking 10 per cent of the needed parts.

One would expect the effectiveness, as we add the few thinking processes and techniques which the task needs, would rise shockingly--as it does.

The overall strategy of value analysis or value engineering includes an array of tactical parts to deal with specific needs. Each need--unfilled--constitutes a valve stopping the flow of results. As each need is covered by a suitable tactic or technique the flow from the system or results from the work accelerate surprisingly.

Once the concept of the overall system nature of value analysis is understood, most of the confusion, apprehension, and fear of conflict disappear.

Value, in a product or service, is the reward for appropriate performance and appropriate cost. Value Engineering must accordingly contain techniques which will sensitize any "lacking" area so that the need can and will be ended.

We have found this system nature of value engineering to be reasonably well communicated by comparison to a piano.

Before the system was put together there were wire, mahogany, castings, screws, paint and assorted fastenings. Each of the elements has a score of good uses. Each is a needed element in its own right. Wire may dry clothes, carry communication, hang bridges, or keep the hogs out of the cabbage patch. Mahogany may support the table, make molding patterns or adorn the president's yacht. All uses were important--some very important. There is nothing new, however, about those materials in those uses.

When the elements have been put together into one specific system, it is called a piano. In this system, every element is appropriately arranged, in view, and readily at hand to make possible solely <u>one</u> purpose--the performance of good music. The new value came not from the amount that is new or not new but from the fact that all of the materials were properly arranged and all

items needed were included. They were at hand--could and would now be used for one purpose and would accomplish that at very high efficiency.

When first created, the system was short some tones. Search found some little-known but very satisfactory wire and brought it into place. Need, then, caused a few new wires to be developed and put into place.

Another interesting find was that while some of the wires from the fence, the clothesline, etc., which permanently accomplished their other functions well, when used for this purpose were a little off tune, quickly lost their tonal accuracy, required great skill to use, or required skilled tuners constantly. The result was that some existing wires were modified.

Now, using largely existing materials, modifying some, and adding a few new ones, then arranging all in an efficient system for accomplishing one specific purpose, new horizons in music were within reach of many more people.

Still, major problems existed with this then new product. Some liked the low sounds and some the high. Not knowing how to use it and often several using it at once, audible mayhem resulted.

Slowly, then, there developed understanding and skill in using it. It was found that for some music certain keys were used and for other, other keys. From this beginning emerged training. Later, it became obvious that only with much talent and some training or much training and some talent could the normal capabilities of the system be utilized.

Wisdom and understanding grew as the new system found its permanent place in its culture. In preparation for comparison to the Value Engineering system, some further observations are made.

1. Music can be made by many methods and is so made.

2. A wide range of music can be efficiently made on the piano.

3. Depth training in piano use is essential if its capabilities are to be utilized.

4. Very irritating sounds often result when the untrained applies vigor to the keyboard. The nearby environment revolts against the creation and, if possible, tosses it out.

By comparison...

1. Value Analysis or Value Engineering is an arrangement of techniques--some old, some modified, each with its own specific usefulness, and some new--for the accomplishment of one specific purpose--the efficient identification of unnecessary cost--before, during, or after the fact.

2. The system has large capability.

3. Its capabilities can be recognized by all, but only utilized by those with depth training and developed skill.

4. It is an abomination when in an environment where the system is not understood or when it is used by those untrained or unskilled.

5. All parts necessary to accomplish almost any of its type of task are included; however, only the parts needed are used to accomplish any one specific task.

"What are some of the keys on the Value Analysis piano?" A segment of the keyboard covers each of the following and dozens of others:

Industrial engineering practices

Work simplification

Manufacturing engineering

Economic design techniques

Depth process knowledge

Supplier specialty knowledge and technique

Good buying

Etc.

Some segments include work needed but not now done.

Each of these groups of keys has its contribution to make when needed and the answer to the problem of securing appropriate cost in any specific system or device may lie in any one or several of them.

A complete definition of Value Analysis then is, "Value Analysis is an arrangement of techniques which...

...makes clear precisely the functions the customer wants,
...establishes the appropriate cost for each function by comparison,
...causes required knowledge, creativity, and initiative to be used to accomplish each function for that cost."

It is seen that some of the techniques--the keys on the piano--are for the purpose of clarifying functions and some are for establishing appropriate costs by comparison. It will also be seen that some of the techniques "cause" the required knowledge, creativity, and initiative to be used. It is in this area that it was necessary to develop some modifications, some extensions, some specialization in techniques used by engineering, by manufacturing, by purchasing, by marketing, and others, in order to develop maximum potential in the elimination of unnecessary costs.

The strategy which is Value Engineering makes clear many causes shown by experience for unnecessary cost.

The action of the Value Engineering system is to identify which of the areas holds the solution to each specific integer of unnecessary cost. The necessary knowledge, creativity, and initiative can then be used exclusively where needed and to the extent needed to end the cost problem.

Some areas are:

1. Management Organization

   If the organization is not best suited to the task to be performed, it can only produce poorer performance in the product or extra cost. If poorer performance results, tests will normally follow and it will be promptly corrected. If, however, higher costs result, they often continue.

2. Marketing Concept--customer functional understanding

   The customer purchases a product to accomplish functions for him. These are exclusively "use" functions and "esteem" functions. To the extent that the customer has not been caused to clearly understand and communicate just the functions he wants to buy and pay for and to the extent that this information is not basic to the engineering and

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ORGANIZATION FOR VALUE ENGINEERING IN RESEARCH AND DEVELOPMENT

In the work of research and development, all of us would like four improvements:

1. Shorter time of development.
2. Lower cost of development.
3. Greater reliability in operational product.
4. Lower cost of manufacture for the resulting end product.

We will discuss a system which can usually contribute to three of the four objectives:

1. One-third less development time.
2. Greater reliability.
3. Twice the weapons per dollar due to halving of manufacturing cost.

It is in the very nature of the operation that the cost of production quantity, rather than the development cost, should be of greatest significance to the nation.

For the R & D management, there are now two equally binding objectives:

1. Meet technical or performance specifications.
2. Meet end product cost specifications.

A product lacking either is under-designed. Managers organizing for R & D will now look to utilizing the competence and the organization which secure both.

One of our leading managers of engineering a short time ago said to me, "Why is it that we always under-design no matter how many engineers we assign to a job? What environment can we create for our engineers which will minimize this situation?"

Let's address ourselves to this question.

First, from a viewpoint of end product cost, new products are almost totally old. It is a rare development in which the area of total newness comprises more than 10% of the end product manufacturing cost. Enclosures, servomechanisms, instrumentation, etc., utilizing known technology, absorb at least 90% of this cost. For the moment, it will be productive to set aside the 10% product cost which will go into new technology and face the task of removing large dollars from the 90%.

Secondly, our experience has proven that shorter development time in producing reliable developments--economical to manufacture--is limited far more by lack of the new idea than by lack of a new material or process.

R & D organizations might then be arranged for searching, locating and providing the necessary new ideas which will reduce costs where they are greatest--the 90% in the cost area utilizing known technology and hardware.

If the challenging objectives of one-third less development time, more reliable products, and one-half the end product cost are to be achieved, you gentlemen will expect to utilize some very different strategy.

We have had some astounding results in some test cases where we have assigned one value engineer to each design engineer. Simpler, more reliable, lower cost solutions to technical problems did come forward in a minimum of time. Both engineers stated that they had never worked in such a productive atmosphere, and they quickly became very proud of their new achievements in the cost and performance field.

Hard-pressed management of R & D work will immediately ask, "What does this value engineer do?" A short redefinition of the multiple assignments which the R & D engineer now has will be helpful. He must (1) secure certain technical performance and he must (2) secure certain cost performance. His

technology, tests, and measurements guide him toward suitable technical specifications. The value engineer maintains that appropriate performance but, at the same time, develops alternatives which will provide appropriate costs or we might better say, appropriate quantities. He utilizes his technology to provide to the design engineer alternatives of large economic value. He lengthens the engineer's reach and shortens development time by bringing "ready done" solutions not only into the area of known technology but often into some of the areas of new technology. As the engineer reaches out, secures and applies new technology in the technical area, so he reaches out, locates and develops practical alternatives in the cost area.

But it is asked, "If I want R & D work to go faster, why wouldn't I just hire another engineer--have two engineers on it--not one--move it twice as fast? Why would I hire a value engineer?"

I guess it's a matter of quantity of special technique and knowledge.

Why would you hire a metallurgist or vibration specialist to work with the engineer instead of just hiring another engineer? Because you have learned that his knowledge and his approach get the engineer to the better answers sooner.

Abundant evidence has accumulated which speaks for the usefulness of this special knowledge and skill.

The value engineer is not a specialist in these technical areas, but an "extreme generalist." He does not know steels in depth, electronic circuits in depth, vacuum castings in depth or any other specific traditional technology. What he knows and uses in depth is a system for identifying function, for evaluating functions in dollars, and for starting a chain of activity which

will produce, from vast and diverse resources, the economic solutions to the problem--often "ready to use."

Is he a crutch? Is an advanced mathematician a crutch? Is a specialist in servo-mechanisms a crutch--or the efficient way to accomplish the objective?

Seldom is a large task appropriately accelerated by increasing numbers of workmen using the same tools. This certainly holds true in R & D, especially when economic specifications have forced increased emphasis. If 500 machine gun troops cannot accomplish a mission, 1,000 may do no better. A pattern of resources, not set by a past system but dictated by the realities of this situation, is called for...perhaps only 200 machine guns, 20 bazookas, and one observation plane.

You might well ask, "Do you mean that if I am using 500 engineers in R & D work and I want to increase their productivity as you have outlined, I must hire 500 value engineers?"

Certainly not.

Select fifty. Make certain that they represent your average pattern of abilities, some being among your most productive men. Have them trained in the technology of value engineering. Assign them to engineers who are responsible for important areas of functional performance. Learn how to integrate their benefits into the organization. Then, on a basis of known performance, "grow" the changes in organization to provide an effective technical and economic development group.

Later, train more value engineers as needed. Meanwhile, provide suitable information to the remainder of the organization so that they will understand the value engineer, his mission, how he goes about his work and how together they can secure better results faster.

You will be gratified to find that often the development moves twice as fast and that end results are more reliable and much lower in cost.

A word of caution may be in order. Research and development management, anxious to try this approach quickly, may be inclined to select certain individuals with rather general training and experience, assign them the name and the work area of the value engineer and put them to work. This must not be done. Already significant techniques, approaches and special knowledge have been developed in the value engineering field. Provide them training in this first.

Again, the manager's work will be different when he has a suitable number of value engineers.

His work must include:

Planning the economic or cost results expected of each value engineering man or group

Providing to them the tools their technology requires

Pacing them

Directing changes as new influences arise

Progressively measuring their work, progress, and results

Suitable periodic reporting to upper levels relating to them.

If I may be allowed a small exaggeration to make a large and important point, I would say, "Look at rules and guides which are organizing your work with a jaundiced eye." A rule must be used only when it fits the specifics. A rule based upon the statistics of the past might well state, "Clothe these 1,000 men in suits which are size 40 regular, with 32" sleeves and 32x32" trousers." This would streamline procurement, greatly reduce fitting costs, but--what a shocking appearance these men would present and how clumsy they would be in their work! The problem is, the rule did not fit the specific situations taken one by one. Perhaps as we both accelerate our development

of weapons and double, when needed, our quantity per dollar, each manager will want his men to prove, before using a rule, that it fits the situation.

The realities of design and development have taught us that lower cost--or increased quantities--is often lost at the first of a group of four or five design and manufacturing decisions which must be made in series. Given a function to perform, excepting in the newest of technologies, usually there are several design approaches. The design approach taken at this point may determine whether the product can be had for $500 or will require $5,000.

Next, choices of materials within the chosen design approach again set minima on resulting end product cost.

Next, choices of processes again set cost minima.

Finally, choices of manufacturing, set-up, and arrangement operating within the framework the previous decisions have provided establish the cost.

At each of these decision points, the value engineer provides the R & D engineer with alternatives related to cost which allow him to make the decisions which will allow lower end product cost.

Time is shortened because of the abundance of "ready to use" solutions provided throughout the entire process by the value engineer.

Reliability has been improved because these alternatives have so often provided the best and simplest means for accomplishing the specified functions.

In conclusion, together let's face the task of accomplishing our developments in two-thirds of the former time, achieving greater reliability and arriving with end products which will be built for half the former patterns of cost.

To accomplish this, let us set extremely high standards and expect them to be met. Let's use the required contributions from value analysis and value engineering sufficiently to achieve these standards.

"Managing the Use of Value Analysis
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1967 Engineering and Management Course

L. D. Miles
Miles Associates

QUESTIONS APPLICABLE TO DAY V

5.1 How can we measure a good Value Engineering job?

5.2 Would you say there is a fairly fixed optimum ratio of value engineers to the total complement of personnel of a business?

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ANSWERS APPLICABLE TO DAY V

5.1 How can you measure a good medical doctor's job? How can you measure a good metallurgist's job? If the patient lives, the doctor succeeded. If the new metal allows the objectives of 10% increased thrust from the jet engine to be accomplished, the metallurgist has succeeded. With the Value Engineer, if the business has satisfactory costs enabling it to sell at competitive prices at an appropriate profit, he has succeeded.

5.2 No. Having value in a product, service, or procedure usually means that it performs its use and esteem functions as good as or a little better than competition, and has costs as low as or a little lower than competition. If the in-place competence and procedures are selling it at competitive prices and making a suitable profit--then they need no Value Engineering. If the opposite is true--if costs are too high--they need it. They may need much of it--and quick.

L. D. Miles
Miles Associates

QUESTIONS APPLICABLE TO DAY VI

6.1 Since the objectives of Value Engineering are not new and most of the techniques are not new, why do you say Value Engineering is new?

6.2 I've had the feeling that Value Engineering was after the fact--looked over the hardware after the job is done. As a matter of fact, it's the same with a doctor--you don't call a doctor until the patient is sick.

6.3 If Value Engineering is really feasible, why isn't it done as a planning function before the fact, not as a control function after?

6.4 Value Analysis seems a little like mysticism--"Just move the Value Analysis wand over and back and everything will be different."

6.5 How do we best sell Value Engineering to top management?

6.6 What are the main organizational drawbacks?

6.7 Where should Value Analysis report in an organization?

6.8 How would I apply Value Engineering to a service like a tax collection office?

6.9 Does Value Analysis apply to the preparation of food in a restaurant?

6.10 Doesn't Value Engineering increase the risk factor?

6.11 How much time is there to do Value Engineering?

6.12 If I had 100 engineers working on a design job and saw they were going to be unable to get designs with the required cost levels, wouldn't I just hire a dozen more engineers?

6.13 Isn't it the function of the Value Engineering group to pick up everyone's mistakes?

6.14 Shouldn't all engineers become Value Engineers?

6.15 Isn't Value Analysis re-thinking?

6.16 Is Value Engineering now being accepted overseas?

6.17 Is there Value Analysis work to be done in management area?

6.18 Why do we find it so hard to accept the premise that specialization in the field of getting lower costs for wanted functions is practicable? Do we really need it?

6.19 I don't understand it. How do we know when an engineer is doing Value Engineering and when he's just doing his engineering job?

6.20 Is Value Engineering just done by full-time people?

6.21 Is Value Engineering permanent or passing?

6.22 How does a Value Engineer determine what to do?

6.23 How do we know when we need Value Engineering?

6.24 What got it started?

6.25 How did it start?

6.26 How do we know that Value Engineering has enough depth and makes a contribution that should not be made by others. How do we know it's the best way to do it?

6.27 How would you apply Value Engineering to the R & D area and still not inhibit creativity?

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ANSWERS APPLICABLE TO DAY VI

6.1 The objectives of the DC-6 are the same as the jetliner and most of the parts are nearly identical. Why do we say the jetliner is new? It has a few parts that are new and some parts that are modified, so the overall "system" is new and it accomplishes a new order of magnitude of the desired function.

6.2 That's right--and many are doing that in Value Analysis right now. BUT--many have found it better to use the right amount of a doctor's advice day to day to avoid these crash trips to the hospital.

6.3 We can't start yesterday. If it's an existing product and better economic objectives are needed, start now. If it's a new product or service, start far before the fact.

6.4 Value Engineering is a "something for something" approach. We have to decide to do it, to learn how, to staff it, to do it, and to pay for it--then we get the benefits. Value Engineering contains some elements--some "wire"--that the system needs when better economic objectives are important. The effect is usually surprising.

6.5 They would only be interested if:

1. They have a cost problem
2. They recognize it as an important problem.
3. Somehow enough understanding is communicated so that they believe that this is the efficient way to end the problem.

6.6 Newness. Any business staffs itself to accomplish the tasks it believes it has, basically in the manner the individual managers have seen it done by others--with small deviations. There has always been the need to meet high performance objectives. There has never before been the need to meet such high economic objectives. Business has not been staffed to do it. The drawback is that everyone thinks getting good enough costs is his job--although he will usually agree that he has often not been able to accomplish it. He says, "Who is this stranger?" He feels, "How will he affect me?"

6.7 To the lowest manager accountable for earnings.

6.8 Name and understand functions precisely. Divide into "use" and "esteem" type. Divide into basic and second degree. Create alternatives for evaluation of each function separately, i.e.,

1. use functions - collect taxes, give receipt
2. esteem functions - provide convenience (to customer)

3. In accomplishing each use function, what basic and what second degree functions are required?
4. In accomplishing the esteem function, what basic and second degree functions are required? Evaluate each separately by comparison.

6.9 Yes.

6.10 No. It lessens it.

6.11 There is no time to do any work that is not needed. If better costs are not needed, don't do it. But if anything is needed and not done, it extracts its price anyhow. Than we pay for it in lost business and lost profits and the business line goes downhill.

6.12 No.

6.13 No. A "mistake" is using wrongly some idea or some tool we have. It was not a "mistake" of Napoleon not to use the bazooka. Neither the tool nor the idea were around. It's the function of the Value Engineering group to provide better and appropriately-developed ideas for one sole purpose--to accomplish reliably the functions the customer wants at lower cost.

6.14 No. All engineers should take some techniques and approaches from the Value Engineering system and use them--the same as they learn and use organizing from management, budgeting from accounting, patent practice from patent lawyers, etc. This doesn't mean that the engineer has become a patent counsel nor that patent counsels are not now needed.

6.15 Yes--or new thinking.

6.16 Yes.

6.17 Yes.

6.18 We may work at keeping healthy the best we know how. Still when we have an accident, a broken bone, or an illness we call the doctor with specialized knowledge, approaches, and skills. We don't quibble about whether he "belongs" in our system of life.

We try to follow the law and still at times we know better answers come from calling legal counsel.

We fertilize our soil. Still at times the results are not good enough and we do call the specialization of the soil specialist to bring improvement.

6.19 How do you know when he's using metallurgy or stress analysis or advanced electronics science? What he and his peers can learn in each field and take in their stride becomes part of their "engineering." He is not doing Value Engineering. If, however, the amount of either Value Engineering

or metallurgy or electronics he can know and use does not produce the needed objectives, specialization in any or all is brought in to help him.

6.20 Yes and No. To do Value Engineering work requires working knowledge of the philosophy, techniques, and approaches of the entire system and developed skill in applying them to every-day situations.

Nothing says that a medical doctor be full time. He could take up law; he could become an accountant; he could manage a grocery store. But if accident or illness are critical, I'd sooner go to one who uses his entire being in advancing in his medical profession--not dividing himself so thinly.

A problem we have now in Value Engineering, to use the same simile, is that the lawyer, the accountant, the store manager take a week's course in medicine and then say and believe, "I'm a doctor"--and start setting bones.

6.21 Permanent. As technology began expanding about the turn of the century, new functions and new products were being created so fast that expertness in competitive cost did not matter that much. From now on, however, with so many relatively "matured" products, lack of expertness in Value Engineering may well nullify a company's expertness in management, sales, engineering, manufacturing, or purchasing and be the reason for its mediocre success or failure.

6.22 He doesn't. How does an accountant determine what to do? How does a lawyer determine what to do? Does he say, "I want to do some accounting--what can I do it on?" or "I want to process a legal case--who can we sue?" Certainly not. A basic need exists in the business, so the accountant is hired and told to make up the records necessary to serve the need. A debtor's bill is long overdue. A need is seen for legal action to clear it up. The lawyer is assigned and does it. The same with Value Engineering. A management needs lower costs on A product, B process, C contract D research project than its present resources get for it. It staffs the amount of Value Engineering that is needed to eliminate the need.

6.23 How do we know when we need a doctor? Although we continually use good health practices, something in our environment or in our acts or in our lack of action has caused us to be sick, so we call in specialization to solve it.

When the costs in a business are so high that a product or service cannot be sold competitively at a profit, that part of the business is sick. Specialization will solve it.

Or, when the costs in a branch of government or an educational institution make it impossible to perform the functions needed with the dollars available, it has an illness. The Value Analysis system was created to solve it

6.24 So much unnecessary cost, that had been missed so long, occasionally came into view. Vice presidents of engineering, manufacturing, and purchasing decided to do something different about it.

6.25 Research was organized and carried out to better understand the reasons for so much unnecessary cost, and to determine ways to avoid it.

6.26 It's hard to learn for sure. If we were not "conditioned" to expect the contribution of medical doctors, how would we learn? I think we'd take one who is vomiting to him and see what happened. We'd take one with a broken bone to him and see what happened. We'd take one who acted hysterical. We'd take one covered with sores. Then, if we found that all or most of them improved or were completely restored to health, we'd want to know how it was done. We'd want a sensible pattern in our own frame of knowledge to explain the effects we'd observed. We then would have both proof and understanding. We'd no longer be perplexed. We wouldn't worry about doctors or self-medication. We'd just call one when needed and live our lives.

Learning that Value Analysis has the depth--excepting for those who can invest the time to learn its techniques--is the same situation.

6.27 Nine-tenths of R & D money is not in the area of unknown. The same benefits of different thinking with psychological brakes partly removed will get simpler better solutions sooner.

In 10% area of unknown, proceed full-speed as before. Even there, some thought from a different angle produced by the approach will often shorten time.

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EFFECT OF "FEAR OF EMBARRASSMENT" ON DECISION MAKING

Producing good tomatoes requires good seed, planting and nourishment. Producing good earnings, in a competitive economy, requires good alternatives for implementation, good implementation action, and good follow-through attention.

No matter how high-grade the seed, no tomatoes grow unless the seed is planted and nourished. No matter how good the "earnings producing" alternatives are, there will be no trips for extra deposits at the bank unless the "implementation environment" makes and nourishes the changes. There are extremely valid environmental factors which "block" changes. They are factors which influence human decision making. One rather surprising and extremely vital factor influencing or causing decisions--"the fear of professional embarrassment"--will be examined.

To establish a background of reality, several examples will be listed, then later examined. To promote proper conclusions it must be well known that all of the managers and decision making people involved were high-grade successful management men. The examples are from four companies.

1. A control device which had lost two-thirds of a large market because of high costs, and was in a loss position, was examined using VE techniques as the result of a "Marketing Department" request. It was soon seen that costs in the order of 25% could be eliminated with no quality deterioration. The manufacturing manager went to the vice president and asked that the work be stopped.

2. When a company with about $5 million business per year lost its profit position, the Vice President of Engineering came to me. He asked help in finding a Value Engineer. I helped him to get a good one and a seminar was held. In the seminar one purchased item was a large forging, which cost $500,000 per year. Five changes could be and were put into effect immediately after the seminar, keeping all quality and adding $160,000 to earnings yearly. Result? The Vice President of Engineering has prevented the Value Engineer from getting any increase in salary for two years, and has let it be well known that he is unwelcome in the Vice President's office.

3. Five 300-foot pieces of copper bus were braised to form a continuous winding 1500 feet long for large electrical equipment. The VE, invited into the job because of high costs and low earnings, arranged with a copper producer to ship it in 1500-foot lengths, greatly simplifying manufacturing, improving the product slightly and decidedly reducing costs. The "scope" of the Value Analysis and Engineering function in that company was reduced, and their budget further limited.

4. Two Value Engineers were invited to take the challenge of increasing the annual "cost reduction yield" in a large company, at a time when it was "hurting" for earnings. In two years they increased the annual cost reduction contribution to earnings from $3 million to $6 million. They were then "made available" as surplus personnel.

Understanding the "why" of these decisions is a necessary ingredient of success in a competitive economy. With understanding, better handling of these factors will result.

Case 1--the control. All responsible management people knew that this control was in "trouble," and that full time, management lead committees had completed cost studies and "found nothing significant could be done." If a different problem solving approach and thinking system now shows large earnings improvement, it communicates to all that, "The men on the job are not good thinkers, are not effective mental-workers and leaders." It is the most embarrassing and perhaps the most injurious thing that can happen to the professional men.

Case 2--the forging. All management and peers knew that the large forging was the sole responsibility of the vice president of engineering. He himself before the seminar said, "I've handled that myself; nothing whatsoever that could be done has been left undone. It's really a waste of time to include it in the studies." As $160,000 of cost came out, he was embarrassed. Probably he was hurt. And naturally he didn't like to be embarrassed and probably hurt in his professional field.

Case 3--the copper bus. Engineering knew that 300 feet was the maximum available length. Manufacturing knew that 300 feet was the maximum available length. Purchasing knew that 300 feet was the maximum available length, and got out the copper handbook to prove it. The longer lengths had probably been discussed before, and probably in the presence of the company president. That the VE couldn't see functional or economic reason for cutting it off at 300 feet, and went out to the supplier who agreed, made the shipments, and lowered the price, embarrassed them all. It probably did lower the president's appraisal of their thinking ability, of their resourcefulness, and their effectiveness on the job. It probably did injure them somewhat professionally.

And naturally they didn't like it and aren't about to help set the stage for repeat performances.

Case 4--$3 million per year. To accomplish this amount of added earnings, dozens of large actions, and hundreds of small ones--similar in nature to those just reviewed--had to be brought into focus and had to have objective action. These were not cases involving large expenditures for tooling, or dependent upon new materials or processes. They yielded to the VE process of "making the problems solvable," then using the "problem solving system" to produce better thinking and better use of what was available. In all cases "it could have been done before." So this cruel thought brought embarrassment to the men making the small decisions and the large ones alike. Add to this the fact that the company was not now "hurting" so badly for earnings, so that much of the force which made it seem necessary to "endure" the embarrassment was now gone.

It is all quite understandable. Understanding this little about it, what shall we do about it? Let's learn more and let's utilize the knowledge effectively as it shows itself to us.

We have in Value Engineering a tool that sprays embarrassment just as automatic weapons spray lead. And we don't know much about embarrassment. I, myself, don't know what it is. I am embarrassed, but I don't know what it is. And I don't know how to handle it. I don't deal professionally with it. But I expect to learn, now that in my judgment it's being isolated as a vital factor. Evidence is showing that there is no other force in decision making in management that is even one-tenth as strong as the force which has embarrassment or fear of embarrassment in it.

Are managers and bosses the prime sources of embarrassment? "What a man believes his boss expects of him determines what he must do." Perhaps he must either do it, or persuade his boss that he tried skillfully. If he believes his boss expects him to have taken simple actions which would end unnecessary cost--and he does think he is so doing--then he is in trouble when a different thinking process makes large savings possible in his area.

Perhaps a different management attitude, thoroughly communicated to men, would decrease the destructive effect on decision making. This attitude is the realistic one "unnecessary cost is NORMAL." Missing one-half or one-third of the opportunities in our jobs is NORMAL. The boss is doing the same. Get another man in my job and he would do the same.

There is a general belief that unnecessary cost is bad. Unnecessary cost is normal! It always exists and always will. As long as we feel that unnecessary cost is bad, we feel when doing cost preventive work as though we were cleaning out the cesspool. There is unnecessary cost in everything we make. Unnecessary cost usually runs between 40 and 75%, depending upon whether products, processes or services are mature or are in the newer categories.

As soon as we can adopt a different philosophy--that unnecessary cost is not bad--thousands of engineers who have done their best, with their knowledge, their time, their ability, with the help given them by their employers, will not feel criticized when someone shows that jobs costing $10,000 could have been done better, simpler, and more reliably for $1,000.

We often hear the word "right"--we want costs "right" before we start. There is no "right" cost, in the sense that this is the ultimate. There is a right cost in the sense this meets the needs of the time, as set by an informed management on the basis of all the competitive factors; but the right cost will

usually still contain 25% or more of unnecessary cost.

SUMMARY AND CONCLUSION

While the skillful use of the VA and VE techniques produces the thinking which makes individual solvable problems, then provides the thinking which produces good value alternatives, much is for naught. The effect of fear of embarrassment, at implementation decision making, usually mandates negative rationalization, rather than implementation.

The source of the embarrassment seems to be men's managers and bosses. Therefore, a fruitful first source for ending the "decision controller" is probably with men's managers.

No disservice is either expressed or implied to the men who must weigh this factor very heavily, because, alas, it seems that embarrassment does inflict real injury upon a professional man.

Environmental Realities which will Decrease Value Engineering Results unless Recognized and Properly Dealt with by Management

1. What people believe you think they are, determines what they must do and say.
2. Men are psychological -- not logical.
3. Feelings decide plans and limit decisions.
4. We cannot communicate to men's feelings by logic.
5. Decisions are very personal. Each is based mainly on minimizing the risk of personal loss.
6. Men discredit what they don't understand.
7. Management needs proven results plus understanding to make decisions.
8. Value engineering techniques are not motivators -- they are do it techniques. Necessary environment must be set by managers.
9. Knowledge is freedom -- lack of knowledge is partial bondage.
10. Creative people are felt to be hazardous by noncreative or judicial people.
11. The new has no chance to succeed in the hands of the one who wants to fail.
12. Never try out the new in the most difficult test.

L. D. Miles
3/24/67

COST REDUCTION PROGRAM-CHECK LIST - PREPARED BY FRED SHERWIN, RAYTHEON COMPANY

I. ADMINISTRATION

1. Is every cost reduction chairman and coordinator acquainted with Company Policy 10-401-110 July 1, 1966? _____

2. Does management at all levels direct cost reduction activities and hold monthly meetings to review results? _____

3. Does each business function participate actively and produce results in the program? _____

4. Are proper reporting procedures followed accurately and timely? _____

5. Does each manager and individual contributor know his responsibilities to the program? _____

6. Do all key employees who can contribute to the program have a copy of "Raytheon Cost Reduction Program" brochure and has it been reviewed with them at staff meetings? _____

7. Have difficult goals been set and equitably allocated to all key techniques and each business function? _____

8. Does each key employee have a personal goal and does his supervisor measure his achievements in this area? _____

9. Is a proper balance maintained between cost reductions and cost avoidances? _____

10. Is there an attempt to insure that all cost reduction efforts are documented? _____

11. Are all cost centers the object of cost reduction effort? _____

12. Are cost reduction projects purposely and systematically selected, and targets and time tables set? _____

13. Are cost reductions properly validated? _____

14. Are periodic progress reports on cost reduction projects required at staff meetings? _____

15. Are all the sub programs given the appropriate attention and direction? _____

16. Are sufficient people and time allocated to administer an effective program in all areas? _____

17. Are suggestions answered promptly and its follow-up and implementation expedited? _____

II. MOTIVATION

1. Is each employee encouraged by management to contribute regularly to the program? _____

2. Is suitable recognition, rewards and compensation provided to each contributing employee? _____

3. Are posters, articles, news sheets and other promotional methods used to keep the program dynamics and provide continual individual motivation? _____

4. Does each employee understand his responsibilities to contribute regularly to the cost reduction program? _____

5. Is the cost reduction effectiveness of each business function and individual measured and are they informed of this measurement? _____

III. TECHNIQUES

1. Are all key decision makers trained to value analysis techniques? _____

2. Are all analytical techniques applied to appropriate cost centers? _____

3. Is creativity encouraged and does a creation atmosphere exist? _____

4. Are creative techniques broadly employed in problem solving? _____

5. Is teamwork prevalent in decision making and cost reduction project work? _____

6. Are cost targeting or product cost control concepts employed? _____

7. Are new materials, products, processes, sources, techniques, etc., given wide publicity? _____

8. Are information seminars held? _____

9. Are special task forces conducted? _____

10. Are all cost centers the object of cost reduction efforts:

    procedures _____
    paperwork, publications _____
    scrap _____
    traffic _____
    filing systems _____
    shipping and packaging _____
    telephone _____
    lighting and services _____

maintenance _____
inventories _____
warehousing _____
capital equipment _____
heating, air conditioning _____
food services _____
test and calibration _____
inspection _____
engineering drawings _____

11. Is every effort made to capitalize on the profit making aspects of value engineering and cost incentive contractual classes? _____

12. Is cost information well organized and quickly available for analysis? _____

13. Is cost estimating done rapidly and efficiently? _____

14. Are work measurement and simplification techniques widely used? _____