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PRINCIPLES OF VALUE ANALYSIS ENGINEERING ©

BY:

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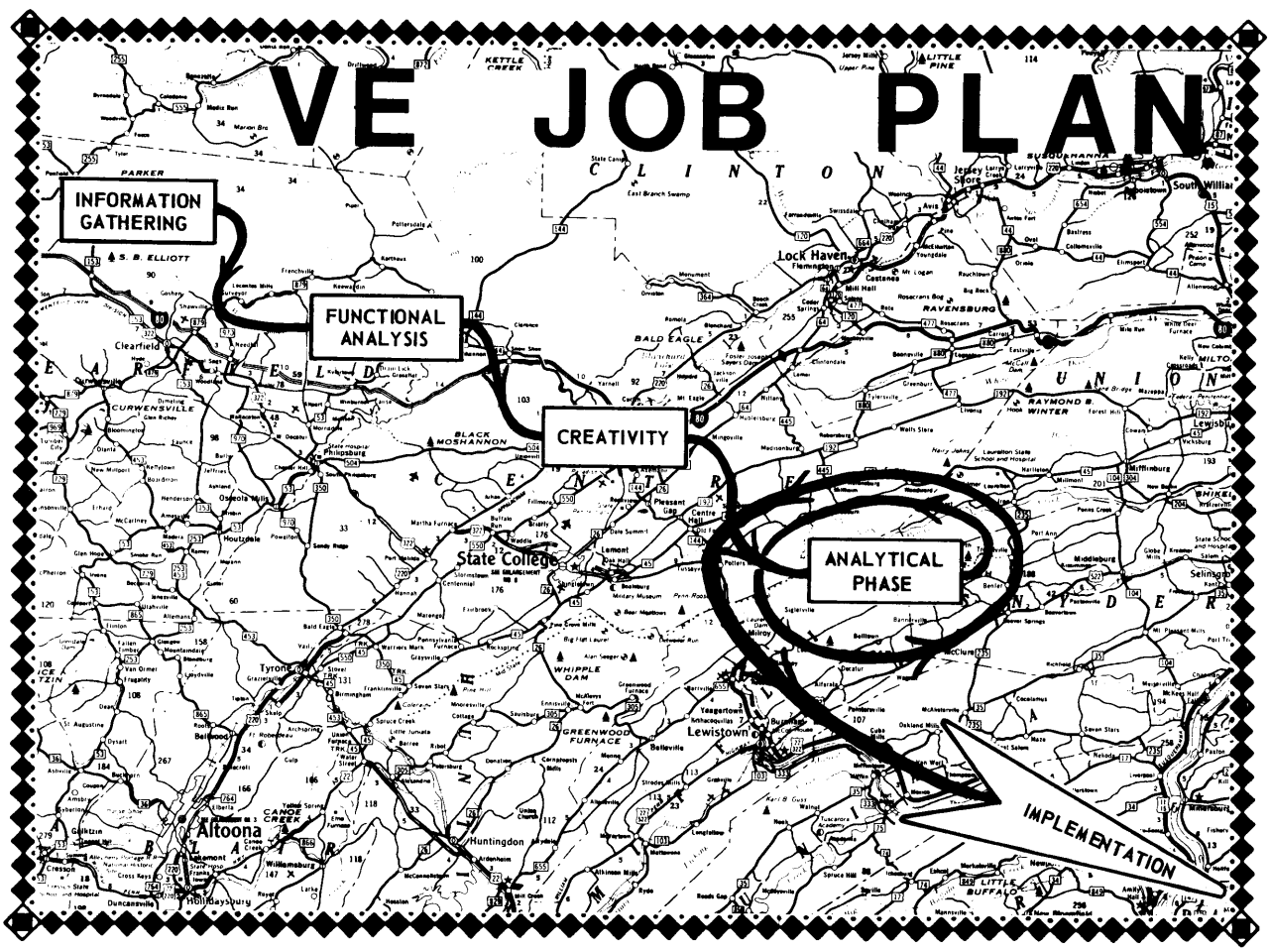
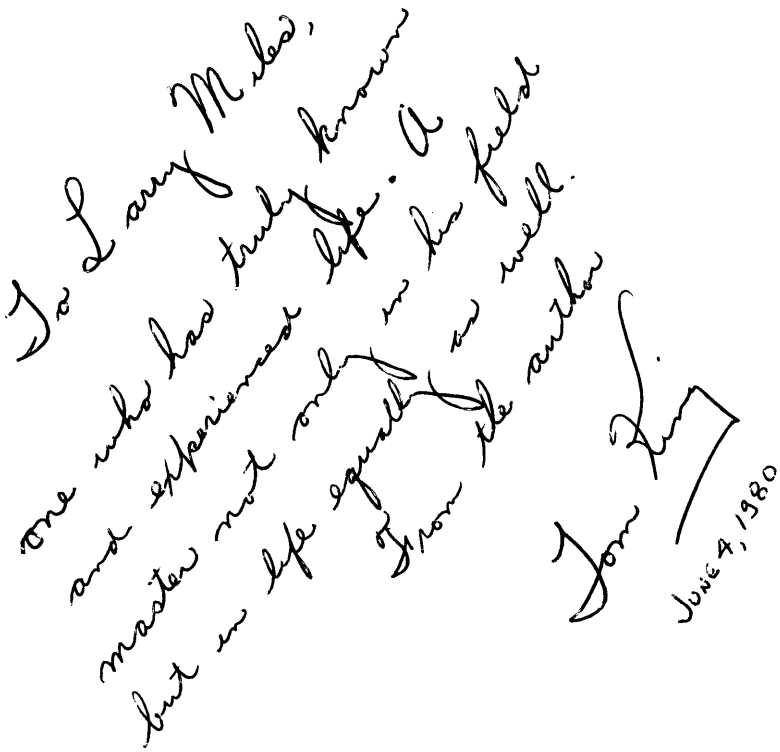
VE JOB PLAN

Volume I No. 1 ©





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VE Job Plan

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JOB PLAN

- **INFORMATION PHASE –**

  GET THE FACTS

  DETERMINE THE COSTS

- **FUNCTIONAL ANALYSIS PHASE –**

  DEFINE THE NEEDED FUNCTION

  VERB – NOUN

  IDENTIFY FUNCTIONS OF PRESENT DESIGN – INCLUDING COMPONENTS

- **CREATIVITY PHASE –**

  THE IDEA PHASE

  WHAT ELSE WILL DO THE JOB?

  GROUP DYNAMICS – BRAINSTORMING

  BE CREATIVE, NOT JUDICIAL

- **ANALYTICAL PHASE –**

  REFINE IDEAS

  USE JUDGEMENT

- **IMPLEMENTATION PHASE –**

  TURN IDEAS INTO REALITY

NOTES

JOB PLAN PHILOSOPHY

The V. E. Job Plan is a systematic means for carrying out a Value Analysis Study.

It identifies the steps that are necessary to conduct a V. E. Study --- and also the sequence in which they must be performed.

It is a road map to follow.

Football coaches use game plans.
Baseball coaches have strategy plans.
Army Generals devise tactical plans.

Good performance comes from good planning.

Even boxers have a plan.

Following the Ken Norton – Duane Bobick fight, which you might recall lasted all of about 90 seconds, was heard this dialogue.

Interview – Eddie Futch, Bobick's fight manager

Announcer:

"Eddie, What happened to Duane? Was it a miscalculation?"

(said Futch) "No, he just didn't follow the plan."

One might presume from this that the plan was to keep from getting knocked out.

Having a planned approach makes good sense for almost any complex undertaking.

- Most vacation trips are preceded by a plan.
- Pilots file a pre-flight plan.
- Avon salesladies map out a route.

AND ON IT GOES

So, it too makes sense to have an organized approach toward achieving value; and this is done through the Value Analysis Engineering Job Plan.

VALUE ENGINEERING JOB PLAN

AN ORGANIZED APPROACH

INFORMATION GATHERING PHASE

- Get all the facts
- Determine the costs
- Eliminate blind spots

FUNCTIONAL ANALYSIS PHASE

- Define the function
- Put a dollar sign on the value of the function
- Separate needs from wants, musts from nice to have

CREATIVITY PHASE

- What else will do the job?
- Confer with others – Brainstorm, list all ideas
- Defer judgment of ideas, be freewheeling
- Force creativity through synectics, attribute listing and morphological synthesis

ANALYTICAL PHASE

- Analyze and refine the ideas, attach a dollar sign
- Evaluate by comparison
- Consult vendors, investigate specialty processes
- Confer with company and industrial specialists

IMPLEMENTATION PHASE

- Process of turning good ideas into reality
- Selling ideas
- Techniques of implementation involve knowhow, timing, human behavior, persuasion and negotiation

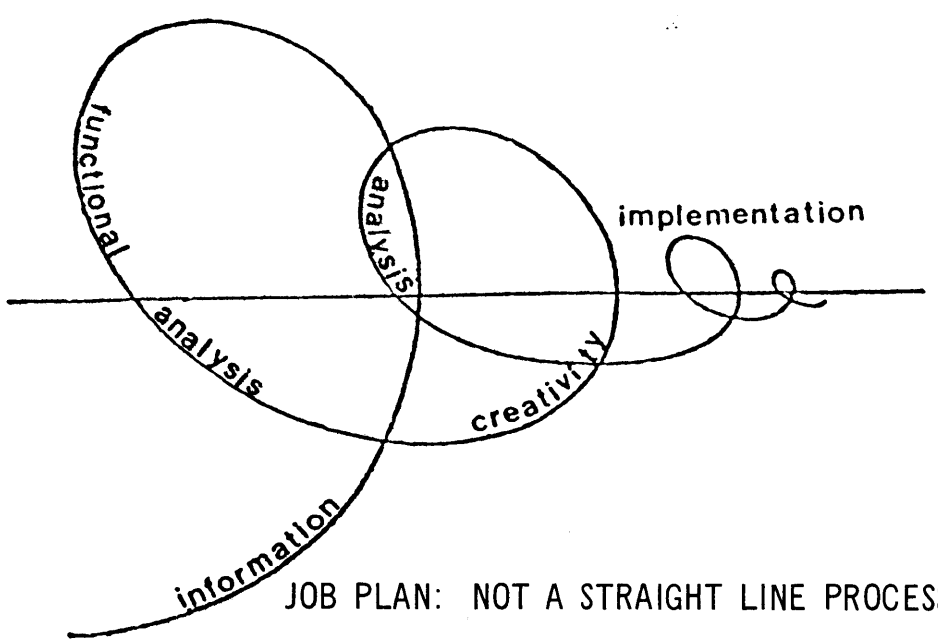
V. E. Practitioners vary the number of phases in the Job Plan and label them by different words – but the differences are semantical rather than real.

In practice, virtually the same modus operandi will be used.

One preferred sequence, follows:

Information Phase
Functional Analysis Phase
Creativity Phase
Analytical Phase
Implementation Phase

While the goal in problem solving processes is a straight line, it is rarely achieved. Rather, the process becomes a pulsating pattern, such as AC Electrical Current, between the various elements of the Job Plan – but always moving closer toward the ultimate solution. This is particularly true in the analysis phase where we refine ideas, test, study, seek additional data, cost out proposals and submit recommendations.



JOB PLAN: NOT A STRAIGHT LINE PROCESS

HOW TO SELECT A PROJECT

First, it is not necessary to wait until the creditors are at the door to begin taking cost improvement action.

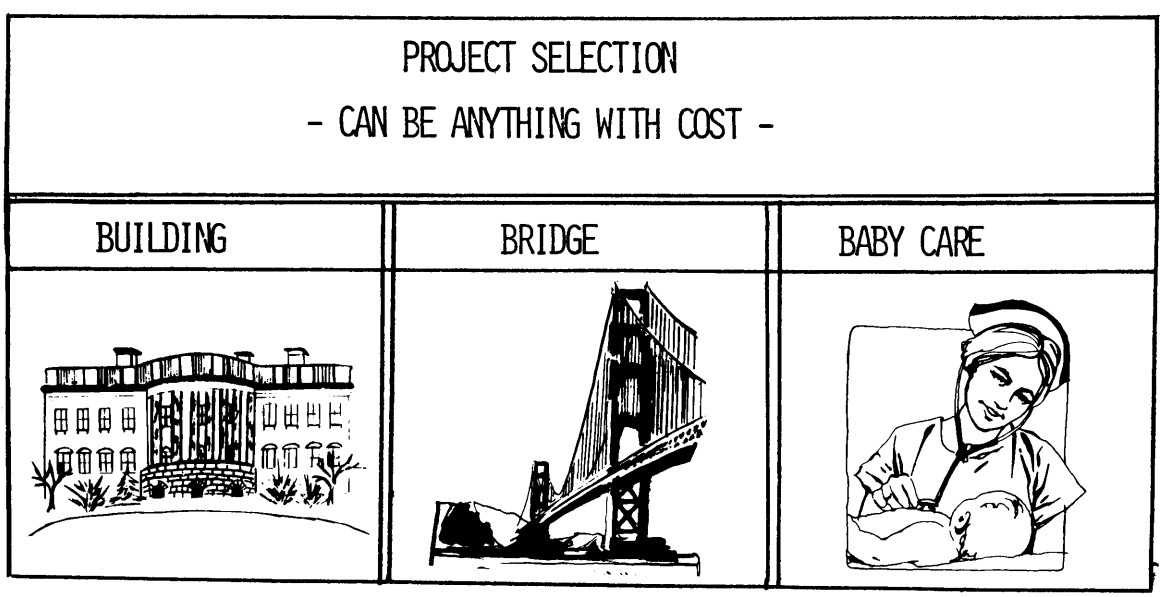
Second, the item need not be in profit trouble before stimulation.

In short, the item can be an opportunity as opposed to a thorny problem, which in itself forces action. And it can be a software item, such as a procedure, process or service not product related, as well as the more traditional "hardware" or saleable product.

In selecting projects, there are some criterions:

- Work on Specifics – not Generalities
- Work where the money is – Pareto's Principle
- Work where the profits are low
- Work where competition is a problem –

  Chances are that's where the profits are marginal
- Work on projects suggested by superiors
- Work on families of parts
- Work on energy sub-systems



INFORMATION PHASE

VE JOB PLAN

1. Information Phase
2. Functional Analysis Phase
3. Creativity Phase
4. Analytical Phase
5. Implementation Phase

INFORMATION GATHERING PHASE
HARDWARE PROJECT

INFORMATION GATHERING ENCOMPASSES THE GATHERING OF THE FOLLOWING INFORMATION AND SUPPORTIVE MATERIAL.

- ASSEMBLY DRAWINGS
- SINGLE PART DRAWINGS
- BILLS OF MATERIAL
- SHOP ROUTERS
- COST EXHIBIT
- ON HAND INVENTORY
- SCRAP RECORD
- WARRANTY RECORD
- SALES INFORMATION
- ANNUAL USAGE
- PRODUCT LINE INFO
- CUSTOMER SPECIFICATIONS
- VENDOR INFORMATION
- AGE OF PRESENT DESIGN

Note: Software projects would require similar data

PROJECT ______________________

INFORMATION PHASE

______________________ (NAME)

ASSY. DWG. NO. ______________________

______________________ (DATE)

PART NUMBER			PART NAME	QTY.	SOURCE P=PUR M=MFD	COMPONENT COST ELEMENTS				COST PER UNIT ASS
SUB ASSY	SUB SUB ASSY	DETAIL				MAT'L.	LABOR	BURDEN	TOTAL COMP.	

T. R. K. 1010

TOTAL COST ______________

INFORMATION PHASE

Consider project selection as an advance portion of the V. E. Job Plan; for, you must secure information in making the selection.

Information gathering centers on:

(1) Getting the Facts

(2) Determining the Costs

> If I were given an hour to solve a problem on which my life depended, I would spend:
>
> 40 MINUTES STUDYING IT
> 15 MNUTES REVIEWING IT
> 5 MINUTES SOLVING IT
>
> – Albert Einstein

Secure all the Facts

The most difficult and tedious job on any analysis is securing facts.

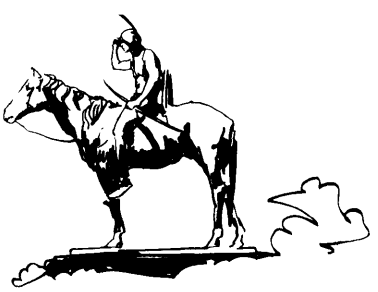
Being certain that the information received is not opinion or assumption.

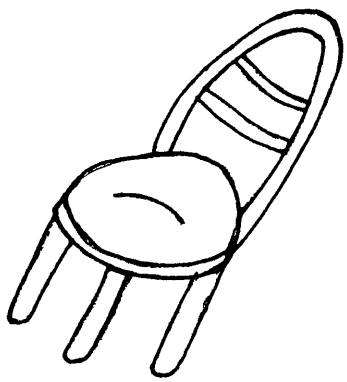
This is more critical when geographical distances are involved.

1. You must get enough information.
2. You must get factual information.

On getting enough –

With insufficient information, we have about the same grasp of a complex program as the fabled blind men had when they were asked to describe an elephant after touching only a portion of its anatomy.





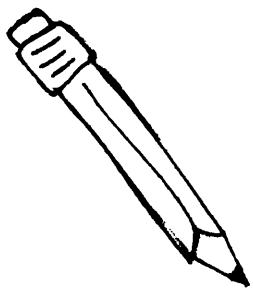
WHAT IS THE FUNCTION OF A CHAIR?

Expressed as a . . . .

VERB	NOUN
SUPPORT	WEIGHT

Secondary Functions:

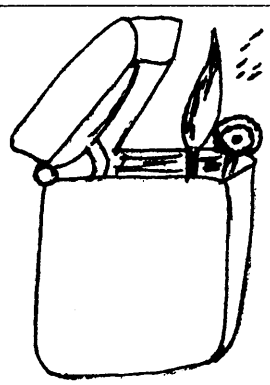
ESTABLISH	LOCATION
PROVIDE	COMFORT
ENHANCE	APPEARANCE



WHAT IS THE FUNCTION OF A PENCIL?

WRITING? ---- NO.

MAKE MARKS



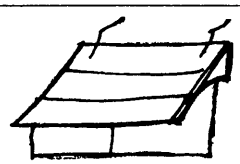
WHAT IS THE FUNCTION OF A LIGHTER?

LIGHTING CIGARS? ---- NO.

PRODUCE HEAT

YOU DON'T BUY GLASSES –

YOU BUY VISION



YOU DON'T BUY AWNINGS –

YOU BUY SHADE

YOU DON'T BUY LIFE INSURANCE –

YOU BUY SECURITY FOR OTHERS

Defining Function

FUNCTIONAL ANALYSIS PHASE

The Functional Phase of the V. E. Job Plan is the most exacting and is the one upon which the fundamentals of V. E. was founded. Function is one element which differentiates V. E. from all other conventional cost improvement approaches. IT ASKS – WHAT IS THE FUNCTION OF A PART? WHAT DOES THE FUNCTION COST? HOW ELSE CAN WE PROVIDE THE REQUIRED FUNCTION?

Conventional approaches dwell on the part itself, rather than the function.

VALUE ENGINEERING IS FUNCTION ORIENTED: IT IS NOT PART ORIENTED. It is concerned with the cost we pay for the function that is performed by the part, service or procedure. The process, consists of identifying the function, placing a price tag on that function, and finding alternate means of performing the function at a lower cost.

FUNCTION IS THAT WHICH MAKES THE PRODUCT WORK OR SELL.

RULE 1 – The expression of each function must be accomplished in two words, as a verb and a noun. A function of a chair would be:

SUPPORT WEIGHT

RULE 2 – Since function is that which makes a product work or sell – there are:

WORK FUNCTIONS

SELL FUNCTIONS

WORK FUNCTIONS are always expressed in action verbs and measurable nouns which establish quantitative statements; such as Support Weight.

ACTION VERBS	MEASURABLE NOUNS
Transmit	Light
Conduct	Current
Establish	Location

SELL FUNCTIONS are expressed with passive verbs and non-measurable (qualitative) nouns; such as:

ENHANCE DECOR

PASSIVE VERBS	QUALITATIVE NOUNS
Provide	Appearance
Improve	Style
Enhance	Decor

RULE 3 – All functions can be divided into two levels of importance, Basic and Secondary.

BASIC FUNCTION: The primary purpose of a product or service.

SECONDARY FUNCTION: Other purposes not directly accomplishing the primary purpose but supporting it or

(1) Providing additional benefits

(2) Resulting from a specific design approach.

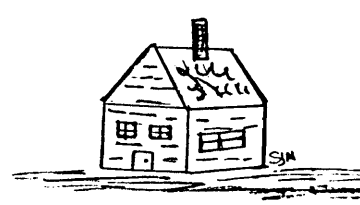
Are the following basic (B) or secondary functions (S)?

PAINT PROVIDES PROTECTION	(B)
BOOTS PROVIDE STYLE	(S)
TIE CLASP PREVENTS MOVEMENT	(B)
TIE CLASP ENHANCES APPEARANCE	(S)

Consider paint on a frame house – whats it for?

Protect surface

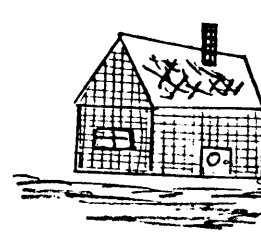
Enhance appearance



WHAT IS THE BASIC FUNCTION? It is - - Protect surface.

So then – how about a brick house that is painted by the same paint. What now is the function of the paint?

It is - - Enhance appearance.

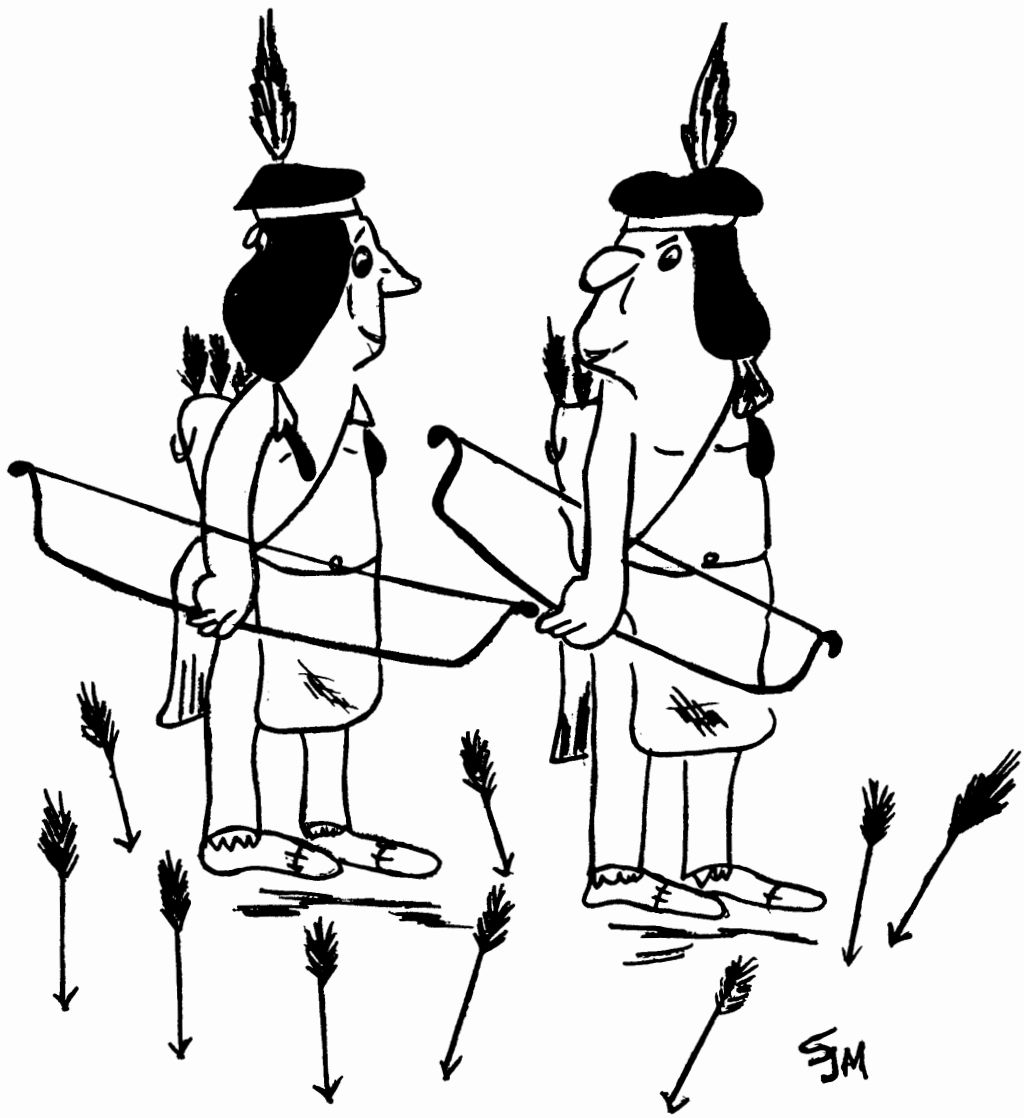


POINT: The same item used in different circumstances might serve different functions

Milk cans originally contained milk.

Today, the function is predominately -- enhance decor.

FUNCTION



THERE MUST BE A BETTER WAY TO GET RID OF RED ANTS.

PROJECT _____

OVERALL FUNCTION _____

PART NO. _____

_____ (NAME)

_____ (DATE)

SEQ. NO.	PART NAME	PART NUMBER	FUNCTIONS						COST PER FUNCTION (ESTIMATE)	LABEL FUNCTIONS I=IMPERATIV E=ESSENTIAL N=NICE TO HA
			VERB	NOUN	B	S	W	SL		
1										
2										
3										
4										
5										
6										
7										
8										

CREATIVITY PHASE

Creativity is never an exact science. It is an art. A teachable art, a learnable art. Studies show that those that have taken courses in Creativity have resulted in 94% of the people having improved creative ability following the course.

A. DEFINITION

Creativity is the art of bringing something new into existence. It has the nature of being original rather than imitated; the art of making, inventing or producing something new and different.

REMEMBER: If the idea is new to us---then its creative. (No matter that it might have been around).

B. RELATION TO INNOVATION

Creativity, applied in Value Analysis, encompasses the elements of innovation.

Semantically, innovation differs from creativity in that creativity, indicates "new;" innovative implies an imaginative application of a given idea to a specific application. Innovation is an adaptive process.

EXAMPLE

Discovery of an inclined plane is a creative act.

Turning it into a spectator ramp walkway at a ballgame would be an innovation.

For the purpose of VA & VE, we will consider Creativity & Innovation in the broad sense to be one---actions resulting from stimulated mental effort and application.

C. CREATIVITY OVERVIEW

1. BRAINSTORMING 3 Types

- Group activity
  - .. Free wheeling, accentuate the positive
- Individual brainstorming
  - .. lose humor, diverse input, hitchhike

BRAINSTORMING

- **TEAM EFFORT** –

  INPUT FROM SEVERAL BACKGROUNDS

- **EVERYTHING GOES** –
  (FREEWHEELING)

  TURN OFF JUDICIAL MIND

  TURN ON CREATIVITY

  DON'T HOLD BACK

  GO FOR QUANTITY NOT QUALITY

- **FORCE IDEAS** –

  SET MINIMUM TIME

  SET IDEA QUOTA

- **JUMP ON THE BANDWAGON** –
  (HITCHHIKE)

  MODIFY OR EXPAND PREVIOUS IDEA

BRAINSTORMING EXERCISE

GUIDELINES

- TEAM EFFORT -

  Input from several backgrounds

- EVERYTHING GOES - (Freewheeling)

  Turn off judicial mind
  Turn on creativity
  Don't hold back
  Go for Quantity not Quality

- FORCE IDEAS -

  Set minimum time
  Set idea quota

- JUMP ON THE BANDWAGON - (Hitchhike)

  Modify or expand previous idea

LIST IDEAS!

. Reverse brainstorming

.. highlighting the negative

2. ASSOCIATION

. Similarity

.. Human body VS an auto engine

. Contrast

.. Starve a RAT, Stuff a RAT – Slow down, speed up

. Contiguity

.. Proximity – happened near the time of

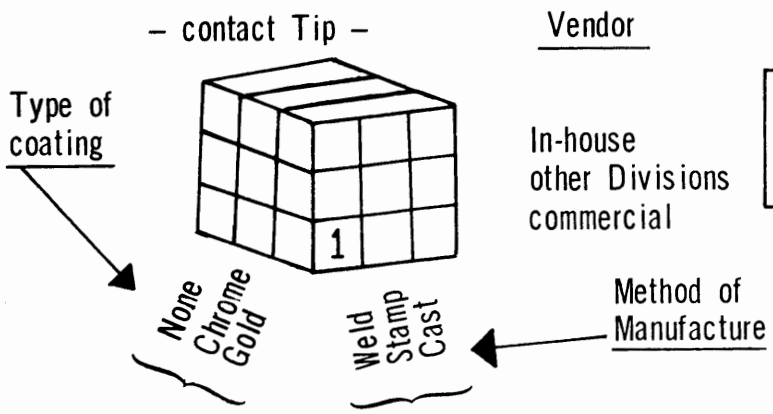
3. IDEA MATRICES

CONTACT TIP

Voltage	Tail	Plating	Tail length	Housing mounting
3 V	Wire wrap	Gold overlay	.630	.125 Dia.
5 V	Eyelet	Ni-Chrome	.500	.4–40
3–5 V	Special	Nickel	.430	NONE

5 elements & 3 variables = 243 choices (3^5)

4. MORPHOLOGICAL SYNTHESIS



Block 1 indicates gold would be welded to the contact tip by a commercial vendor.

5. ATTRIBUTE LISTING ILLUSTRATION: HOUSING

Material	Color	Shape	Mounting
Polyester thermoplastic	Green	Rectangular	Bolted
Urethane	Natural	Oblong	Doweled
Epoxy	Pink	U–Shape	Glued
Micarta	Polkadot	S–Shaped	None
Carbon	Racing Stripe	Box	Wired

(Attribute listing has much to do with physical characteristics)

6. SYNECTICS--GORDON TECHNIQUE

Only the instructor/designer knows the problem. And he asks the group for solutions after giving them one word. This technique is supposed to prevent early closure on a problem.

Example might be -- you are looking for a way to add gold plating or overlay to rolled stock.

The leader might say – JOIN

Leading to suggestions such as:

Weld	Freeze	Bolt
Wire	Glue	Braze
Stamp	Overlay	Etc.

7. SPECIAL TECHNIQUES

- Checklists
- Trigger words
- Dictonary
- Alphabet
- Paper memory
- Notebook (Haefele method)

ANALYTICAL PHASE

VE JOB PLAN

1. Information Phase
2. Functional Analysis Phase
3. Creativity Phase
4. Analytical Phase
5. Implementation Phase

ANALYTICAL PHASE

The creativity phase, which precedes, features a free wheeling, anything goes-generation of ideas; not so, the analytical phase. In many respects it can be thought of as the judicial or realistic phase.

It now becomes necessary to analyze the ideas, cull out the impractical, and combine those which lend themselves to being combined.

In making these determinations, the job plan leaves the makings of a straight line process and begins its series of swirls back through the job plan.

- More information is needed to determine the practicality of an idea.
- Product costs need projected or confirmed for favored ideas.
- Implementation costs must be estimated.
- Vendors need to be consulted to concur regarding validity of ideas.

Once the ideas are firmed up, they form the basis of the recommendation to Management that will or can be made prior to implementation, the final phase.

For some who practice Value Engineering, the job plan ends here; and the project is documented and formally presented to another agency for consideration and approval. This can be a handicap for the obvious and usual reasons; the reviewing body may have had but little input into the study, and inclined not to be responsive to it. For this reason this author favors including the implementation phase as an integral part of the job plan.

VE JOB PLAN

1. Information Phase
2. Functional Analysis Phase
3. Creativity Phase
4. Analytical Phase
5. Implementation Phase

THOUGHTS ABOUT IMPLEMENTATION

The Fighter

I fight a battle every day,
against discouragement and fear,
Some foe stands always in my way,
The path ahead is never clear.

S. E. Kiser

A hammer is of no use unless you pound with it.
A brick is no good unless you build with it.
Talent is wasted unless it is used.
And an idea not acted upon, can be quite a barren thing.

That is why the IMPLEMENTATION PHASE is so important. Lacking success here, the VE job plan becomes nothing more than an exercise.

There are two basic aspects to implementation:

DOING and PREVENTING

The discussion which follows will examine the implementation process as it applies to the job plan.

IMPLEMENTATION PHASE

The Implementation phase separates the fair value engineer from the good and the good from the very distinguished. Here is where starry eyed ideas must meet the cold blue light of dawn and be turned into reality if the value exercise is to be meaningful.

Having an idea is one thing, getting it implemented is another. Recognizing this, some value programs terminate at the recommendation stage; leaving the analysis to another body.

The implementation stage can be more an art than a science; involving:

- PERSUASION
- SELLING IDEAS
- COMMUNICATION
- NEGOTIATION
- HUMAN BEHAVIOR

Timing and fear of personal loss are two major considerations.

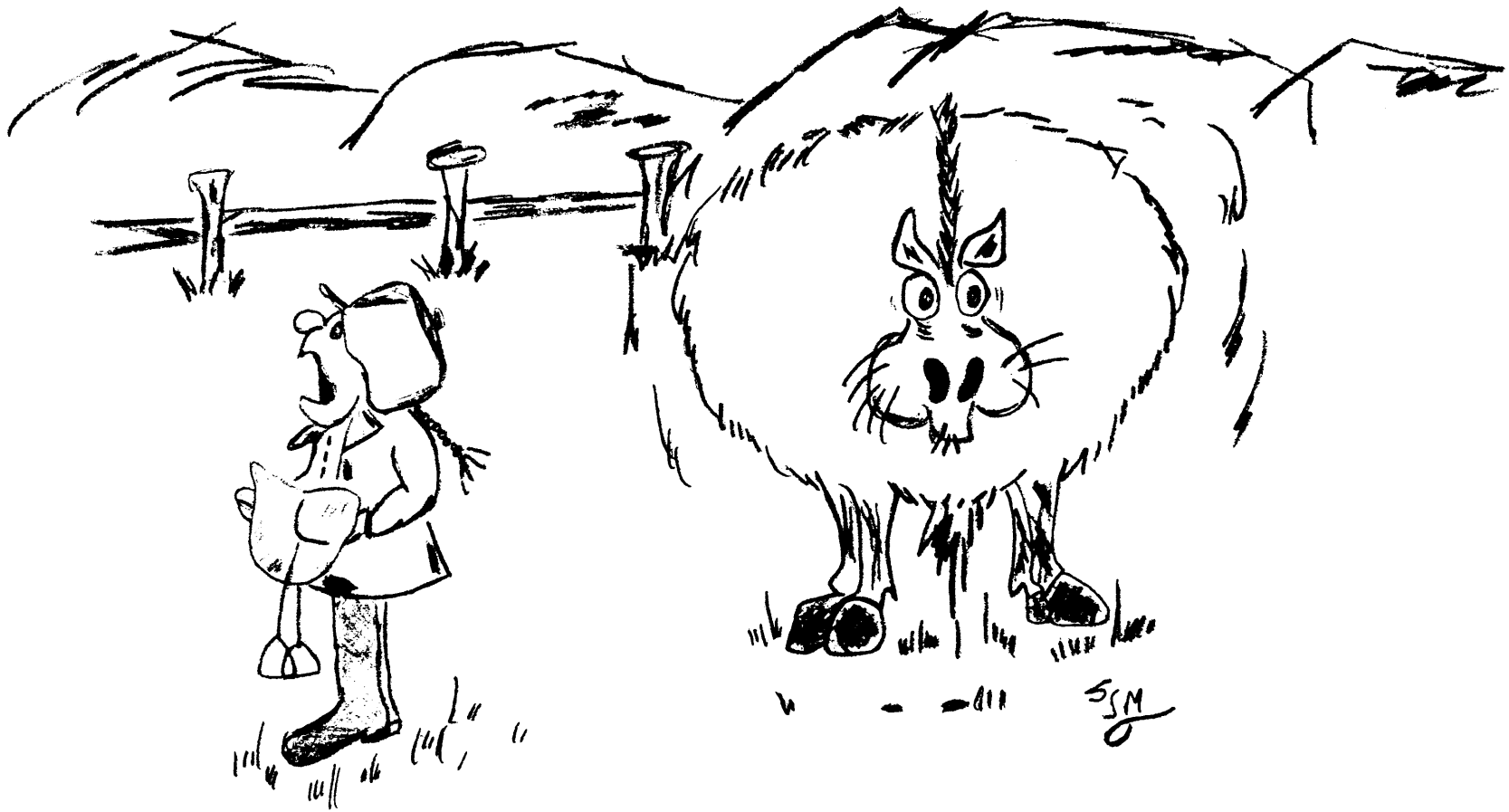
Another fact is that it is often much easier to prepare a logical, immediate and convincing case for rejecting an idea than it is to find the initiative for implementation.

WHY WOULD ANYONE BE UNRECEPTIVE?

Certainly, Fear of personal loss is a big one and in truth governs more business decisions than the promise of gains.

Take for example the Engineer who designs very carefully to cost parameters and achieves an initial low cost design.---

- Is he often lauded for outstanding cost control effort? (generally not)
- If a failure occurs in the field, does he feel the hot heavy hand of, (a) the customer (b) the field rep. (c) the General Manager (d) Engineering Manager. (History tells us yes)



"Mother!!! He's Doing It Again!"

Consequently, a phenomenon known as a "defensive set" occurs.

TAKING A DEFENSIVE SET

All of us have experienced the sensation of making an unfortunate, if not unwise, decision in the performance of our work. Despite setbacks, most engineers tend to personify a resilient nature early in life which enables them to consider each new opportunity based on its individual merit.

This trait is true for two paramount reasons. First a young engineer has not yet experienced upward mobility and has little departmental status or position to protect. Secondly, he has yet to become battle scarred or reprimanded significantly for errors.

Later, he will probably experience his share of both and, consequently, will become a more conservative and judicial practitioner. The key to the extent of the defensive set may not lie directly with the individual however, but rather with the degree to which his superiors have tolerated justifiable failure. Vince Lombardi once said: 'Winning is not a one time thing, it's the only thing." Some industrial managers, not unsurprisingly, think the same way – consequently the defensive set among subordinates. The defensive set leads to roadblocks.

ROADBLOCKS

A roadblock is a term describing a decision and statement made without due consideration or logic. Generally, it is an automatic or conditioned negative response geared to prevent implementation of an idea. The resistance is nearly always in the form of a generality, rather then a specific. Further, it usually follows very quickly the presentation of the idea.

Heres one that will work forever:

ROADBLOCK NO. 1 (When business is booming)

"Our purchasing department is very busy now – having record sales. Wait until things slow down a little." (And when business slows down) "Don't you know that when business slows

down, Purchasing becomes busier, canceling orders, and adjusting delivery dates. Also, whether or not you order one or fifty pieces, a P. O. is needed just the same. Come back when business is better."

ANTIDOTE: Believe them not, and press on for progress. The Value Analyst should anticipate roadblocks. If one looks forthcoming, he should be prepared, and respond.

ROADBLOCK NO. 2

"That proposal would cost a fortune to implement!"

ANSWER: "Possibly you're right, but let's determine just how much and make a decision on that basis."

ROADBLOCK NO. 3

"Why change, we haven't had a failure on that part for 25 years."

ANSWER: "That might be the clue that the safety factor is more than sufficient. Incidentally, have you taken a close look at the gross margin on your product lately. This change would help."

If justice does not appear to be forthcoming, ask for a resolution in writing.

WHY?

Have you tried to refuse any reasonable request in writing? It is surprising how difficult it can be to give written reasons, recorded forever, why an idea which will save money should not be implemented.

Some roadblocks are valid.

Remember too, some roadblocks are good and keep you from danger. Driving through a washed out bridge, for example.

Just maybe the guy is right! It happens.

ORGANIZATIONAL OBSTACLES

Cost improvement opportunities in software areas are often not as clearcut as those on engineered (hardware) products. Quite often the subject is a system or process which is influenced

by many interdepartmental functions.

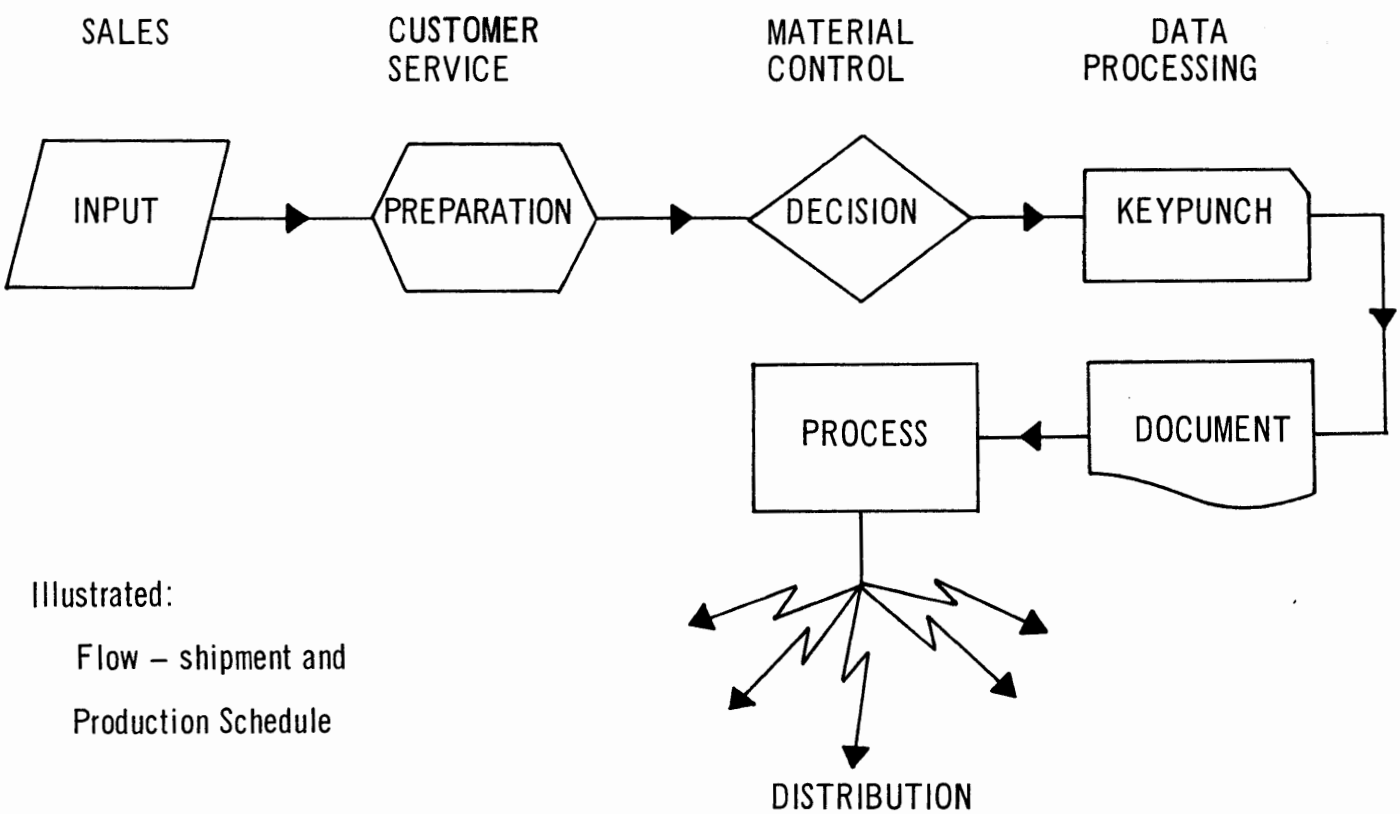
The investigation, analysis and implementation of ideas which cross departmental lines is very difficult. See example below of shipment and production schedule.

* *

Rays Rule asserts that – The larger the organization and the lower the management echelon from which the project originates the less likely the chance of success.

* *

Tenacity and communications are the keys here.



Illustrated:

Flow – shipment and

Production Schedule

Ideas which cross Departmental lines are difficult to implement.

SELLING IDEAS

SELLING IS AN EMOTIONAL PROCESS

SELL YOURSELF, THEN YOUR IDEA

OFFER A CHOICE OF SOLUTIONS

ASK FOR THE IMPLEMENTATION

SUGGEST A PLAN FOR IMPLEMENTING

IDEA VISIBILITY

Very few people can follow a complex technical idea by the verbal process. Complicating that, few of us can deliver a complex verbal presentation with such skill that it is clearly understood.

The idea presentation can be greatly complemented by visual aids hanging in view for easy reference. Use of graphs and appropriate charts is always good, the simpler the better.

Having a physical mockup or pattern of the proposed idea is invaluable. Tests have indicated that "touching" an object adds a new dimension of understanding and familiarity.

GROUP DECISION

If the decision involves a particular group, it is pragmatic to include a member of that group into the VE Workplan far in advance of the Implementation Phase.

This has a two-fold benefit:

(1) It gives the final decision maker a sort of insider status – having been involved in the study all along. Not just dumped on him at the tail end of the study with perhaps an edict.

(2) Someone will have to "physically" implement the idea. Who better than one of the prime movers who was instrumental with the proposal development and familiar with the rationale behind it.

Remember a group decision of somewhat lower quality may be more desireable than a "high quality" one issued by an individual, because the group decision may be implemented more quickly and with minimal difficulty.

Synergistic Effect

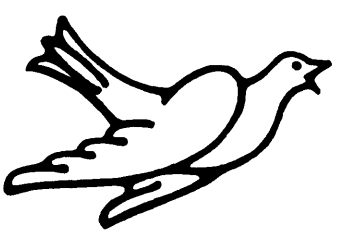
1 + 1 = 3

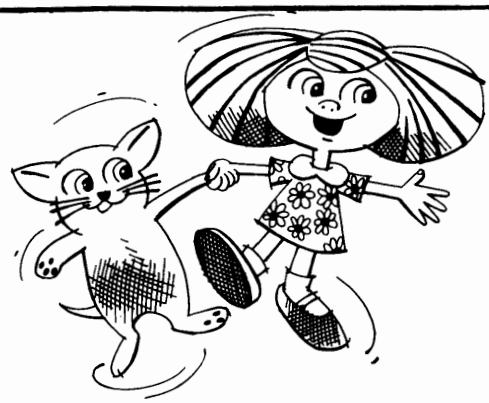
SPECIAL TECHNIQUES AND STRATEGIES FOR IMPLEMENTATION

- Recommend via a team-work approach.
- Include a subordinate on the team, of the manager that you will eventually have to convince.
- If risk is involved or approval does not appear forthcoming – ask for a trial. It is difficult to refuse a trial.
- Touchdowns are more often scored on a series of plays rather than one long bomb. While awaiting perfection, do the possible.
- Don't put the manager in a corner. Give him an out. Every man must have his status.
- Show enthusiasm – show confidence.
- Build pilot models.
- Give some room for choice – let him be a part of it.

HUMAN RELATIONS

- Share the risk, share the credit.
- Give recognition.
- Be consistent.
- Act in a way which avoids personal embarassment to decision makers.
- Be a good listener – never pass up an opportunity to keep your mouth shut.
- Don't back an individual into a corner without an escape route. Help him find one if he is nestled there. □





THINGS TO KNOW AND DO

1. WHAT IS MEANT BY THE TERM - JOB PLAN AS IT APPLIES TO VALUE ANALYSIS ENGINEERING?

2. RATIONALIZE THE FACT THAT VALUE MANAGERS OFTEN VARY THE NUMBER AND NAMES OF THE JOB PLAN ELEMENTS.

3. WHAT DATA MIGHT YOU GATHER IF YOU WERE BEGINNING A VALUE ANALYSIS STUDY ON COPIER USE IN A MAJOR COMPANY.

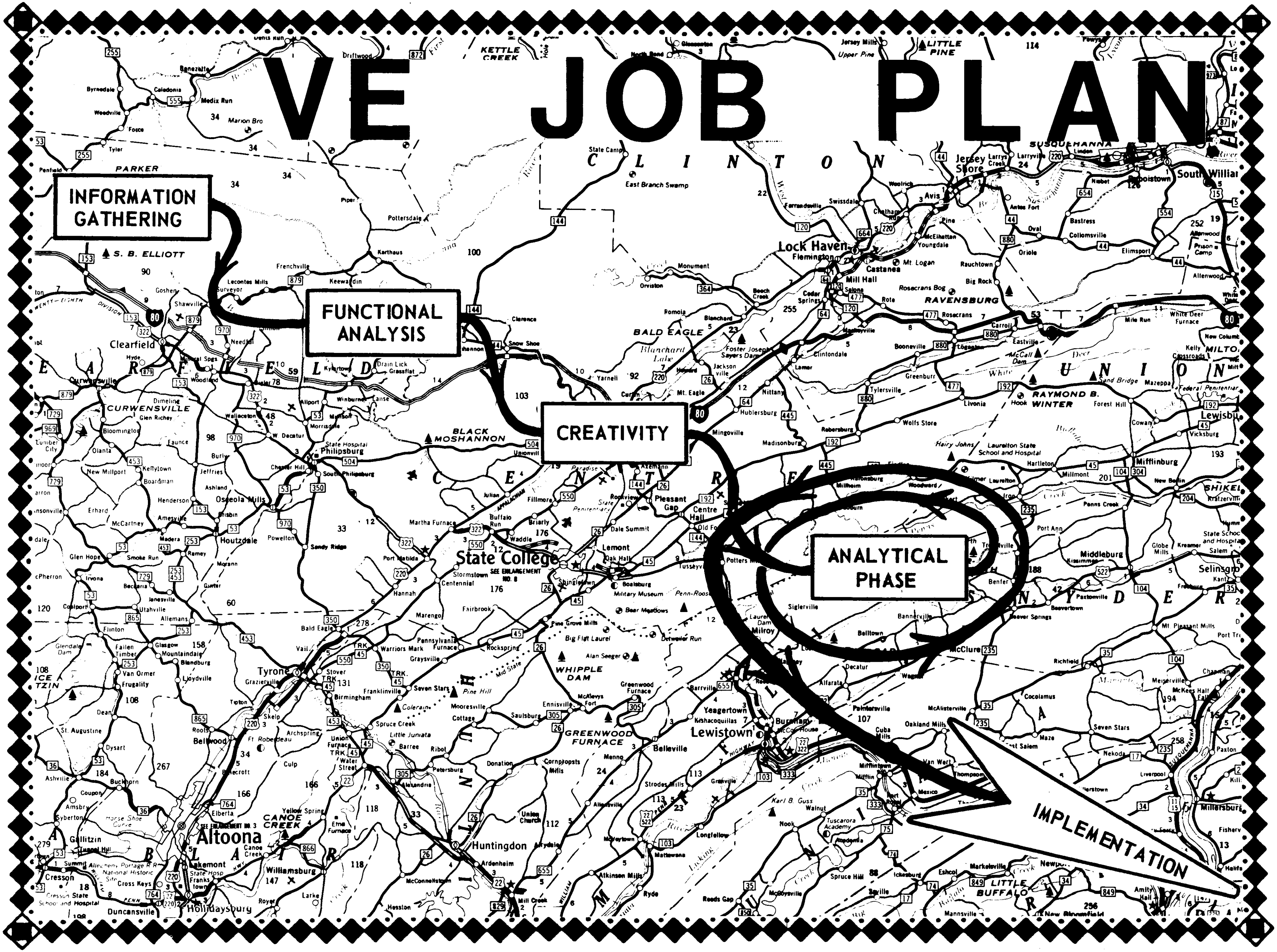
4. IS THE BASIC FUNCTION OF AN ITEM ALWAYS FIXED, OR CAN IT CHANGE DEPENDING ON THE APPLICATION? ILLUSTRATE.

5. FUNCTION IS THAT WHICH MAKES A PRODUCT _____ OR _____. IN WHAT TERMS DO YOU EXPRESS THE FUNCTION OF AN ITEM OR SERVICE?

6. BRAINSTORMING: A YOUNG FRIEND OF YOURS HAS A DILEMMA. SHE HAD PREVIOUSLY AGREED TO GO TO THE PROM WITH A CLASSMATE; SHORTLY THEREAFTER, THE BOY OF HER DREAMS ASKED HER TO GO, ALSO. COME UP WITH (15) SOLUTIONS TO THE PROBLEM -- COMIC, DEVIOUS OR OTHERWISE.

7. WHAT IS A ROAD-BLOCK?

8. HOW MIGHT YOU HANDLE THIS ROADBLOCK? "I'M NOT CHANGING THE DESIGN EVEN THOUGH THE PROPOSED ONE MIGHT BE BETTER, BECAUSE IT'S NOT INTERCHANGEABLE WITH THOSE IN THE FIELD."


VE JOB PLAN
INFORMATION GATHERING
FUNCTIONAL ANALYSIS
CREATIVITY
ANALYTICAL PHASE
IMPLEMENTATION

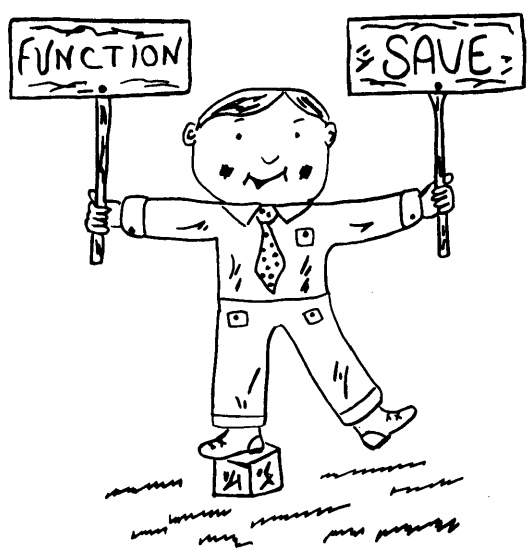
PRINCIPLES OF VALUE ANALYSIS ENGINEERING©

BY:

THOMAS R. KING

BASIC FUNDAMENTALS

Volume I No. 2 ©



VALUE ANALYSIS/VALUE ENGINEERING
DISIPLINE

PRINCIPLES OF VALUE ANALYSIS ENGINEERING

Basic Fundamentals

Volume I No. 2

PRINCIPLES OF VALUE ANALYSIS ENGINEERING

Volume I No. 2 Basic Fundamentals

CONTENTS

WHAT EXACTLY IS VALUE ANALYSIS ENGINEERING?

Value Engineering is a discipline which uses an organized, creative approach to achieve the required function at the lowest cost. Value Engineering or Value Analysis permits value to remain in the product while taking costs out.

The terms, Value Analysis and Value Engineering, are often used interchangeably for practical purposes; the distinctions being:

VALUE ANALYSIS is the review of an existing established product, system or service to remove unnecessary costs. Essentially, cost reductions.

VALUE ENGINEERING is the building of low cost and value into a product while in the design or conceptual stage. Essentially, cost avoidance.

The V. E. Job Plan is characterized by six penetrating questions.

What is it?

What does it do?

What must it do?

What does it cost?

What else will do the job?

What does that cost?

The heart of Value Engineering is the element --- function.

Value Engineering differs from other cost reduction approaches in that V. E. analyzes the function of a part rather than the part itself. Conventional Cost Reduction approaches zero in on the part itself.

For example, in cost reducing a chair, the conventional approach is to look at the chair – could the legs be shorter, the arms – less padding, the seat narrower, etc?

Value Engineering begins by saying, What is the basic function of a chair? Answer – Support Weight.

Notice that the function is, and always will be, described by a verb-noun combination.

What are the secondary functions?

Establish Location

Provide Comfort

Enhance Decor

V. E. then proceeds into the job plan with such inquiries as:

. What does the chair cost?

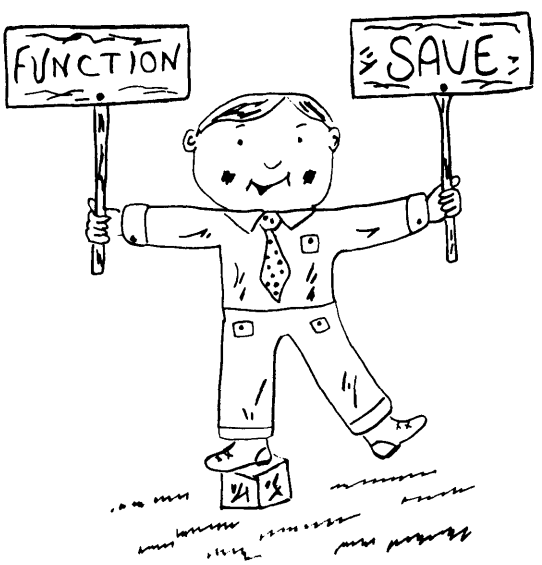
. What else will support weight? A barrel. A rock. A stump.

. What does that cost?

Many additional sophisticated, forcing techniques are utilized throughout the analysis with upwards of 40% saving yields not uncommon in contrast with the 10 – 15 % savings generally associated with conventional cost reduction programs.

Value Analysis is universal. It can be used on hardware (nuts and bolts) or software (forms and systems), and has application in industry, hospitals, schools and even the home.

Want a tool to fight inflation? Try Value Engineering.



VALUE ANALYSIS/VALUE ENGINEERING
DISIPLINE

VALUE ANALYSIS ROOTS

Value Analysis and Value Engineering are terms whose roots began during World War II and were developed because of necessity.

During the War, the primary materials, goods and services were not always available; anyone of that era wishing to buy a new car or even tires for an old one can attest to that.

Patching tires by the roadside was a common sight.

Gathering milkweed pods to substitute for unavailable nylon, used in parachutes, was another youth project.

Collecting old tin cans, yet another.

Improvision was evident on a large scale. It was necessary to find alternates which could suffice for the preferred material and perform the desired function.

It was a situation of individuals being forced to search for ideas to solve a particular problem; like it or not.

In searching for substitutes, a lot of ingenuity and creative imagination had to be energized to find workable solutions.

A special example is sugarless cake which was baked without the benefit of sugar – God bless Grandma, who improvised so well.

Enter Mr. Miles.

In 1947, one of the vice presidents at General Electric, Mr. Harry Erlicher, recognized a rather unusual phenomenon that had been happening. Design engineers had been acutely forced, by wartime shortages, to abandon traditional design approaches.

Sometimes the substitute just couldn't equal the performance of the material it was replacing; but not always. Often the substitute was just as good; occasionally it was even better, and surprisingly, lower in cost.

This phenomenon happened enough by accident that Mr. Erlicher began to ponder if there was a way to make it happen on purpose. He assigned Lawrence D. Miles, a respected staff

engineer, to work on this problem. Subsequently, Mr. Miles, now recognized as the father of Value Engineering, developed the foundation of Value Analysis and Value Engineering as we know it today.

Mr. Miles worked in Purchasing, therefore, much of the first Value Analysis work was done there.

The first Value Analysis workshop was conducted in 1952 for approximately sixty people from various General Electric facilities. Some of these individuals returned to their plants as full time Value Analysts and initiated V.A. Programs. Consequently, the growth internally (G.E.).

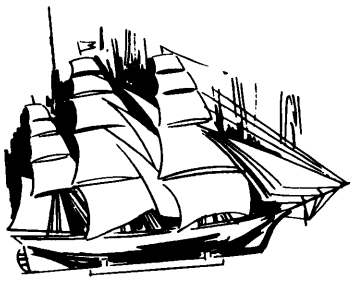
HOW VALUE ANALYSIS SPREAD

Later, this approach to cost improvement received national focus through mass media; front page cover in the Wall Street Journal, and a feature story in Reader's Digest. Perhaps a bigger boost was through vendors who were invited to participate in V. A. seminars. As a result of these exposures, the discipline was investigated and spread rapidly throughout industry. Government and service organizations soon followed suit.

Organizations such as the National Association of Purchasing Managers (NAPM) and PURCHASING MAGAZINE in particular, promoted use of the Value Analysis discipline, and promote it yet today.

National conferences on Value Analysis further aroused the interest of industry and Government. Additionally, Trade associations began endorsing Value Analysis in the late 50's. Committees, enhancing Value Analysis as an industrial and professional activity were established with members from industry and government.

In 1959, the Society of American Value Engineers (SAVE) formed as a professional, Technical Society to consolidate technology and promote the growth of the profession. Today, SAVE remains the hub of National focus on Value Engineering activities and is headquartered in Dallas (Irving), Texas.



AND THEN THE NAVY

In the mid-fifties, the Navy Bureau of Ships became interested in Value Analysis and established a Value Engineering Program. It was here, we understand, that the term Value Engineering was introduced because the Navy thought it more appropriate. Job classifications existed for Engineers, not analysts, consequently, the adaptation from Value Analysis to Value Engineering.

Value Engineering proved to be an effective device in reducing shipbuilding costs. So much so, that the Navy honored Mr. Miles with its highest civilian award -- THE DISTINGUISHED PUBLIC SERVICE AWARD.

With the Navy's early successes, it became apparent that all Government agencies could benefit from the concept. Following an evolutionary process, the Government now encourages contractors doing business with them to participate in cost savings programs for mutual benefit. In some agencies, this encouragement is quite strong and written into the regulations and requirements. This is done primarily through VECP's and ASPR. (Value Engineering Change Proposals and the Armed Services Procurement Regulations).

Many state and municipal Governments have adopted Value Analysis Programs to help reduce operating expenses. Pennsylvania, Massachusetts, Minnesota and Kansas were some of the early leaders.

VALUE ANALYSIS CAN HELP YOU

The concepts and techniques of Value Analysis have spread throughout the world in industry, Government and service organizations. VA has grown because it gets results. VA provides an organized, systematic approach toward reducing costs. VA can remove unnecessary costs in your business, no matter what it is; as it has done successfully in a myriad of applications.

COST EFFECTIVE PROGRAMS

There are a number of successful programs being used in industry to reduce cost, most of which directly attack the product. Primarily, they are part oriented; consequently, they tend to restrict thinking to the item in its present form.

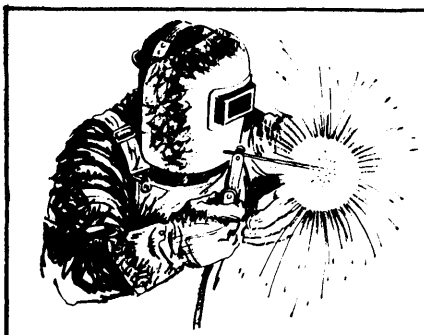
This does not imply, however, that they are not essential to a well-managed business. They are essential.

Value Engineering should not be used to replace these proven techniques. Rather, VE should augment and complement existing cost control programs.

A variety of cost improvement disciplines that have proved advantageous follows:

1. Cost Reduction
2. Cost Avoidance
3. Cost Improvement
4. Suggestion Programs
5. Procurement Programs
6. Zero Defects and quality circles
7. Work Simplification
8. Problem Solving Devices
   - Conventional
   - Creative
   - Scientific
   - Kepner Tregoe
   - Problem Anaylsis
9. Operations Research
10. Industrial Engineering

1. Cost Reduction – Cost reduction is accomplishing a reduction in costs through a variety of relatively conventional means. The cost savings is quite tangible; prior cost of an item is, say, five dollars, and the new cost is four dollars. Cost reduction can occur in any operation.



METHODS

TRANSPORTATION

PROCESSES

COST FRIGHT – VS COST IMPROVEMENT

COST FRIGHT	COST IMPROVEMENT
(Near term)	(Long range)
. Fire Fighting	. Planned
. Desperation Cut	. Continuing
. Policy Dictum – Cut 10% of expenses	. Effective and Lasting
. Crisis Engineering – Crash Cuts	. Trim the Fat
. Arbitrary Slashes	. Sometimes Increase Cost, add new equipment
. Short lived as a rule	. Fun
. Personal Anguish	

The goal should be to eliminate waste, not programs or people.

Cost Fright is evident when worthwhile programs are discontinued, capital expenditures halted and heads ruthlessly lopped. The purpose, in short, is to trim costs --- and do it now.

In this situation, the good operations are penalized. If the desperation cuts become an expected reaction to a downturn, a consequence will be that an effective manager will protect himself and the good of the department, with plenty of cushion in the future.

2. Cost Avoidance – Avoiding a price increase, or committed expense through direct and conscious effort. Jaw boning with vendors when a price increase is announced, to either minimize, defer or negate the effective increase.

3. Cost Improvement – is thought of as improvements in efficiency in which the immediate savings payback is intangible. For example a savings in secretarial filing time. But over a longer period of time these improvements should accumulate sufficiently to impact the balance sheet through the elimination of overtime or need for another employee.

4. Suggestion Programs – Suggestion programs are a communication vehicle which provides employees an opportunity to submit ideas on reducing cost, enhancing safety or improving quality of working life. Employees are generally monetarily rewarded for their contribution through a determined program scale: often a percentage of the annual dollar value their idea generates.

ADVANTAGES	SHORTCOMINGS
. Utilize the Human Resource	. Shotgun approach
. Promotes teamwork	. Improvements not directed where they are most needed.
. Provides a vehicle for communication of ideas.	. Generally, exempt people ineligible to participate.

5. Procurement Programs – This is basically a purchasing program designed to reduce the cost of incoming purchased materials. A conscious effort by the buyer to secure optimum prices and challenge price increases. Savings are not recorded when they are the result of windfalls such as the effect an increased sales volume level would have on economical order quantities. Some techniques follow:

. Competitive buying	. Consolidating similar buys for volume breaks
. Term agreements	. Freight and payment terms
. Negotiations with existing vendor	

6. Zero Defects – Zero defects deals largely with the motivational aspects of shop employees in regard to scrap and rework problems. Objectives:

- Create within people an awareness and a desire to produce error free work.
- Encourage employees at all levels, through proper attitude, to assume responsibility for a zero defects environment, as members of a common purpose.

Unfortunately, Zero Defects activity per se has waned or has been consumed by other disciplines. However, the present popularity in Quality Circles can in some measure be attributed to the influence of the earlier Zero Defects activity.

Advantage of Quality Circles is that the quality problems are examined by those individuals most directly involved with the problem. Further it is a group effort, and gives production employees a slice of the action in the decision making process.

7. Work Simplification – Work Simplification is a technique that was developed by Allen Mogenson. It has great impact in that an individual can apply the discipline to his own work, in making work on the product, simpler.

A four step process is a feature of this discipline.

OBSERVE	THINK	DECIDE	ACT
. Pick a job	Why is this necessary?	*	Eliminate
. List the details	What does it accomplish?	*	
	Where can it best be done?	*	Modify
	When should it be done?	*	Combine
	Who should do it?	*	Rearrange

8. Problem Solving Devices

CONVENTIONAL	CREATIVE	SCIENTIFIC	KEPNER TREGOE
Observe	Define problem	Hypothesis	Looks back
Think	Laundry list	Deduction	as well as forward
Try	Cull the list	Experiment	Problem oriented
Explain	Recommend	Analyze	
	Action plan	Re–Experiment	
		Document	

PROBLEM ANALYSIS

. Trouble Statement	. Possible Causes
. Specify Differences	. Test
. Specify Changes	. Verify

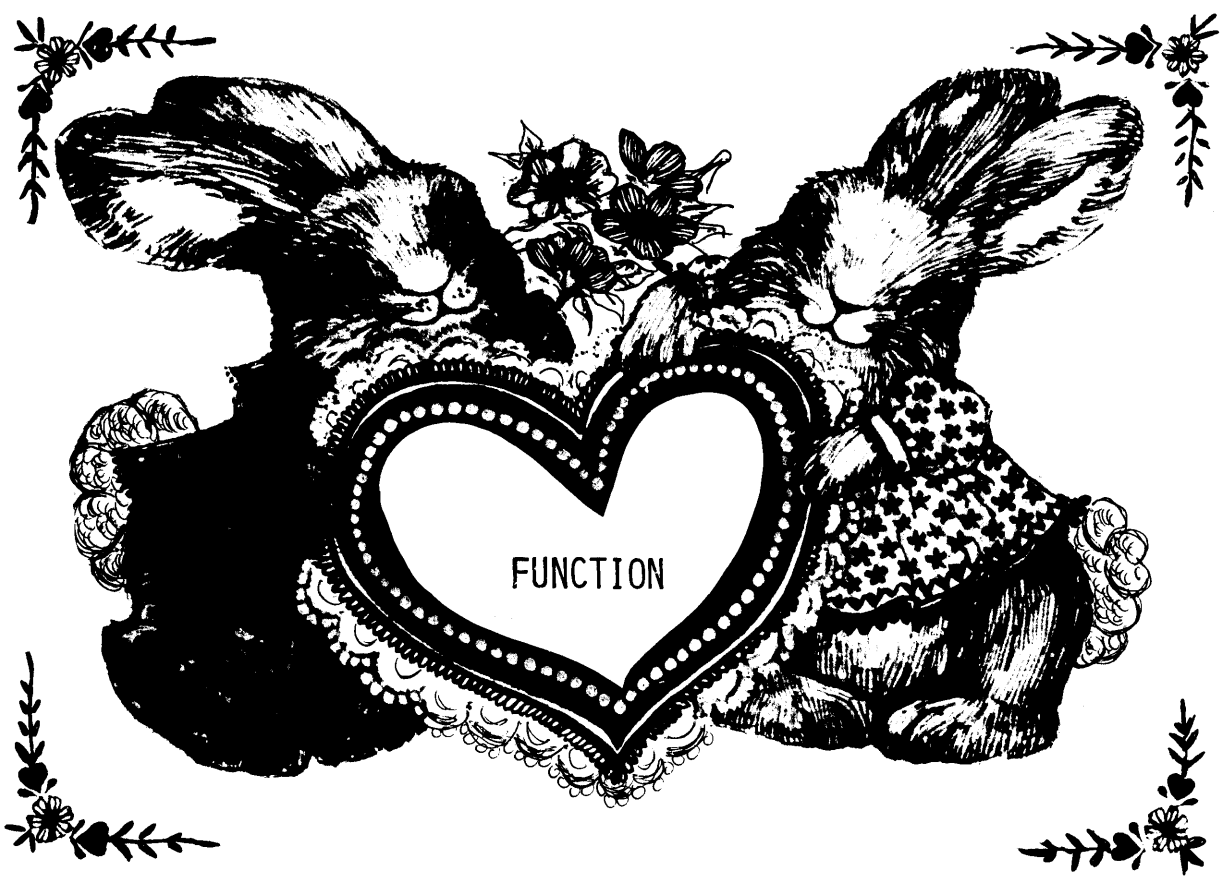
9. Operations Research – The application of scientific and mathematical methods and models toward solving business operation problems. This tool has application on systems such as inventory, warehousing, distribution, capital and business investment opportunities.

10. Industrial Engineering – An engineering discipline concerned primarily with how best to manufacture a given product and the time allotted for manufacture. Industrial Engineering involves routing, specifying tools, methods and equipment for making the product. Work measurement is the control for measuring the efficiency by which the product is produced.

With all these good programs then, what is it that makes Value Analysis Engineering so unique?

The Answer is – – – <u>FUNCTION</u>

The heart of Value Analysis Engineering is the element – function.



VALUE ENGINEERING – FUNCTION OR DISCIPLINE

There are two schools of thought regarding Value Engineering as a function, or as a discipline, and some degrees of variation between.

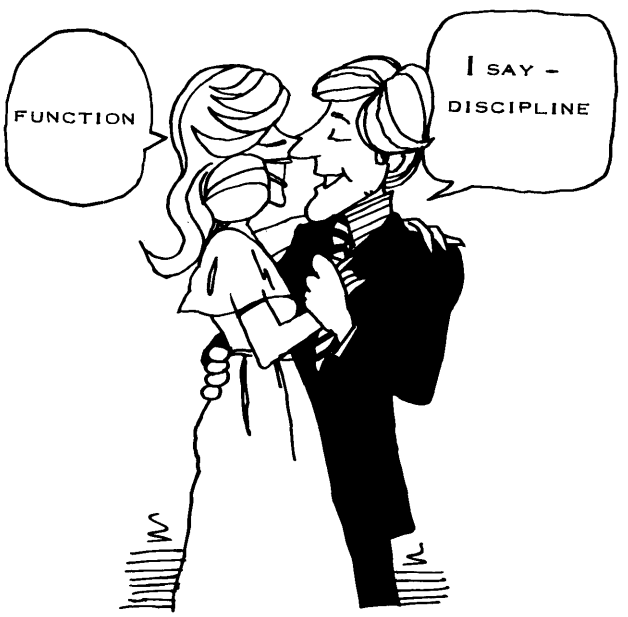
FIRST – That Value Engineering is indeed a function on the table of organization and should take its place along the more traditional ones, such as:

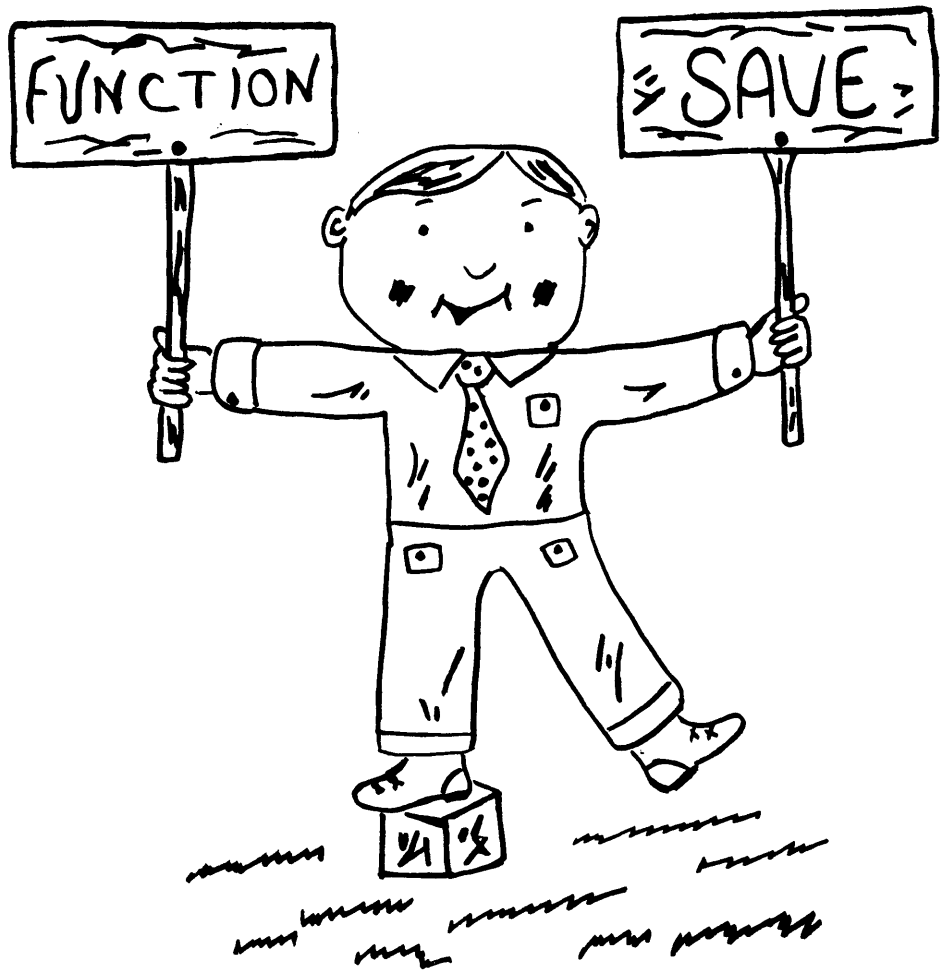
Industrial and Design Engineering, Manufacturing and Accounting.

SECOND – That Value Engineering is rather a discipline – a tool to be used by all existing functions as a means to improve value and minimize costs.

Concepts:

The fact is that both could be correct, and both concepts could be operational simultaneously at a given facility.





VALUE ANALYSIS/VALUE ENGINEERING DISIPLINE

CRITICAL ELEMENTS -
VALUE ANALYSIS ENGINEERING

- FUNCTION
- VALUE
- WORTH
- COST

NOTE: A DISCUSSION OF THESE ELEMENTS, FOLLOWS.

FUNCTION DEFINITION

FUNCTION IS THAT WHICH MAKES THE PRODUCT WORK OR SELL.

RULE 1 - THE EXPRESSION OF EACH FUNCTION MUST BE ACCOMPLISHED IN TWO WORDS, AS A VERB AND A NOUN. A FUNCTION OF A CHAIR WOULD BE:

SUPPORT WEIGHT

RULE 2 - SINCE FUNCTION IS THAT WHICH MAKES A PRODUCT WORK OR SELL - THERE ARE:

WORK FUNCTIONS
SELL FUNCTIONS

WORK FUNCTIONS ARE ALWAYS EXPRESSED IN ACTION VERBS AND MEASURABLE NOUNS WHICH ESTABLISH QUANTITATIVE STATEMENTS; SUCH AS:

ACTION VERBS	MEASURABLE NOUNS
TRANSMIT	LIGHT
CONDUCT	CURRENT

SELL FUNCTIONS ARE EXPRESSED WITH PASSIVE VERBS AND NON-MEASURABLE (QUALITATIVE) NOUNS; SUCH AS:

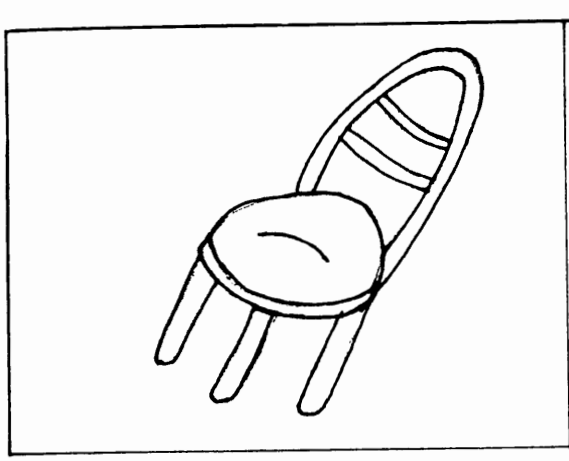
PASSIVE VERBS	QUALITATIVE NOUNS
IMPROVE	STYLE
ENHANCE	DECOR

RULE 3 - ALL FUNCTIONS CAN BE DIVIDED INTO TWO LEVELS OF IMPORTANCE, BASIC AND SECONDARY.

BASIC FUNCTION: THE PRIMARY PURPOSE OF A PRODUCT OR SERVICE.

SECONDARY FUNCTION: OTHER PURPOSES NOT DIRECTLY ACCOMPLISHING THE PRIMARY PURPOSE BUT SUPPORTING IT OR, PROVIDING ADDITIONAL BENEFITS, OR RESULTING FROM A SPECIFIC DESIGN APPROACH.

FUNCTION ANALYSIS



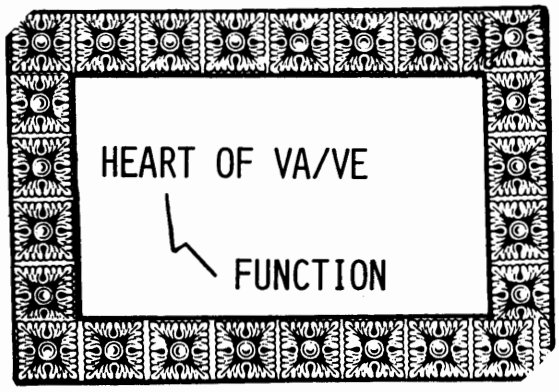
WHAT IS THE FUNCTION OF A CHAIR?

Expressed as a . . . .

VERB	NOUN
SUPPORT	WEIGHT

Secondary Functions:

ESTABLISH	LOCATION
PROVIDE	COMFORT
ENHANCE	APPEARANCE



DO IT YOURSELF EXERCISE

FIRST - IDENTIFY FUNCTIONS.

NEXT - DETERMINE IF:

BASIC (B) OR SECONDARY (S)

WORK (W) OR SELL (S')

HUNTING HAT

VERB	NOUN	BS	WS'

BED

VERB	NOUN	BS	WS'

MILK CAN

VERB	NOUN	BS	WS'

VALUE

Classes of:

MORAL	–	Drinking of beer – some religions forbid, Marijuana, cheap funeral.
AESTHETIC	–	Dressed up – Appealing lines in building design.
ECONOMIC	–	Anything with a price tag.
RELIGIOUS	–	The Sacraments.
SOCIAL	–	Belong to clubs
POLITICAL	–	Name, Gaza strip.
JUDICIAL	–	Having order.

ECONOMIC VALUE

The Value Analyst is most concerned with Economic Value. VALUE DEFINITION = Value is determined by the lowest price for the required function or service at the desired time and place and with the essential quality.

Economic Value can be subdivided into three sub-classes.

1. USE OR UTILITY – Power of a thing to serve an end.
   - . . . Utility of a wrench – a pen, towel
   - . . . Utility for a given purpose – engagement ring
   - . . . Utility for a given condition – aspirin
   - . . . Suitability of location – oasis, beach
2. ESTEEM – The power of a thing that makes us desire its possession.
3. EXCHANGE – The power of a thing to procure other things in its place. Generally two conditions are necessary:
   - . . . It must be of some use (satisfy want)
   - . . . Difficulty in attainment (scarce or elusive)

Fishing worms – exchange value? - - Yes.

Hedgehogs – not likely
Hedgehogs are scarce, but except for zoos, little call for them.

NOTE: Some Value practicioners consider a fourth sub-class - - - - COST VALUE.

WORTH

The value of an item is expressed in terms of Worth. Recognize that even beauty bestows Value, and consequently worth.

DETERMINING WORTH

Let's imagine the master brake cylinder of your car is leaking. What is it worth to you to have it fixed?

The answer lies of course whether the car is safely in the garage or being maneuvered down the Baja Peninsula.

Nevertheless, in establishing the worth of a function, we must not get caught up in the emotional aspects of what could or could not be --- BUT ONLY WITH THE FUNCTION THAT MUST BE PROVIDED.

In this case what is a fair worth for repairing the master cylinder.

MEASUREMENT OF VALUE AND WORTH

The measurement of Value is the ratio of worth to cost and is represented by the formula –

$$\text{VALUE} = \frac{\text{WORTH}}{\text{COST}}$$

If V = 1 or greater, a value exists. If less than 1, the item does not represent good value.

EXAMPLE: If a pair of shoes cost $20 and are worth $20, the shoes are said to constitute good value.

WORTH = COST = VALUE (FAIRNESS)

If a pair of shoes cost $20, and are worth $40, the shoes are said to be a bargain, or exceptional value.

WORTH $>$ COST = BARGAIN

If a pair of shoes cost $20 but are worth only $10, poor value exists.

WORTH $<$ COST = POOR VALUE

Subject for cost review.

RECOGNIZE THAT WORTH CAN BE DYNAMIC

It can be safely concluded that worth can be dynamic because of external pressures.

Have you ever run out of gas inside a tunnel or on a busy parkway? If so, you might be quick to agree that a gallon of gasoline at that particular time merits a premium price.

But then, only the first gallon perhaps; and this has to do with the marginal utility of value.

MARGINAL UTILITY OF VALUE

Each added increment of goods brings diminishing value returns to the point of superfluity, where value disappears completely.

An example of this is a young boy eating ice cream cones number 1, 2 and 3 at a given setting. The first one is good, the third brings much less satisfaction.

MEASURING WORTH

How can we measure the worth of an object?

Different ways; here are some:

. Worth by judgment, experience and intuition.

Individuals deal with money, costs, trades and exchange all their lives. Worth can be projected through knowledge of similar items or experiences. Intuition as we think of it here is not a lightning flash of revelation, but rather a calculated expression based on experience and conscious alert thought.

Worth by comparison with existing standard

What should it cost to cut a field of hay? A non-farmer might think in terms of:

What's the normal charge for cutting a lawn?

Knowledge of existing standards are critical in determining worth of items.

Consideration – such as:

$/# – Coffee, Tea

$/SQ' – House, building plans

$/Time – Rent, meters, motels

$/Mile – Bus, train, plane, taxi

WORTH BY FUNCTION

Consider an easy chair for the living room.

What is it worth to support weight?

What is it worth to provide comfort?

What it is worth to you will determine what kind of chair you will purchase, and what you will be willing to pay for it.

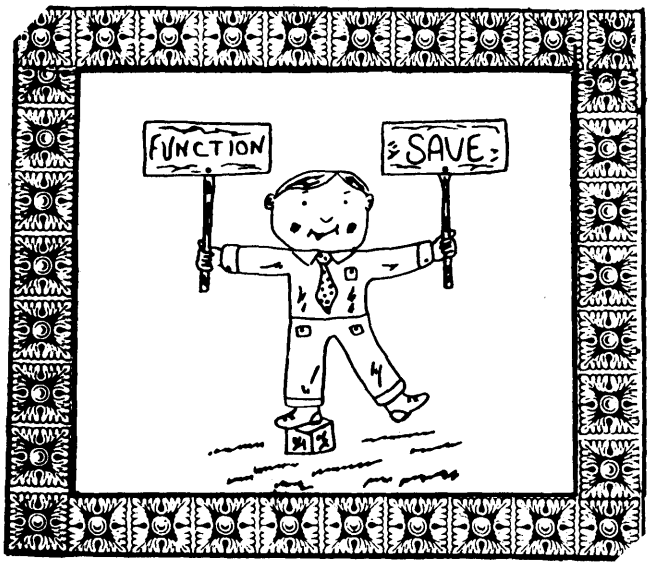
WORTH BY METHODICAL RANKING

Several techniques are available.

(1) Numerical evaluation

(2) Combinex method

(3) Group ranking



Emotion has a price tag and results in unnecessary costs.

Three prominent ways are:

- DEFENSIVE SET
- SPECIFICATION CREEP
- OVERSPECIFICATION

TAKING A DEFENSIVE SET

All of us have experienced the sensation of making an unfortunate, if not unwise, decision in the performance of our work. Despite setbacks, most engineers tend to personify a resilient nature early in life which enables them to consider each new opportunity based on its individual merit.

This trait is true for two paramount reasons. First, a young engineer has not yet experienced upward mobility and has little departmental status or position to protect. Secondly, he has yet to become battle scarred or reprimanded significantly for errors.

Later, he will probably experience his share of both and consequently, will become a more conservative and judicial practitioner. The key to the extent of the defensive set may not lie directly with the individual however, but rather with the degree to which his superiors have tolerated justifiable failure. Vince Lombardi once said: "Winning is not a one time thing, its the only thing." Some industrial managers, not unsurprisingly, think the same way – consequently, the defensive set among subordinates.

OVERSPECIFICATION AND SPECIFICATION CREEP

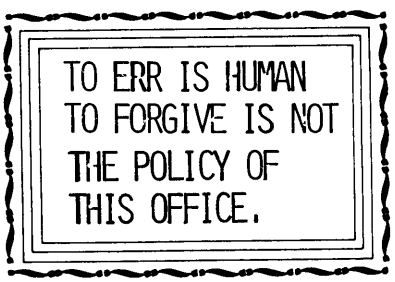
In new designs, the defensive set manifests itself in overspecification. Hazards or perils are precluded by designing more than ample safety factors into a product. An interesting thought here is that an engineer is often lauded and held in high esteem because he wants to "Maintain high integrity" in the product, when in fact, he fears personal risk of failure. A facade is thus maintained. The crux of the matter is this: Has function been considered? Has value been provided – lowest cost of providing the required function at the desired time

and place with the essential quality? If not, cost has not received the proper priority.

Specification creep is termed by the author to mean the overreaction to field problems which results in more than necessary corrective action. It stems from fear. Fear of future problems; fear of the surfaced problem becoming all too noticeable and conversation worthy.

To demonstrate decisive action on the problem all components within an affected assembly might be strengthened promptly instead of an analysis to determine what one or two parts might need corrective change. As a contributing factor, the situation is hectic, normally requiring a quick and decisive response; thus cost is seldom a strong priority.

Specification creep is one way that unnecessary costs get built into the product structure. It presents a more serious challenge for change than overspecification because warranty and retrofit files stand as partial evidence and justification to its current existence.



DEFENSIVE SET

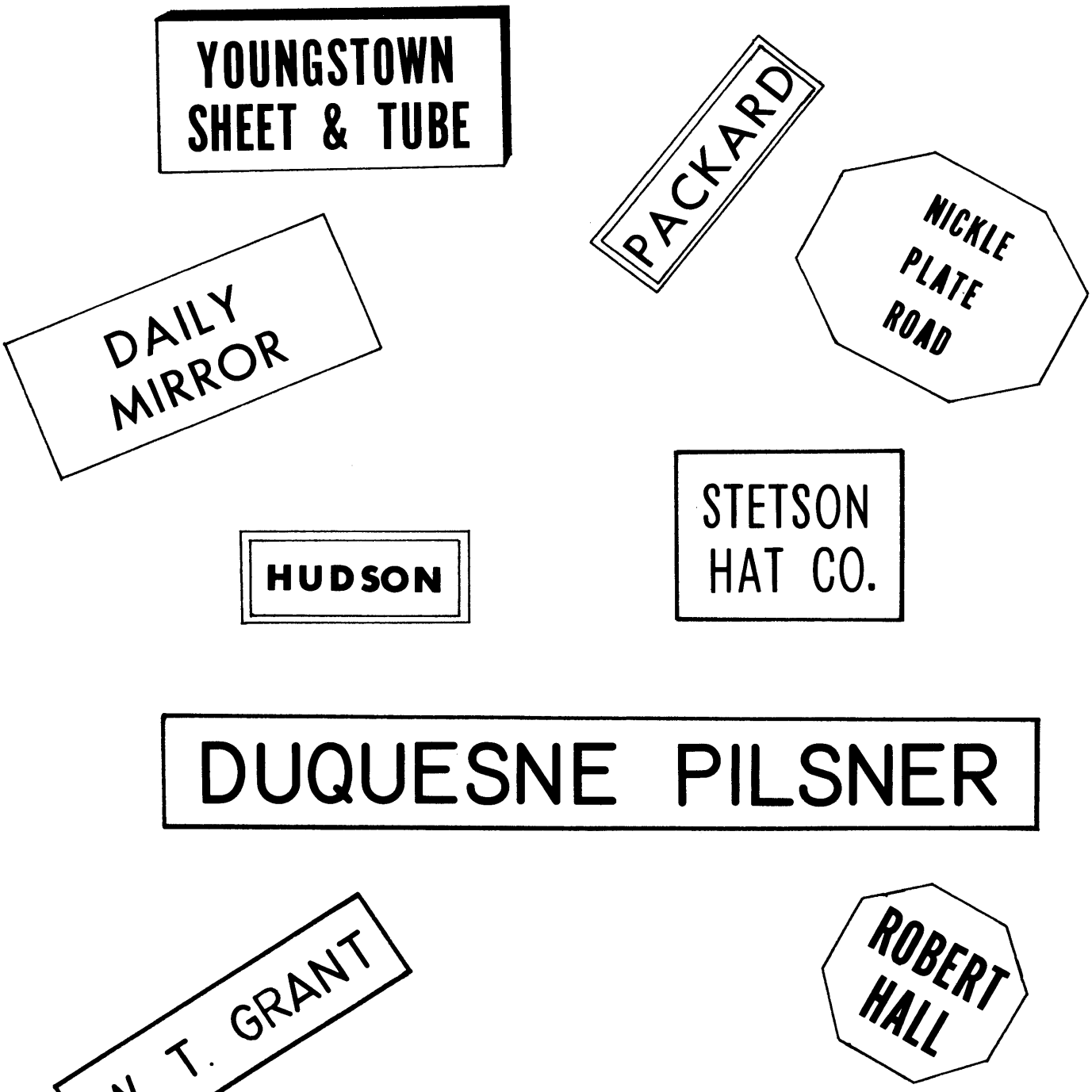
FEAR OF CONSEQUENCES.

OVERSPECIFICATION

DESIGN EXCEEDS NEED.

SPECIFICATION CREEP

OVER-REACTION TO A PROBLEM.



COLLIER'S

FORT DIX

FRENCH PIANO

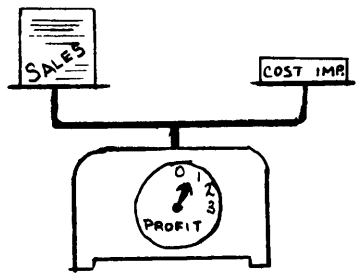
WHERE ARE THEY NOW?

IMPORTANCE OF COST SAVINGS

Recognize the importance of a dollar saved versus a dollar in increased sales.

What is the approximate profit on each dollar of sales?

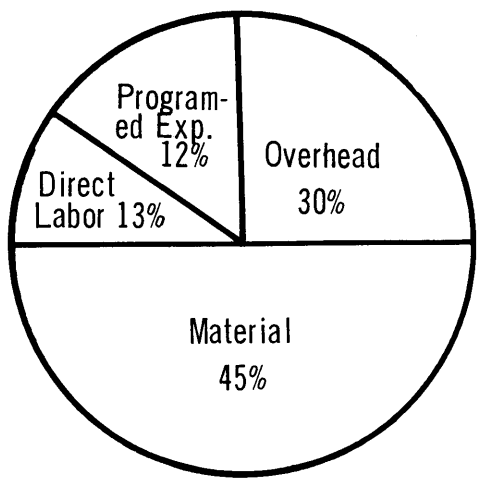
Answer, approximately $.05 profit for each dollar of sales. This means to increase profits one dollar, two alternatives are available. Either increase sales by $20 or decrease costs by two dollars. A 10–1 ratio.

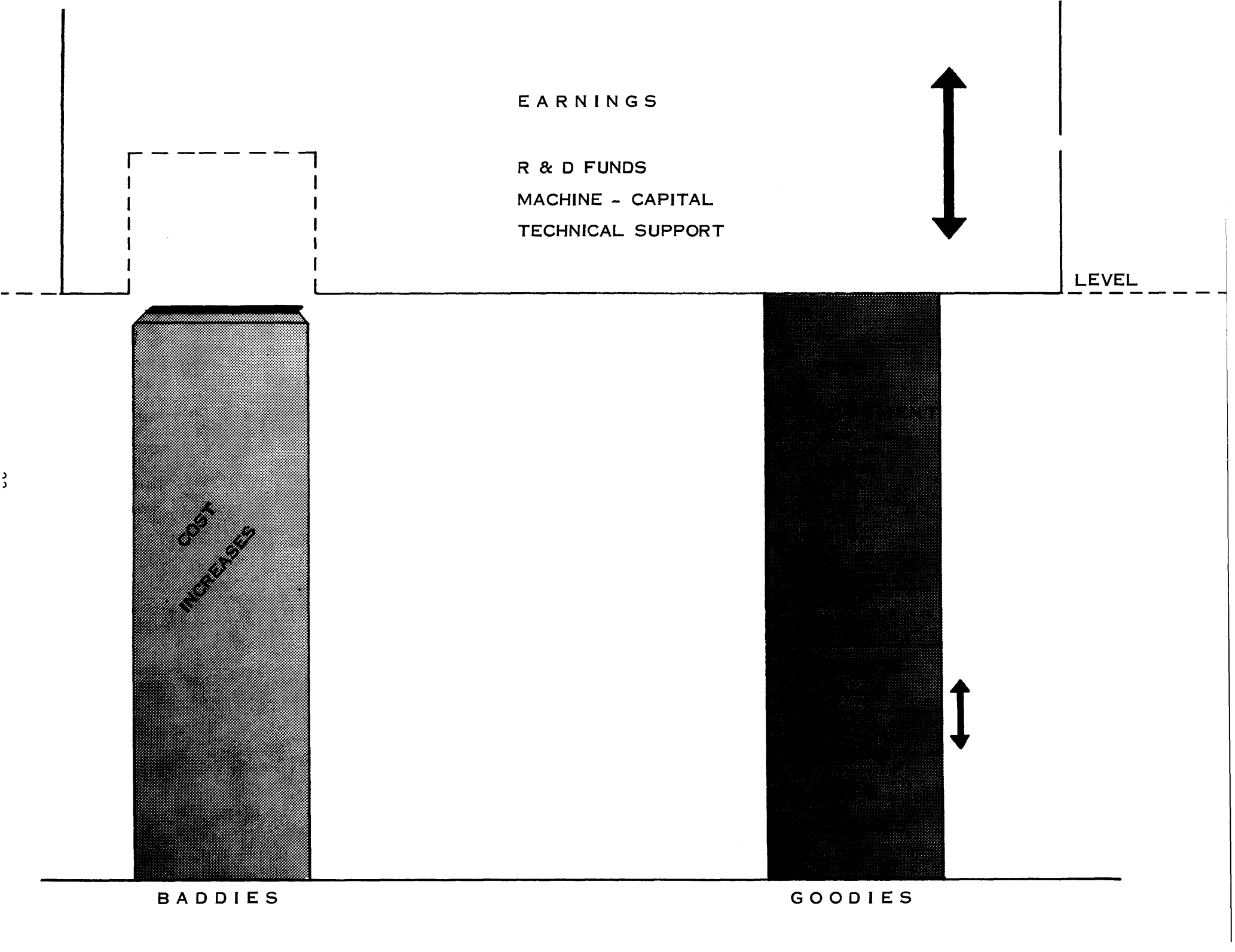


OPPORTUNITIES

In early years, cost improvement effort has largely been directed at the end product itself--the hardware going out the back door. Industrial Engineering has been the stalwart leader in this regard through the application of work measurement and manufacturing engineering.

The attack on costs have been heavily preoccupied with controlling direct labor costs. The attack has been successful as evidenced by looking at the cost pie breakdown. Direct labor costs are a relatively small amount, approximately 13% of the total cost dollar.




EARNINGS
R & D FUNDS
MACHINE - CAPITAL
TECHNICAL SUPPORT
LEVEL
COST INCREASES
BADDIES
GOODIES

EARNINGS MODEL EXPLAINED

NOTE: This earnings model assumes earnings level to be at a desirable position.

In formulating the annual business plan it is necessary to project the known and predicted cost increases.

CALL THESE BADDIES

These cost increases must then be attacked and offset by planned means.

CALL THESE GOODIES

Some goodies are: Selling price increases, increased sales volumes and cost improvement.

INCREASE SALES, ELEMENTS OF

- MARKET PENETRATION
- REDUCE SELLING PRICE
- PAYMENT TERMS
- SUPERIOR PRODUCT
- BETTER SERVICE
- PERSONALITY

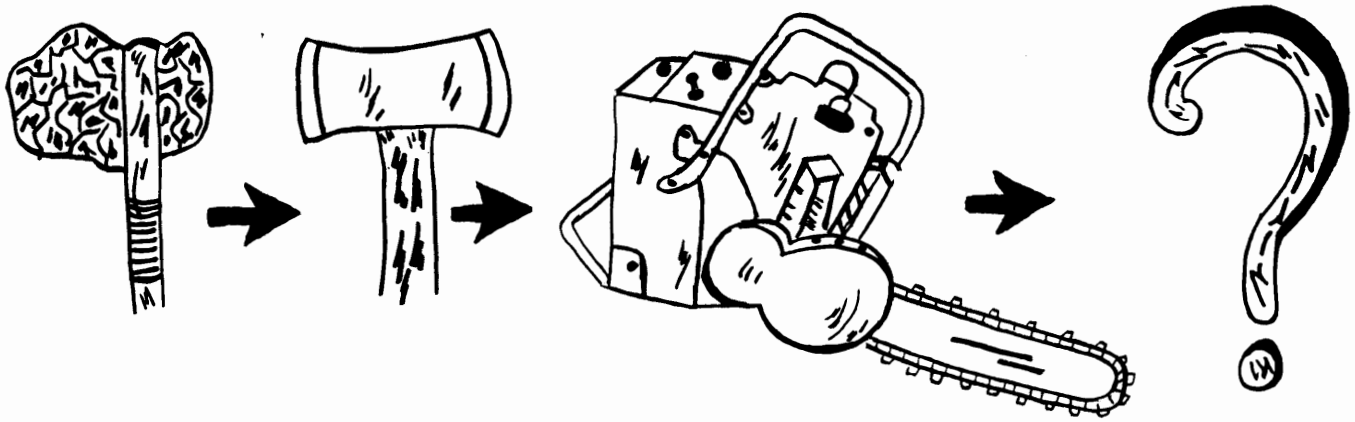
The objective of increased selling price and increased sales volumes are diametrically opposed in a competitive, elastic marketplace.

Cost Improvement is perhaps the most important factor in maintaining earnings position in a competitive market.

"Over the long haul the low cost producer will prevail"

Cost Increases are a two-edged sword. Earnings are needed for improving manufacturing costs and the product. However, if earnings aren't maintained, funds will not be available to apply to Research and Development programs, capital expenditures and adequate technical support. Without these, the costs will automatically rise.

Good management requires that prospective cost increases are projected in advance so that proper balancing action can be effected; or at least known.



WHERE DO WE GO FROM HERE?

Value Analysis Engineering will play a vital role in the future growth or survival of well-managed businesses. Let's look at some case studies to see how value was improved through using value analysis methodology.

Is its cost proportionate to its usefulness?

CASE STUDY 1

Throw rugs are rented and laundered weekly by an external cleaning service. An Analysis indicates that low traffic areas do not require weekly cleaning and in some cases, no rugs at all. Implement.

Will another dependable supplier provide it for less?

CASE STUDY 2

Presently utilizing a freight bureau for auditing freight bills manually. Changed to a computerized firm which will provide the service more efficiently at a lower cost.

Is there anything better for the intended use?

CASE STUDY 3

Prior design called for variable speed motor design and sheaves. Very expensive to repair and maintain. Replaced with DC motor drive. Better performance and more maintenance-free.

Can a standard product be found which will be useable?

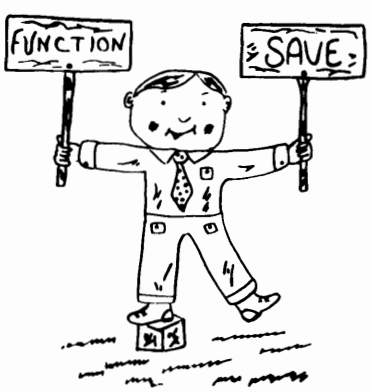
CASE STUDY 4

By conscious effort, an engineer found an available oil seal from a local automobile agency that was not only better but twenty percent of the cost of one supplied by an O. E. M.

Is anyone buying it for less?

CASE STUDY 5

At a technical society meeting one evening, two individuals discovered that their respective companies were purchasing standard forms from the same supplier. Except that the company buying the higher volumes had a significantly higher cost per unit. Situation was corrected. (No, the colleague did not have to pay higher prices also).



Does its use contribute Value?

CASE STUDY 6

Platforms around machine tools were made from finished pine lumber. A change to rough oak lumber resulted in a 3X increase in life and elimination of safety hazard from falling through. Cost remained the same.

Is it made on proper tooling – considering quantities used?

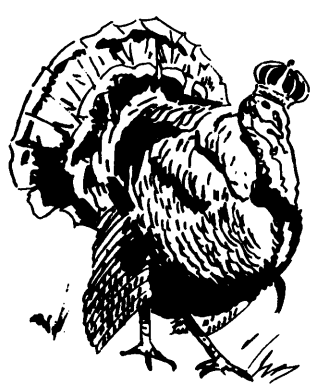
CASE STUDY 7

An item that had been overlooked following the prototype testing stage continued to be fabricated from a weldment. When discovered, and costs analyzed, it quickly became apparent that pattern costs for a casting were justified to decrease unit costs.

Can a useable part be made by a lower cost method?

CASE STUDY 8

A part with a contoured configuration was being burned from a 1/4" plate. Following approval for a reduction in thickness, it was possible to buy the item as a stamping at a three-quarter reduction in cost. Part became functionally better due to improved flatness.

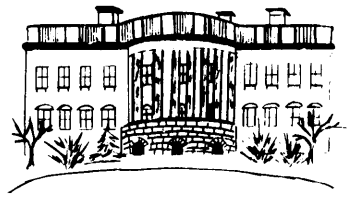


Does it need all of its features?

CASE STUDY 9

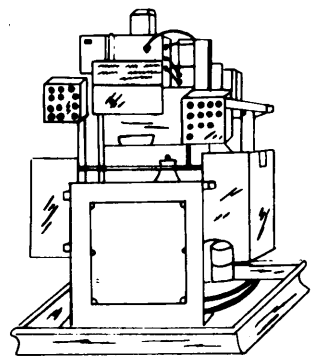
A large corporation had the practice of buying company automobiles from those presently available at the dealer. Often this included two-tone, power windows and trunks; essentially features that were not required. Company now procures all vehicles by ordering to defined specs.

CRISIS IN PRODUCTIVITY



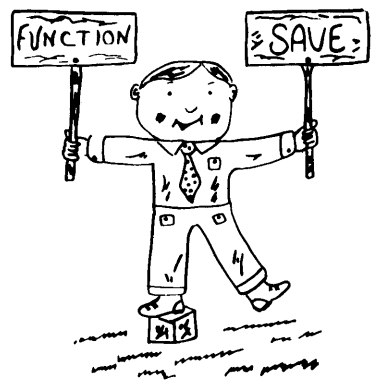
IMPROVED PRODUCTIVITY THROUGH
GOVERNMENT INTERVENTION

INNOVATIONS IN PRODUCT DESIGN



TECHNOLOGICAL ADVANCES
IN MANUFACTURING

PRODUCTIVITY THROUGH MOTIVATION



VA/VE AS DISCIPLINES CAPABLE OF
SOLVING THE PRODUCTIVITY PROBLEM

PRODUCTIVITY SOLUTIONS

SUPPORTERS WITH DIVERSE SOLUTIONS TO THE PRODUCTIVITY PROBLEMS APPEAR TO BE LINING UP, OFTEN HEATEDLY, IN VARIOUS CAMPS. A COORDINATED PLURALISTIC ATTACK IS ESSENTIAL.

MEMORABILIA ON VALUE

THE WALL STREET JO

MIDWEST EDITION — MAY 26, 1952

COST CONTROL

GIANT GENERAL ELECTRIC FINDS THAT PENNYPINCHING PAYS IN A BUYERS MARKET.

NOTHING-IS-TOO-LITTLE DRIVE ON EXPENSES BRINGS BIG SAVINGS IN MANUFACTURING.

SCHNECTADY—The purchasing agent for the giant GE Company here turned to an engineer not long ago....."Larry Miles".....

What's News—

Business and Finance

ECONOMIC FEARS of much slower growth or even outright recession are unwarranted, White House economist Charles Schultze said. In a major policy speech he conceded slower expansion is disappointing but insisted the recovery is likely to continue for some time.

(Story on Page 1)

A 7¼% prime rate was posted by Chase Manhattan, a ¼-point boost that is expected to spread.

(Story on Page 1)

A budget deficit of $61.3 billion agreed to by House-Senate co for fiscal 1978. That is wid year's expected $45 bill is near Carter's pro

(Story or

Natural-gas r

World-Wide

LANCE'S CONCERN in mid-1975 **government job was indicated.**

Long before the November e Lance was worried his pros ernment post could be th ciplinary agreement ar he headed, Senate cording to affidavits the Senate Goverr tee, the federal of ment last Nove ers six mon headed f that h the

Inve

200
180

A Reader's Digest REPRINT

Biggest Thing Since Mass Production

A carefully worked-out technique of "value analysis" is producing dramatic dollar savings for consumers and taxpayers

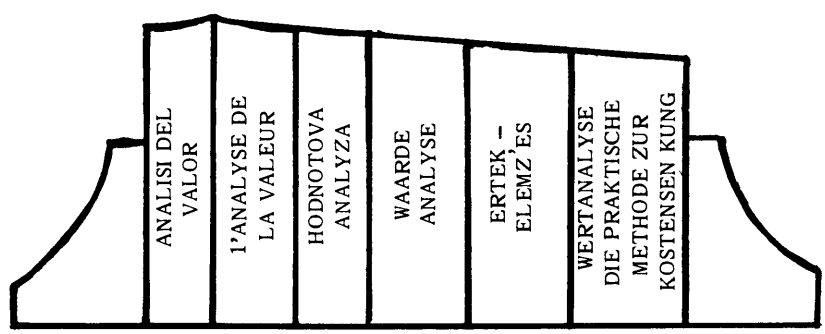
By Lloyd Stouffer

BACK IN 1947, Larry Miles, a General Electric design engineer, walked into his boss's office in Schenectady, N th a bone-jarring question ny- body here care wh " Somebody, And the idea a the design k his own e one of imers

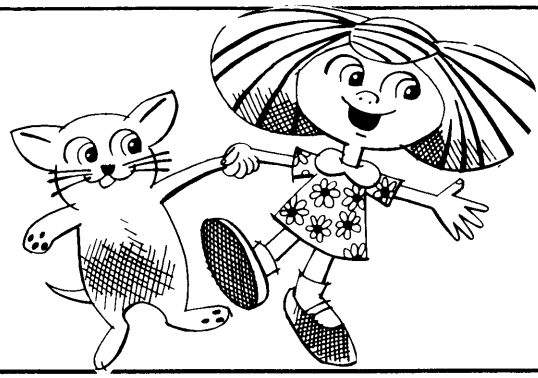
ance. In 17 years, savings from value engineerin estimated at more tha for the purchasers from toasters to One of the engineered control an ex co

- 1959 -
SOCIETY OF AMERICAN VALUE ENGINEERS IS FORMED

UNITED STATES NAVY
DISTINGUISHED
PUBLIC SERVICE AWARD
TO
L.D. MILES



L.D. MILES BOOK – TECHNIQUES OF VALUE ANALYSIS AND ENGINEERING – HAS BEEN TRANSLATED INTO MANY LANGUAGES.



THINGS TO KNOW AND DO

1. A FRIEND SAYS - "VALUE ANALYSIS IS NOTHING BUT GOOD OLD FASHIONED COST REDUCTION." HOW WOULD YOU EXPLAIN THE DIFFERENCES AND ADVANTAGES?

2. THE TERMS VALUE ANALYSIS AND VALUE ENGINEERING ARE SYNONYMOUS FOR MOST. IN WHAT WAY DO SOME DIFFERENTIATE BETWEEN THE TERMS?

3. WHO IS CONSIDERED THE FATHER OF VALUE ANALYSIS AND IN WHAT YEAR AND COMPANY DID IT BEGIN?

4. WHAT IS MEANT BY THE TERMS:
   . DEFENSIVE SET . OVERSPECIFICATION
   . SPECIFICATION CREEP

5. ECONOMIC VALUE IS ONE OF SEVEN CLASSES OF VALUE; NAME THEM.

6. ECONOMIC VALUE HAS THREE (OR FOUR) SUB-CLASSES, BEING: USE, ESTEEM AND EXCHANGE.
   . TO HAVE EXCHANGE VALUE AN ITEM MUST BE _____ AND _____.
   . PHILOSOPHICAL QUESTION - WHAT IS THE DIFFERENCE BETWEEN THE ECONOMIC SUB-CLASS ELEMENT - ESTEEM AND THE PRIMARY VALUE CLASSIFICATION AESTHETIC?

7. DEFINE WORTH.

8. WHAT IS MEANT BY MARGINAL UTILITY OF VALUE?

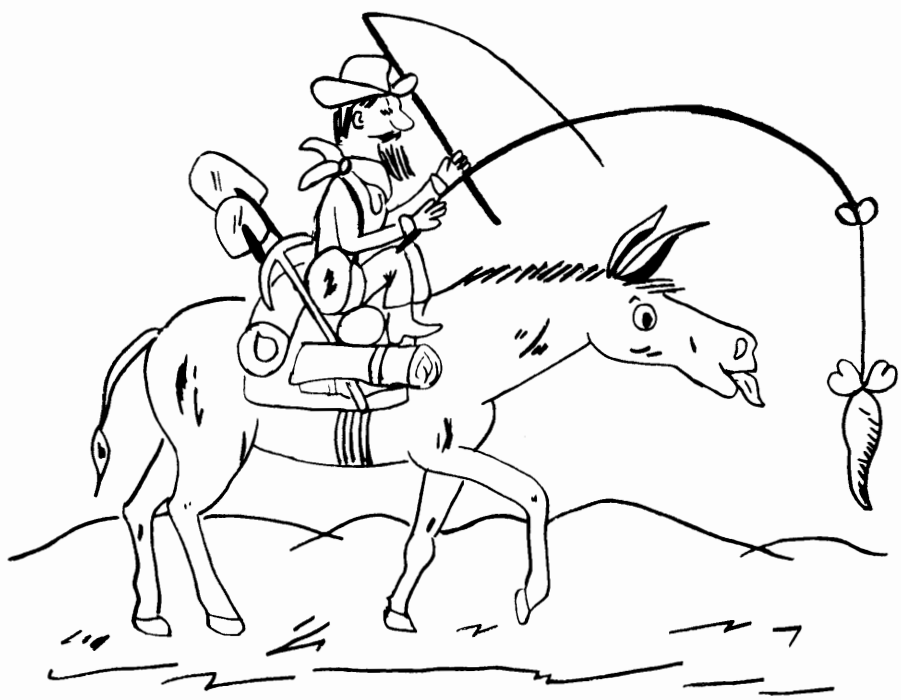
9. DEFINE THE FOLLOWING: . FUNCTION . BASIC FUNCTION
   . SELL FUNCTIONS . SECONDARY FUNCTIONS . WORK FUNCTIONS

PRINCIPLES OF VALUE ANALYSIS ENGINEERING ©

BY:
THOMAS R. KING

MOTIVATION

Volume I No. 3 ©



PRINCIPLES OF VALUE ANALYSIS ENGINEERING

Motivation

Volume I No. 3

PRINCIPLES OF VALUE ANALYSIS ENGINEERING

Volume I No. 3 Motivation

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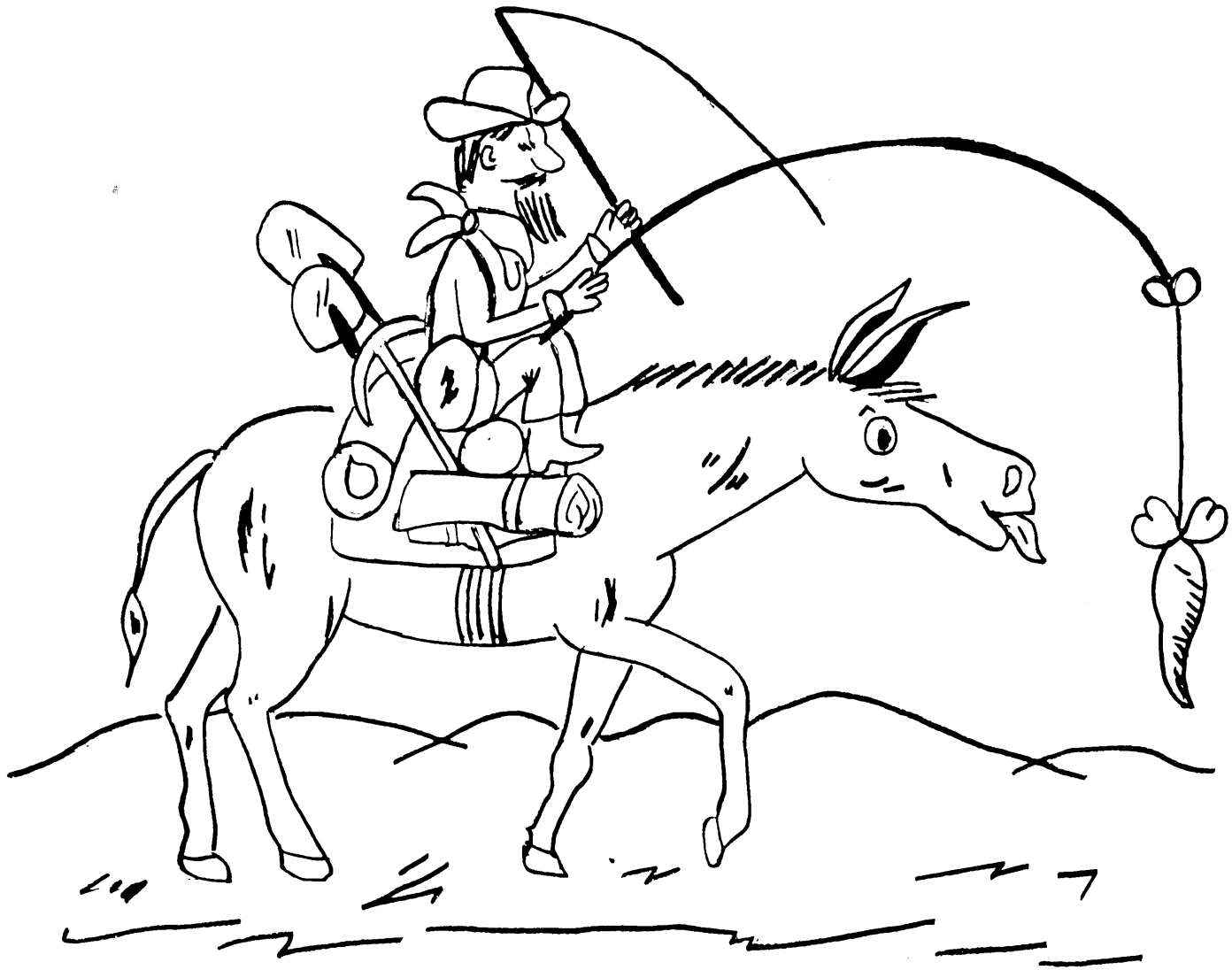


MOTIVATION

Management deals with method and style. Combined they form a process, and at once, are a marriage of an art (style) and a science (method).

Motivation is inherent in the management process, and it too has peculiarities of both art and science. However, it is much harder to quantify.

Understanding Human Behavior is one of our lesser skills in Industry today; consequently, it follows that motivating people is also one of management's shortcomings.

Truth is that we know an awfully lot more about things –– than we do about people. We can take a block of steel, analyze it, comprehend its chemical and physical properties and go on to make that particular steel do what we want it to do. Not necessarily so with people.

Additionally that chunk of steel will act much the same tomorrow as it did today. With people, it will depend upon what has happened in between the time periods.

Although there have been many reports, forums, and discussions on motivation, there exists little consensus regarding what factors motivate workers. If all the reports on motivation were laid end to end, the most profound statement that could be made is, that they were lying end to end.

THE BOTTOM LINE

Maybe, management isn't really concerned about motivation per se.

Candidly, from an altruistic standpoint, we care little about motivation. What does concern management is productivity or output; and the fact that motivation has an effect on productivity. Consequently, the interest in motivation is that it is a means to an end. If management can inspire positive motivation, or set the climate for self motivation, productivity will improve. Earnings will rise.

EXTRINSIC AND INTRINSIC MOTIVATION

Intrinsic motivation is motivation from within, and is done willfully and most often with pleasure or an objective in mind.

Extrinsic implies motivation from without.

MOTIVATION VS STIMULATION VS MANIPULATION

Sometimes it is difficult to draw semantical distinctions; largely it depends on one's point of view. Whacking a jackass, could be interpreted as:

MOTIVATION – As intended by the Whacker

MANIPULATION – As felt by the Whackee

STIMULATION – As witnessed by the Passerby

Manipulation is often well disguised as a form of motivation.

MOTIVATION ELUDES PREDICTABILITY

Examining a copy of Business Week Magazine, I discovered an article entitled "Art," which publicized a young millionaire, having a 1200 acre ranch outside Amarillo, Texas. The article begins with a picture of a windswept plain featuring the Texan attired in Civil War Battle garments, (a Yankee one), boots –– the whole works, leaning against one of ten Cadillacs which are buried vertically in the earth; the windshield and hood of the cars exposed and pointing skyward in a circular pattern.

It's obvious that this gentleman was motivated, but motivated in a very peculiar sense. We have to admire his imagination but question seriously its meaning. It required initiative to develop this creative idea, locate ten late vintage Cadillacs, transport them to the ranch, excavate the ground, crane the automobiles into a vertical position and refill the excavation with dirt. What motivated this individual to do this, only he knows, but motivated he was.

MONEY DOES MOTIVATE

The theory that "Money doesn't motivate," for a time was a popular one, however, very dangerous and if misunderstood could cause considerable harm. Life used to be straightforward and most people regarded money to be the chief motivator. However, a very effective and convincing promotion was advanced by the B. S.'ers (Behavioral Scientists) and it became the in-thing to parrot the idea that Money doesn't MOTIVATE.

Money, or more precisely, the things it can be exchanged for, is the reason people go to work. Is it not then a motivator?

Money motivates a man to get out of bed, go down into the pits or climb a skyscraper.

It is not job enrichment that induces men and women to jump out of warm pajamas in the morning; it's money. Fondness or dislike of a job will determine whether one does it grudgingly; but happy or not, earning power and lack of alternatives will determine if one will endure.

The feeling whether money motivates or does not motivate is a personal one, largely influenced by one's interpretation of the term – motivation.

MOTIVATIONAL THEORIES

There are several interesting management or motivational theories that are popular in Industry, today.

Even though one might pick at them they have nevertheless provided much food for thought on the subject of motivation.

MC GREGOR THEORY

A popular management theory credited to Douglas McGregor is:

THEORY X
and
THEORY Y

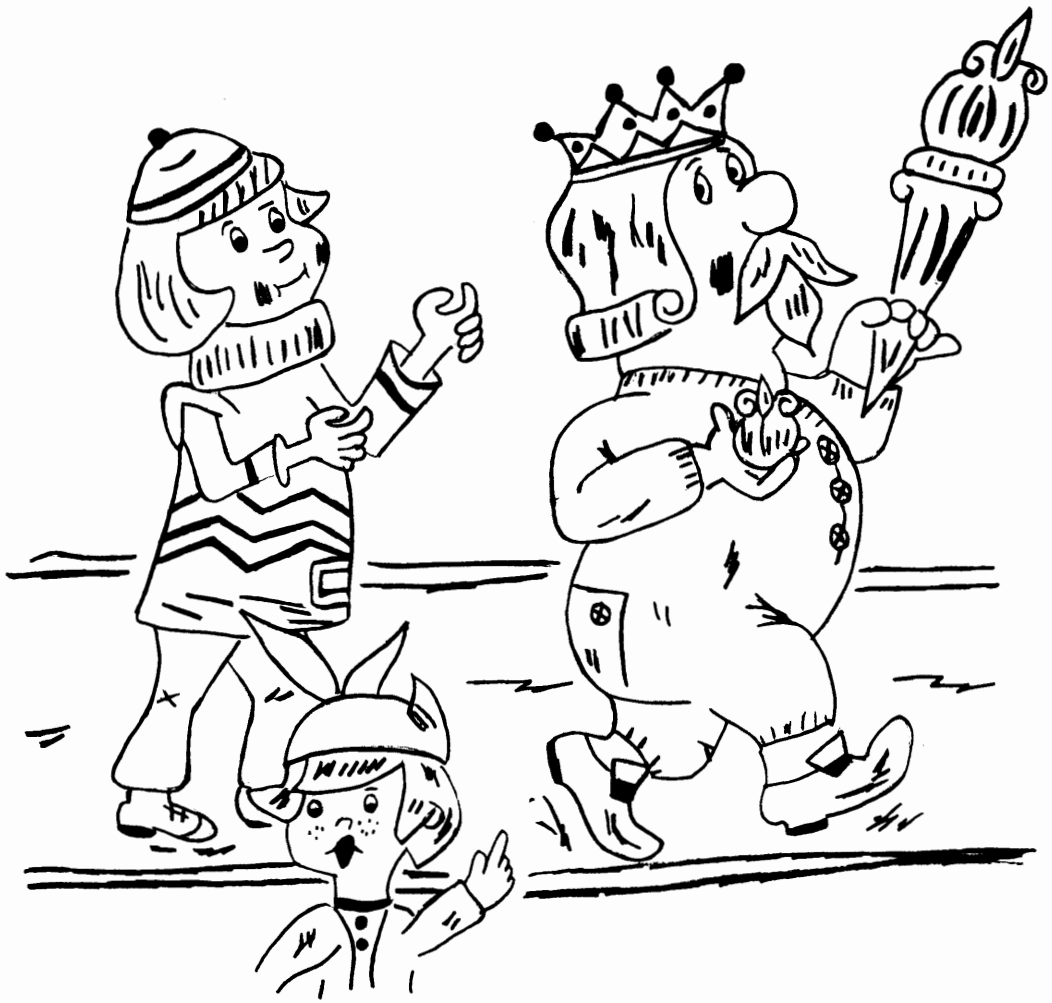
MONEY DOESN'T MOTIVATE

SPONSORED BY THE

B.S.'ers ⟶

(Behavioral Scientists)

Is this theory, much like the emperor's new suit of clothes; made of such fine material that only the very intelligent can see it?



THE EMPEROR IS *BARE*

You probably recall from childhood, the story of the farmer and the stubborn donkey. For added stimuli the farmer carried a whip, and on the harness in front of the donkey's nose, dangled a carrot. Theory X is equivalent to the Donkey scenario; an idealology of punishment and rewards.

Theory X says this about people: They are lazy, lack motivation, work only because they have to, tend to be gullible and not too awfully bright.

All in all not a very glowing reflection.

Theory Y says somewhat the opposite: People have many skills, exhibit a potential for creativity; further they are interested in doing a good job, dynamic, thirst for change and challenge, and are capable of handling their own affairs.

The upshot of this thinking is that managers who view people as X, will perform as Theory X managers; they will exhibit tight-fisted, strict control almost to the point of being a dictator. Some practitioners mistakingly envision Theory X as being strong management and Theory Y as weak; but not so. Both can be equally strong or effective.

EDITORIAL ANALYSIS – THEORY X AND Y

It is difficult to conceive that all people would fall neatly into the categories of X (lazy) or Y (industrious). People are not static lumps of clay.

People are not apples alike; and they are subject to change, mentally and physically.

- Not all people are X
- Not all people are Y

Some are leaning toward X

Some are leaning toward Y

Some are dynamic – depending on time and circumstances

Some days they are X – Some days they are Y

X Manager – X worker		Necessary Relationship
Y Manager – Y worker	EQUALS	Excellent Relationship
Y Manager – X worker		Unworkable Relationship
X Manager – Y worker		Degrading Relationship

It is the Manager who must adapt to a given condition.

An X worker, forces a superior to be an X Manager.

MASLOW'S HIERARCHY OF NEEDS

Another theory, developed by Abraham Maslow, deals with man's/woman's hierarchy of needs.

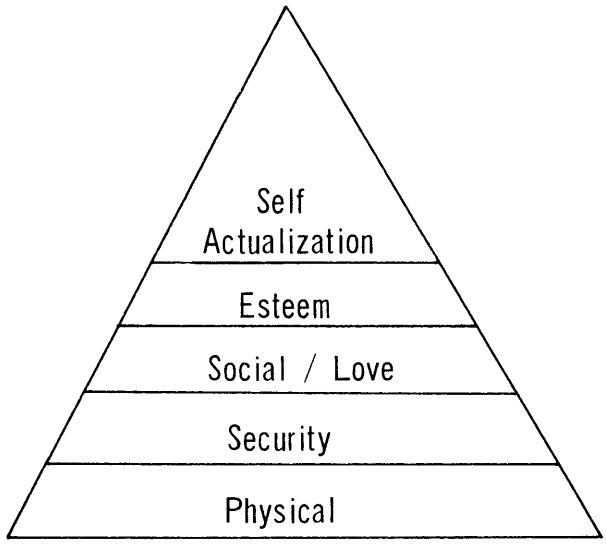
It says simply that man's needs are nestled in the shape of a triangle, consisting of five ascending levels. The strongest needs are at the bottom level and are termed physiological needs –– essentially survival. A need satisfied is no longer a need.

Once these needs are satisfied, and only then, it is possible to aspire for the next higher level needs; the second being security.

Security involves such factors as predictability and safety. Satisfying these needs man will want to move on to the third level, social – belonging and love. Love, not in a sense that one might ordinarily think of it, but rather a fraternal love, such as joining a union, the Elks, or a social club. Basically, it feeds a want for affection and acceptance.

Many people, Maslow determines, do not graduate from lower level needs.

Beyond social needs are esteem needs, which is personified by a parking place at work, a big office, belonging to a country club, or having a five bathroom house. The pinnacle need is termed self-actualization, often associated with writing a book, presenting papers to college psychology classes, quoting poetry, or perhaps burying Cadillacs in the earth.



Maslow's Hierarchy of Needs.

EDITORIAL VIEW – MASLOW'S THEORY

The theory has substance, however, I do not believe that it is necessary to climb all consecutive levels before continuing to a higher order need.

Hippies portray a standard of living that would exemplify only the first and fifth levels. They exist, it appears, on bare essentials, yet do their thing without any regard to esteem.

Retreating back down the hierarchies can be an abrupt happening. One can envision the retreat bypassing the intermediate needs as one's aspirations are crushed due to some disturbing revelation.

Additionally, there is another factor that would add credibility to the theory. And that is the matter of –– degree.

True, most people might climb up from these needs one by one, but some will need much more of one need than another. He might require very little security. Conversely, one might require much social belonging and love.

Esteem as we think of it means little perhaps, to Ralph Nader.

Maslow's theory is a good one and is a good model to massage, based on an individual's experience and perspective.

MOTIVATION HYGIENE THEORY

Another motivation theory, credited to FREDERICK HERZBERG, is the Motivation Hygiene Theory.

Herzberg reasons that there are a number of elements which motivate people; likewise, there are other elements, which in themselves do not motivate people, yet if absent – will de-motivate people.

Money, Herzberg avers, does not motivate people. Fursuing this, money does not motivate an individual, but the absence of proper remuneration will certainly de-motivate him.

MAINTENANCE–HYGIENE NEEDS	MOTIVATORS
Company policy and Administration	Achievement
Supervision	Recognition of Achievement
Interpersonal Relationships	Work Itself
Working Conditions	Responsibility
Salary	Advancement
Status	Growth
Security	

HERZBERG'S MOTIVATION/HYGIENE THEORY (Editorial Comment)

Its an interesting theory which appears to apply more to management than production workers. Money must be considered a motivator; the chief one.

More precisely, it is the underlying things that money can be exchanged for that creates the motivation:

- NICE CLOTHES
- SENDING THE GIRL TO COLLEGE
- OCEANFRONT VACATION
- SECURITY

Enjoying one's work will make a difference whether or not one does his job cheerfully, nevertheless, money is the inducement to go to work and perform.

VIEWS BEYOND INDUSTRY

Some interesting views on motivation that I have heard from people outside of industrial circles belong to NICHOLAS VON HOFFMAN – NEWS COLUMNIST, BISHOP FULTON J. SHEEN, and my friends in the mining community.

NICHOLAS VON HOFFMAN in a newspaper article – HOW TO MOTIVATE WORKERS, is quite candid about different business strategies – which he terms schemes – to improve motivation. His point, if I understand it correctly, is that experiments on rats using a system of rewards and punishments, does not necessarily apply to people.

He is right.

Also, he expresses disdain when there are excessive "attaboy's" or plaudits passed out for job performance. Von Hoffman states that maybe one reason businessmen keep trying to find the right motivation formula in the face of so many failures is that of:

> An unrecognized desire to believe that people show up for work every day for some reason other than money.

Otherwise, the most promising Motivational device is an electric cattle prod.

BISHOP FULTON J. SHEEN – NO HOPELESS CASES

Bishop Sheen says that no two people have the same amount of energy; all are born with different talents and differing energy power levels.

Despite the differences, one fundamental that seems to apply is that an individual can channel the power in either direction.

A person who is capable of going say 10 feet in the direction of virtue is also capable of going 10 feet in the direction of badness.

A person who is capable of 500 units of creative bad, could if transposed, produce 500 units of creative good.

In other words, each soul has a given quantity of power. Putting this in perspective, over the years I have detected some very astute local union officials; eloquent in communication and possessing sharp negotiation skills. Real whirlwinds. Further, they were recognized, as a term, UNION PEOPLE, DYED IN THE WOOL. But then a promotion occurred and they found themselves in Management. Here their perspectives changed, but their energies did not. STILL they were whirlwinds, but their energies were consumed in a different path.

FRIENDS IN THE MINING COMMUNITY, simply stated their motivation this way:

NO WORK --- NO PORK.

DRIVES

Survival

Biological – Hunger – Thirst

Physical – Activity

Biological – Sex

Physical – Power

PROPAGANDA TACTICS

Name Calling

(Repeated Lie)

Glittering Generality

(Associate with virtue)

Transfer

Testimonial

Plain Folks

Card Stacking

Bandwagon

DRIVES

Rated Strength of Biological and Social Drives

Motives	Rating	Motives	Rating
Appetite-hunger	9.2	Respect for Deity	7.1
Love of offspring	9.1	Sympathy for others	7.0
Health	9.0	Protection of others	7.0
Sex attraction	8.9	Domesticity	7.0
Parental affection	8.9	Social distinction	6.9
Ambition	8.6	Devotion to others	6.8
Pleasure	8.6	Hospitality	6.6
Bodily comfort	8.4	Warmth	6.5
Possession	8.4	Imitation	6.5
Approved by others	8.0	Courtesy	6.5
Gregariousness	7.9	Play-sport	6.5
Taste	7.8	Managing others	6.4
Personal appearance	7.8	Coolness	6.2
Safety	7.8	Fear-caution	6.2
Cleanliness	7.7	Physical activity	6.0
Rest-sleep	7.7	Manipulation	6.0
Home comfort	7.5	Construction	6.0
Economy	7.5	Style	5.8
Curiosity	7.5	Humor	5.8
Efficiency	7.3	Amusement	5.8
Competition	7.3	Shyness	4.2
Cooperation	7.1	Teasing	2.6

EXPERIMENTAL FINDINGS – D. Starch Principles of Advertising
Chicago: Shaw and Sons, 1923, P. 273

ABOUT THE EXPERIMENT: Starch prepared a list of forty-four motives for action and had them rated by seventy-four men and women. Each rater was instructed, "Ask yourself how important each element is in determining your actions from day to day." The motives were rated on a scale from 1 to 10; 10 being high.

STRATEGIES

ADVERTISING STRATEGIES

Statistics	Slogan
Sublimation	Symbol
Romantic	Snob Appeal
Expert	
Youth Appeal	New – Improved
Testimonial	
Humor	Budget Cost

PEOPLE MAY PREFER MARTYRDOM

Even though an individual might point out a problem, he might not want help. In other words, he likes pain. He likes martyrdom. Two cases in point.

CASE I

Elroy was a foreman who had a problem he was happy to share with anyone. The holdup in his production pipeline was the nozzle ring inspection station, where rings were examined for air flow capacity. Even with three shifts, three workers each, it was an impossible task.

A bright young engineer found a way to reduce the measurement and calculation time on nozzle rings from the previous 75 minutes to just 3 minutes; and, do it better.

Goodby pipeline holdup!

Elroy's reaction?

My goodness, what am I going to do with the second and third shift workers?

Tom, I have this problem . . . . . .

CASE II

A young engineer, observed with interest a key technological problem of the day. Product Engineering had expressed a keen desire, if not a mandatory request to Manufacturing engineering, to develop a means for putting a teflon seal groove in a rotating apparatus. The problem was that the disk material was a tough high alloy steel, difficult to machine; it was much further complicated by the fact that the required groove was to be only .015 inches wide, .250 inches deep and machined radially on the face.

Impossible, nearly.

Rather than assign the problem to lower strata levels, the Manufacturing chief assumed the challenge. Ranging far and wide, taking national and international trips, exploring new technologies, – consulting with kings and emperors alike, he at last reported failure. Alas, it can't be done.

Feeling remorse for his superior, (about four status levels up), the young engineer went on the offensive during the vacation, production shutdown period.

Armed with a special cobalt tool that had been contour ground for maximum support, a factory work order – maximum charge about twenty dollars, and a first rate toolmaker, he ascended upon a South Bend lathe.

Thereupon, utilizing some ingenuity and skill, the groove was indeed machined in a disk simulating the needed function. Voila!

The young engineer sped back to his supervisor's office (four levels up) with blazing eyes and saliva dripping from the sides of his mouth. With uncontrollable enthusiasm, he presented the finished workpiece and stuttered his tale.

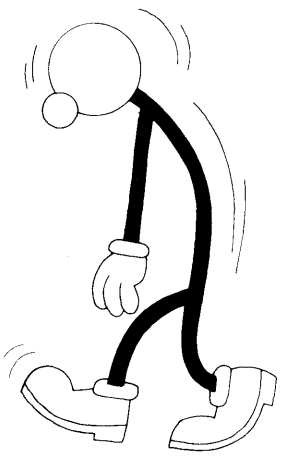
The boss's response was --- Rage.

"You didn't." Well, you did and you didn't. It was a fluke and we will be unable to duplicate it under production conditions."

That was his verbal communication. His non-verbal communication (eyes and hot breath) "Make - - - - sure you don't show that to the Designers, or for that matter anyone else."

Within seven minutes after leaving the room, a band saw was located and a corner removed from the dishonored workpiece. This corner remains in my office today as a lasting reminder that people don't always want ideas just because they say they do.

This is a sad tale. It's unfortunate, but it is one repeated every day in industry, somewhere, and immeasurably detracts from the quality of working life.



MOTIVATION – IMPLEMENTING IDEAS

Communicating a complex proposal requires a high degree of skill. Often the decision made is not on the merits of the proposal, as the decision maker understands them, but on his judgment of the presentor and his track record.

The presentation should be simple; salient points not cluttered with details. Too many ideas or choices at one time, creates confusion.

To illustrate this, is what the author considers an all time classic: a wife selecting wallpaper. A strategy here is not to acquaint her with the large stores having forty nine shades of blue, but rather steer her into the local outlet, where it is a well-established fact.

"Yes, we have blue, here it is."

GLITTERING GENERALITY

It doesn't hurt to add image endorsement to the proposal – people who command respect.

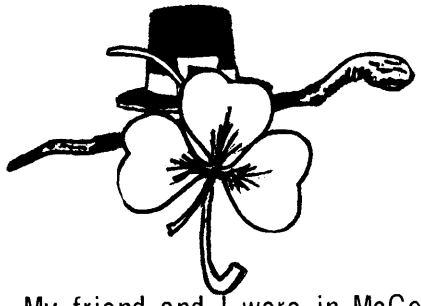
Such as, "You know, your boss really likes this idea." Rather than a heavy hand, it is important information to add to the proposal.

Just consider the embarassment he will incur if he rejects the proposal and his boss really does like it.

POWER GROUPS

Recognize in some power groups that your ideas per se, will never be implemented without a rigorous massage –– sufficient to identify the power group with the finished product. This is not all bad. It must be remembered that with decision, also comes responsibility and accountability for that decision. It should be one that they will feel comfortable with.

There are times, however, when major structural changes could weaken your proposal. On these, a valid and offsetting tactic when approaching a "power" group, is to include them in the decision making process.



Story of Andy Frain

A Short Story

by Tom King

My friend and I were in McCormick Place in Chicago to attend a Machine Tool Show. We arrived early in the morning and found that entrance was not permitted to attendees until ten o'clock, but exhibitors were permitted in, and there were many.

We determined to try to casually meander through posing as exhibitors. Our entrance was blocked by a big friendly uniformed Irishman – Andy Frain, whose name was on his cap.

"Sorry and begorrah chaps," he said.

He was both very courteous and effective in keeping the public out, and offered suggestions on how to spend the two waiting hours. So, we decided to have breakfast. We discussed motivation theory over toast, and specifically speculated on Andy Frain.

Why was he so pleasant? So much he seemed to like his job! And on and on about the motivation of this security guard.

We waxed eloquent and came up with this zenith of appraisals:

Reason he was so motivated was that the agency saw clear to put his name – Andy Frain – on his hat for the world to see.

My friend concurred. It sounded plausible. We vowed to implement this procedure back home in Pennsylvania.

Wiping bacon juice from our jowls, we paid the bill, went to another level of the amphitheatre, and approached another entrance.

Much to our surprise, there was another guard; this time a woman – coincidentally – with the name Andy Frain. And a third Andy Frain, who it was clear, was no Irishman.

Then truth struck.

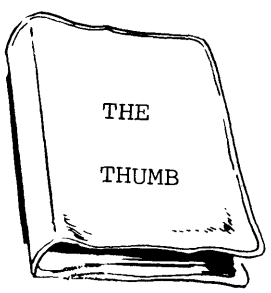
They were all Andy Frains. It was the agency's name.

And my friend and I had concluded wrongly about motivation that day, and the enthusiam of the big Irishman.

I often wonder about this experience when trying to lump people into general theories on

- THE MAESTRO -

AND NOW MAESTRO FIORINI BOWS AND GESTURES TO HIS PIANIST, WHO BOWS, AND NOW HE AND SHE BOW TO EACH OTHER AND ONCE AGAIN TO THE AUDIENCE, AND NOW MAESTRO FIORINI MOTIONS TO THE FIRST CELLIST AND ALL THREE ARE BOWING TO EACH OTHER AND TO THE AUDIENCE, AND NOW MAESTRO FIORINI MOTIONS THE WHOLE SYMPHONY TO STAND AND MAESTRO FIORINI AND THE SYMPHONY ARE BOWING TO THE AUDIENCE, AND THE AUDIENCE IS ALL BOWING AND I AM BOWING AND THE GANG IN THE CONCESSION STAND IS BOWING AND THE USHERS ARE .....



- THE AUTHOR -

THE AUTHOR WISHES TO DEDICATE THIS BOOK TO HIS THIRD GRADE TEACHER WHO CURED HIM OF DANGLING PARTICIPLES AND TO THE PROOFREADER, HARVEY SNARLAPPLE FOR DECIPHERING THE LINEAR EQUATION CONCERNING THE EXPECTED COFFEE CROP IN UGANDA AND TO PRUDY ELDERGILL FOR MIMEOGRAPHING THE ROUGH DRAFT AND APPLYING SNO-PAKE TO ALL TYPEWRITER ERRATTA AND TO HIS FINE FRIENDS IN ZANZIBAR FOR COUNTING THE CATS, AND TO .....

KRISTA PREFERS SUMMER

I like summer because in summer you can go swimming and learn to swim. And you can go on vacation like Florida and really can get a good tan. We make forts in the woods with our friends. It's fun to make things out of nature. Eating down in the woods is fun too. But my favorite thing is family camp. I'm glad because this year, 1977, I get to play softball with all the big people. I've been practicing all my free time. And at family camp you can meet a lot of friends.

Thee End

MOTIVATION – FAMILY STYLE

STUDY:

I happened to read this essay written by my daughter while looking through her school papers.

Immediately, and fortunately, I recognized the motivation behind the "Krista Prefers Summer Letter" for what it was.

She was only nine but passionately wanted to play softball with the biggies; – powerful Walter Mitty type athletes whose athletic prowess on the ball diamond was legend against the competitive likes of teenagers, old men and less than co-ordinated women.

What audacity! Wanting to play with us pros. The motivation behind the desire, I have concluded was this:

The previous year while at family camp the older sister, quite athletic, was permitted to occupy deep left field – an out of the way place, – during the "fierce" competition.

Suddenly, a batter sent a screaming liner her way. Somehow -- whether skill or an act of self preservation -- the ball slammed into her mitt and stuck. A sensational catch. Everyone applauded Marcy, the ball nabber.

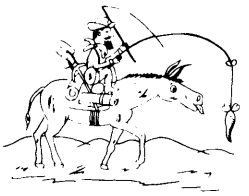
Later, at the group evening meal, the Master of Ceremonies announced indeed that Marcy was the heroine of the day. Another round of applause.

Well, guess who was most affected by all this? Younger sister – Krista. For here, as evidenced by the essay nine months later, she was seriously preparing to get a slice of the action and recognition for herself. It is obvious that this was an important objective for her -- and too only nine years old.

Had I not seen the essay, I would have undoubtedly shooed her away from the grownups that year. And predictably she would have been shattered, demotivated and down. But I did see it. And made sure she had the opportunity to perform --- albeit in the far, far right field foul line, away from danger. Sometimes when you're lucky, you win one. And I felt particularly good about this outcome.

To this day the letter remains in my office as a constant reminder, that in dealing with others, you must look at perspective from their situation – not your own. For in doing so, you will work to find a win – win situation for both. □

YALE'S 12 MOST PERSUASIVE WORDS – USE THEM!	
YOU	EASY
MONEY	SAFETY
SAVE	LOVE
NEW	DISCOVERY
RESULTS	GUARANTEE
HEALTH	PROVEN



CASE STUDIES – MOTIVATION

Survey: During a controlled survey with office management personnel – I posed the following question:

"WHAT CHANGES IN YOUR JOB OR WORKING ENVIRONMENT WOULD MAKE YOU MORE PRODUCTIVE OR FEEL BETTER ABOUT YOUR JOB?"

– Responses follow –

* *

CASE STUDY – 1

"I would feel better about my job if I felt I could advance into something more challenging. I have mastered my job and I do it well, but sometimes I want something more inspiring to do."

CASE STUDY – 2

"I feel that I would be more perceptive and responsive to my job if I did not receive a flat percentage rate (which is standard) on a yearly basis. I am a company employee, not a union employee and I feel that my raises should be consistent with my ability to perform.

Presently I receive a raise on a yearly basis for any work performed. I would like to receive a raise for my strong points and contributions to the company, within a reasonable amount of time. Company people should be of a competitively oriented personality, that would not allow them to be content with just a job. They must be constantly looking for advancement and promotion. Management must provide and incorporate an attitude of growth with meaningful rewards of promotions and financial rewards."

CASE STUDY – 3

"Cleaner offices, better office equipment, such as flexowriters, typewriters. Better ventilation, new carpeting, paint and draperies to soften the noise of the flexowriters and vibration."

CASE STUDY – 4

"Compliment as well as criticize. In other words encourage."

CASE STUDY – 5

"I would say a major problem in the white-collar working division is in the area of responsibility and authority. I believe many people are held responsible for certain things that they do not have the proper authority to really carry out, or if they do have the authority, they are never given a clear definition of just what power they do have.

A clear definition of a persons job is needed. This may have to be done every year or certain time period – a re-assessment."

CASE STUDY – 6

"Better office conditions, such as more privacy while talking to customers on phone – maybe a partition around each desk. Cleaner offices that are badly in need of paint and draperies."

CASE STUDY – 7

"I would like to hold a job that I am qualified for. I have gone and graduated from College with an Associated Degree in Secretarial Administration, and am now an inventory clerk. I would be much happier if I had a job that was more suited to my background In other words – If the employers would make sure that they do not have over qualified people doing the simpler jobs."

CASE STUDY – 8

"I would like to understand more the procedure of changes or additions in the Company, in other words the basic system of purchasing department of the control center.

I would like to feel like a human operating a machine, (knowing the procedure or the roots of the job) rather than a machine running a machine."

CASE STUDY – 9

"If I only had one boss to tell me what work I have to do, instead of five people trying to give me work to do."

CASE STUDY – 10

"I need a quieter place to work. I'm on the phone all day and it gets pretty noisy with the people talking and the printer in back of me all day long. It's hard for me to hear and its also hard for the person on the other end to hear me."

CASE STUDY – 11

"If I had a desk I could look more organized. Right now I have a table with one small drawer in it. Also the desk would take up less space and would have a front panel on it where as the table is all open in the front."

CASE STUDY – 12

"Keep us receptionists warm and we will be more productive. Hint – fix the entrance doors so that the wind from outside doesn't howl thru the large cracks and crevices. After all, it is much easier to type with flexible fingers and easier to answer the phones when not in a crouching position."

CASE STUDY – 13

"Working for someone who really cares what you do and makes you feel like your helping the company. A feeling of pride and concern that someone cares.

Get the boss more involved in what really are the office problems and question."

SUCCESS INGREDIENTS

CAN

WANT

TRY

ETHOS

(VALUES)

PATHOS

(FEELING)

DETERMINANTS

OF

HOW ONE WILL REACT

LOGOS

(LOGIC)

THINGS TO KNOW AND DO

1. According to Maslow, man's needs are nestled in an ascending triangle, fourth level being esteem. How would you explain the fact that many young people of modest means drive an exceptionally expensive car?

2. Is money a motivator? Discuss.

3. If money is not a motivator, why do many companies maintain incentive or piecework programs?

4. Herzberg determines that advancement and growth are motivators, while money is not. What do the terms <u>advancement</u> and <u>growth</u> mean to you?

5. What does McGregor mean by Theory X and Theory Y?

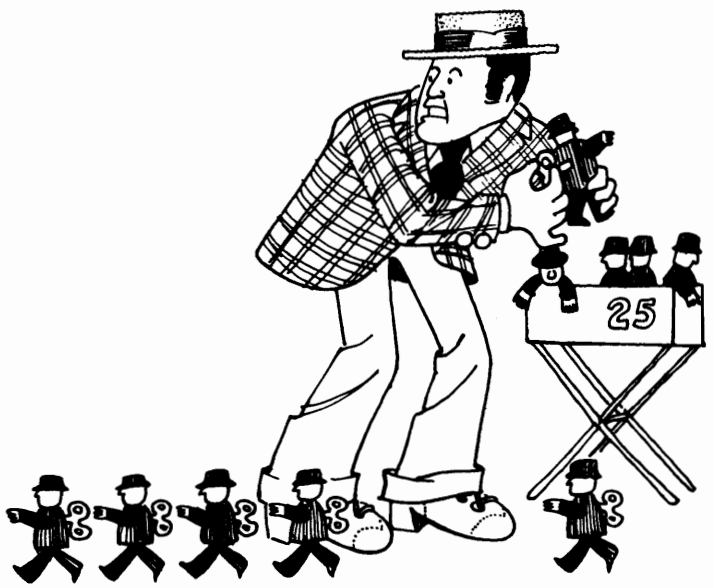
PRINCIPLES OF VALUE ANALYSIS ENGINEERING

BY:

THOMAS R. KING

ADVANCED TECHNIQUES I

Volume I No. 4



PRINCIPLES OF VALUE ANALYSIS ENGINEERING

Advanced Techniques I

Volume I No. 4

PRINCIPLES OF VALUE ANALYSIS ENGINEERING

Volume I No. 4 Advanced Techniques I

CONTENTS

DETERMINING WORTH

Distinctions and similarities between the terms – VALUE and WORTH have caused many ideological discussions.

For some the terms seem nearly synonymous; others, even those perhaps recognizing distinctions, often use the terms interchangeably.

Consulting Webster – worth is defined as the value of something measured by its qualities or by the esteem in which it is held.

The author tends to think of the relationship of Value and Worth in this manner:

First – the determination of value is expressed in terms of unity by the ratio –

$$\text{VALUE: } \frac{\text{WORTH}}{\text{COST}}$$

Continuing, Value is thought of as an overall condition; qualitative, and expressed in varying degrees.

Worth is thought of as the measurement of that condition (Value); quanitative, and expressed as cost – perhaps in terms of money, time, or personal sacrifice.

Is a particular hat worth ten dollars? (worth, quanitative) It is if it satisfies a need with the lowest cost at the desired time and place, and with the essential quality, (value, condition)

Rather than get mired in deep rooted philosophy let us examine the various methods for determining worth which will provide greater insight.

METHODS FOR DETERMINING WORTH

Several good methods exist for determining the worth of an item or its various functions. Some of these are:

1. INDIVIDUAL ESTIMATE
2. GROUP CONSENSUS
3. NUMERICAL EVALUATION
4. COMBINEX
5. MATRIX ANALYSIS
6. MATRIX ANALYSIS – QUASI FORMS THEREOF
7. DIRECT MAGNITUDE ESTIMATION

WORTH – INDIVIDUAL ESTIMATE

This method is not as imprecise as it would first appear, and is based primarily on factors, such as:

- EXPERIENCE
- JUDGMENT
- INTUITION
- COMPARISONS
- KNOWLEDGE
- INCREMENTAL COSTS

People buy, sell and trade in their daily life and ultimately develop a sense for the worth of goods, functions and services. Some, obviously, are more skillful at it than others.

As you will see in the following examination of worth, individual estimates play a vital role in even the more scientific approaches toward measuring worth.

WORTH – GROUP CONSENSUS

Experience with several controlled group ranking exercises in university and industrial settings has convinced the author that groups do better than individuals acting alone, in determining worth.

This proved true in eighty percent of the controlled exercises. Why?

Group discussion, and the different input and skill levels brought by individuals to group activity, tend to counteract the extreme levels of bias and lack of information held by individuals on certain issues.

Want a quick, relatively safe way to determine worth? –– Organize a group.

WORTH – SPECIAL TECHNIQUES OVERVIEW

Several good techniques exist for determining worth a little more scientifically. Most of these evolve around a matrix grid and approach the determination of worth from a one on one comparison, step by step, of the various items, elements or functions being examined.

While the objective of the various techniques is similar, there are nuances and characteristics which make each one unique in its approach.

Some of these are:

Matrix evaluation and quasi – forms thereof, combinex, function rating grid, matrix evaluation chart and numerical evaluation.

NUMERICAL EVALUATION

Numerical evaluation is a technique that was developed by A. E. Mudge to readily establish the order of importance of any list of functions, items or events.

Application of numerical evaluation in ranking the importance of features to be considered when selecting a copier, is shown in the example – Page 4.

MATRIX EVALUATION – OVERVIEW AND CASE EXAMPLE PROBLEMS

There are several varieties of matrix evaluation techniques and quasi forms thereof, each having certain strengths. Following, I have taken a specific problem, applied three different types of matrix evaluation, and remarkably have come up with a consistent solution to the problem. The different types shown are:

APPLICATION I – Matrix Evaluation – Simplified

APPLICATION II – Matrix Evaluation – Real Data Input

APPLICATION III – Two step process

Function Rating Grid

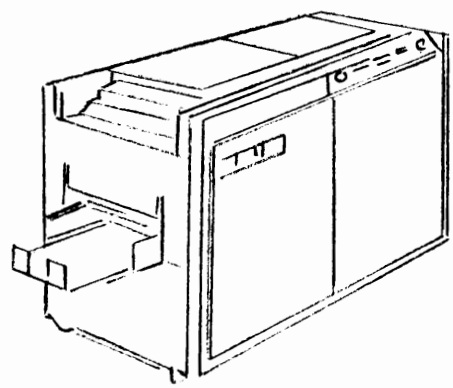
Matrix Evaluation

Numerical Evaluation -- Instructions

CONSIDERATIONS IN SELECTING A COPIER

Key Letter	Functions	Weight	Ranking
A	Bond Paper	3	4
B	Copy Cost	9	1
C	Speed	0	6
D	Two Side Copying	4	3
E	Service	2	5
F	Reduction	6	2

1. List functions, elements to be compared.
2. Based on information obtained, compare "A" with "B". Place the letter representing the most important in the upper left hand block in the matrix. Add to this block the appropriate weight factor, i.e., 1–2–3. The weight factor is determined by the speed of the decision, i.e., if rapid use 3, etc.
3. Compare "A" to "C" in a similar manner and add the weight factor.
4. Compare "A" to each lettered element below it, determining importance and weight.
5. When this is done, step down to "B" and compare it, on a one to one basis, to each lettered element below it. Continue this process until every element has been compared to every other element.
6. After all elements have been compared, add the weight factors for each letter, both vertical and horizontal, and place the total in element.
7. Then establish the descending order ranking, the element with the highest weight being #1.



MATRIX

	B	C	D	E	F
A	B2	A2	D2	A1	F1
	B	B3	B1	B2	B1
		C	D1	E2	F2
			D	D1	F1
				E	F2

PROBLEM SCOPE:

OBJECTIVE:

DETERMINE THE RELATIVE WORTH OR RANKING OF FOUR FAMOUS BASEBALL PLAYERS;

PETE ROSE	DAVE PARKER
JOHNNY BENCH	WILLIE STARGELL

ABILITIES CONSIDERED:

BATTING AVERAGE	SPEED-DEFENSE
HOME RUN OUTPUT	EXCITE CROWD

EDITORS NOTE: Reference several sources, among them these fine publications.

COMBINEX – Value Analysis to Improve Productivity – Fallon, Wiley InterScience – 1971.

QUANTITATIVE EVALUATION – Techniques of Value Analysis and Engineering – 2nd edition – Miles, McGraw–Hill 1972.

NUMERICAL EVALUATION – Value Engineering – A Systematic Approach – Mudge, McGraw–Hill 1971.

MATRIX EVALUATION – APPLICATION I

BASIC FEATURES:

- A weighting system whose sum is unity (1.0), emphasizing the importance differential assigned to the elements by which the ball players will be measured.
- A rating system of 1 – 5 (high) by which players are rated against the elements.
- Process steps
  - (A) Rate players by element (5 – high), and post.
  - (B) Multiply rating times weight. Post values.
  - (C) Add values horizontally to determine relative worth.

MATRIX EVALUATION – APPLICATION II Real Data Input

Application II features a little different approach than I, in that real data is included in the evaluation, thus making it possible that it could, (not necessarily would), be more scientific and precise.

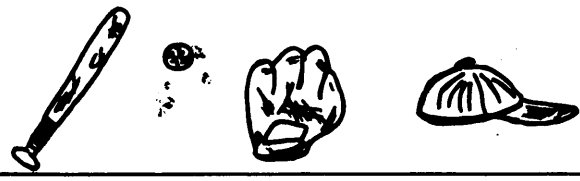
Rather than compare, say – Pete Rose and John Bench – against home run ability, perhaps giving Pete a two rating and John a five, or whatever --- it is possible to include the exact number of home runs that each has struck.

It is also possible to use actual batting averages, but here some common sense must be used. Batting averages are listed in terms of 1.000, such as .280. And one can see very quickly what would happen if the user chose to use .280 in the matrix instead of 28 as shown; the overall impact would be negligible -- WEIGHT OF .2 X .280 RATING = .056. This would mean next to nothing in the overall relative worth, and nearly wipe out the element – batting average – as a means of comparison.

Application II uses a maximum rating scale of 100. This seemed to work out decently, however, give some thought to this -- perhaps further developing this "real data" approach.

Stargell is shown with 31 homers averaged per season, consequently a rating of 31; base being 100. Rose 12, consequently a 12 rating.

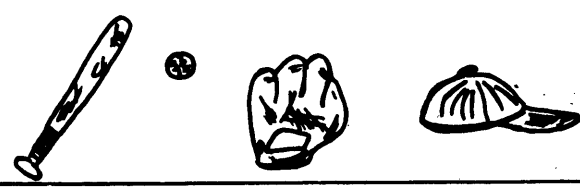
What if it were known that the most home runs ever averaged by an individual over an illustrious career was 40? Should we then realistically assume that 40 be considered a 100% performance and thus elevate Stargell's rating from 31 to 77? (2.5 x 31)



EVALUATION MATRIX - BALLPLAYERS

ELEMENTS	BATTING AVERAGE	HOME RUNS	SPEED DEFENSE	EXCITE CROWD	RELATIVE WORTH
WEIGHTS	.2	.3	.1	.4	= 1.0
PLAYERS					
ROSE	5 1	2 .6	4 .4	5 2	4.0
PARKER	5 1	4 1.2	5 .5	4 1.6	4.3
BENCH	3 .6	4 1.2	4 .4	4 1.6	3.8
STARGELL	3 .6	5 1.5	3 .3	3 1.2	3.6

Application I Evaluation Matrix – Simplified



EVALUATION MATRIX - BALLPLAYERS

ELEMENTS	BATTING AVERAGE	HOME RUNS	SPEED DEFENSE	EXCITE CROWD	RELATIVE WORTH
WEIGHTS	.2	.3	.1	.4	= 1.0
PLAYERS					
ROSE	31 6.2	12 3.6	90 9	100 40	58.8
PARKER	32 6.4	20 6.0	100 10	95 38	60.4
BENCH	27 5.4	30 9.0	80 8	90 36	58.4
STARGELL	(28) 5.6	(31) 9.3	(70) 7	(85) 34	55.9

28 Indicates Batting average .280

Actual number of homers Avg/Season

100 Maximum Rating

Application II Evaluation Matrix – Real Data Input

NOTE: Players are measured against elements using some real data inputs.

The danger in using real data input is that without caution you might lose consistency among the elements. However, it does afford the opportunity and the credibility of adding precise data to the analysis.

MATRIX EVALUATION – APPLICATION III Two Step Process

This application differs from I and II, in that:

- It is a two step process
- First – Weights for elements are determined using a matrix approach rather than assignment of values – adding to unity. Elements are ranked in importance of 1 – 4; 4 being high.
- Second – each player is then performance rated by the satisfaction or abilities he displays for each element. Ratings are 1 – 10; 10 being high.
- Tallying
  - (A) Satisfaction rating is multiplied by the weight for each element.
  - (B) Worth score is tallied horizontally.

COMMENTS – WORTH TECHNIQUES

There are many quasi forms and offshoots of the evaluation techniques described herein.

One appeared in Value World Volume 2 No. 4, and was interesting in that it was evaluating just two job candidates over a large number of desired elements. Both the weights and the evaluation of the candidates were accomplished with a 1 – 5 system.

Two closing points for your consideration:

- Never discount individual or intuitive judgment. Recognize that even in the more scientific approaches described here, there are some elements reliant upon individual estimates or judgment.
- Finally, become familiar with the various methods or techniques that are available – then if necessary, tailor them to suit your personal style or specific situation.

STEP 1 - MATRIX RANKING - DETERMINING IMPORTANCE RANK

ELEMENT	1	2	3	4	VALUE	RANK 1=LOW
1. BATTING AVERAGE	X	0	1	0	1	2
2. HOME RUNS	1	X	1	0	2	3
3. SPEED/DEFENSE	0	0	x	0	0	1
4. EXCITE CROWD	1	1	1	X	3	4

STEP 2 - EVALUATION MATRIX - BALLPLAYER PERFORMANCE

ELEMENTS	BATTING AVERAGE	HOME RUNS	SPEED DEFENSE	EXCITE CROWD	
RANK MULTIPLIER	2	3	1	4	
	SATISFACTION MEASUREMENTS 1 - 10 (HIGH)				WORTH SCOPE
ROSE	9	6	9	10	85
PARKER	10	9	10	9	93
BENCH	7	10	8	8	84
STARGELL	8	10	7	7	81

APPLICATION III EVALUATION MATRIX -

TWO STEP PROCESS

NOTES

PARTICLE ANALYSIS

Particle Analysis is the systematic examination of each particle of material used in a product or application to determine if it is essential to fulfill a necessary function.

The object is to reduce the amount of material needed to manufacture a given product; this is done in two ways, by identifying:

- Material that is discarded during the manufacturing process as chips, ends, etc.
- Material that remains on the end product that is not critical to its functioning.

Particle Analysis begins with the theory that each particle of material costs money to be purchased, and incurs additional costs in being removed. For example, extra weight on a casting usually results in a higher casting cost and again, additional machining costs when that material must be removed to meet final specifications. Further, it is not uncommon to see more waste going into, say, punch press scrap, than remains as material on the finished product.

Application of Particle Analysis involves laying a grid (matrix) pattern of appropriate squares over a drawing of the part being examined. NOTE: The part drawing should include the dimensions the part is being made from. Two pictorial views are necessary-front and end view. The grid pattern can be in millimeters or fractional inch graduations.

Next step is to "X" out all matrix squares where material has been removed by the manufacturing process.

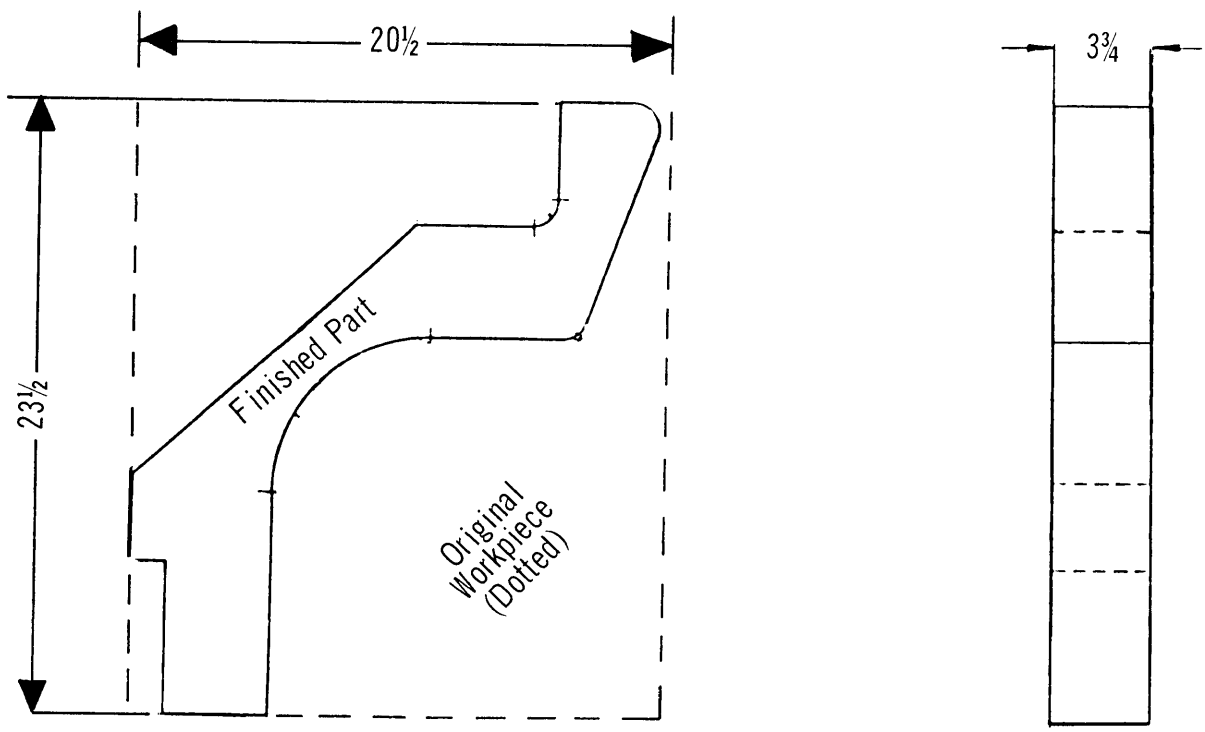
Calculate the residual loss by % of the original workpiece. Then perhaps with a different colored pencil, "X" out all squares on the finished workpiece which are not critical to its functioning. Consider also, the unnecessary material that is internal to the workpiece as well as the outside configuration.

Calculate the potential additional waste.

This exercise will lead you to analyze:

- Material Waste
- Over Machining
- Overspecification in Design

The example which follows will show the initial part, particle analysis application, and some suggested improvements.



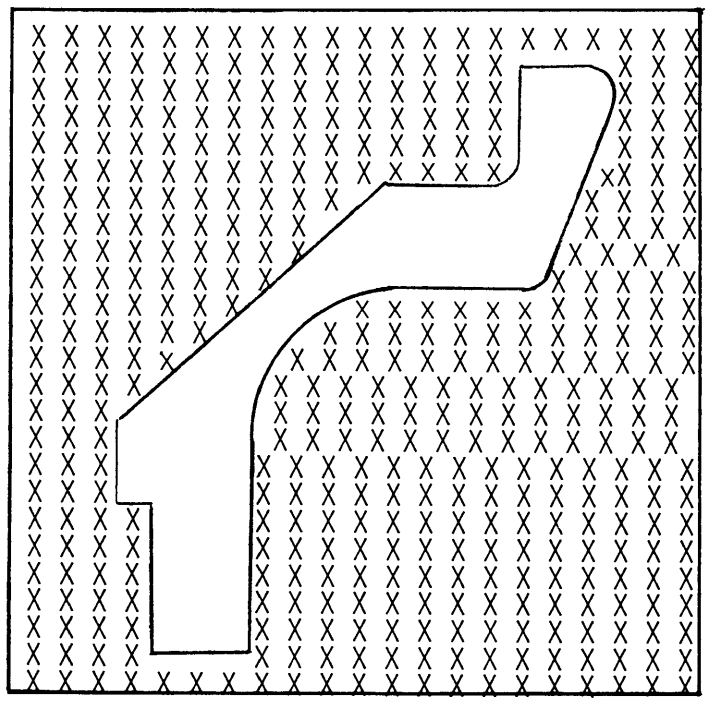
ASTM PLATE
20 5/8 X 23 5/8 X 3 3/4

PARTICLE ANALYSIS EXERCISE

Instructions:

1. 'X' out all material blocks removed from original workpiece.
2. 'X' out (with red pencil) all remaining material which you feel is non-critical to the parts function.
3. Calculate % of non-functioning material.

Application of Particle Analysis



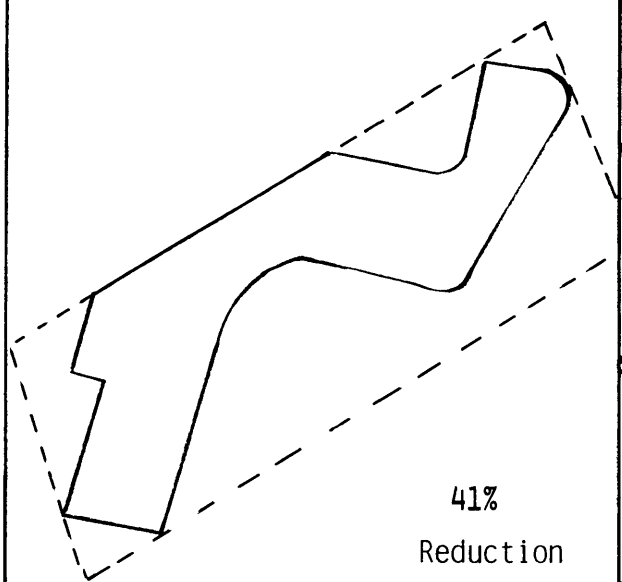
Percentage Waste
Approximately 80%

Original Specification
20 5/8 x 23 5/8 x 3 3/4

Alternatives

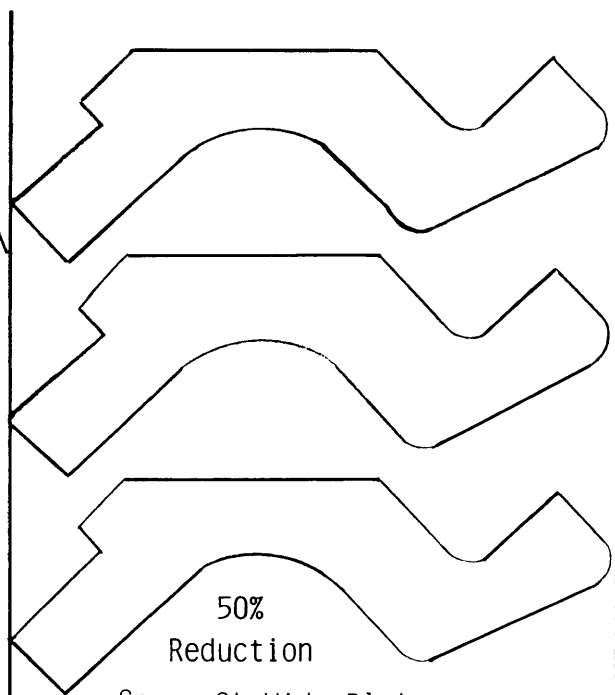
CASTING

FORGING



41%
Reduction

Spec 10 x 29 x 3 3/4



50%
Reduction

Spec 24 Wide Plate

COST VISIBILITY

BEFORE AND AFTER THE VA PROPOSAL

Success in Value Analysis is dependent upon understanding costs.

Reliable cost data enables the Value Analyst to pinpoint high cost areas and focus his effort where it will have the greatest impact.

Costs must be known in order to have a basis of comparison between the existing standard and the new cost improvement proposal.

Having the necessary cost data is one thing, making it visible is another.

Visibility is thought of as the quality, state or degree of being visible. Perhaps in the practical sense a better working definition is the constructing or presenting of information, formerly hidden – not perceptive, so that it is highly visible or graphic.

Cost visibility is all important, and is part of the initial information gathering phase. It tells one where to apply effort for the best potential return.

SELLING IDEAS USING A COST COMPOSITE

Selling ideas to the reticent decision maker requires that the positive aspects are highlighted in order that the benefits are readily known. They must be visible.

A cost visibility composite is a useful device for highlighting the impact of recommended cost savings ideas to the decision makers.

The composite contains current costs and presents various alternatives which return varying amounts of savings for various risks.

It allows the decision maker room for choice and provides the justification for the risk alternative eventually selected.

A Cost visibility composite is a non-threatening technique to aid the designer and overcome his fear of personal loss in making redesign considerations. Rather than pinpointing shortcomings, it is a device aimed at highlighting opportunities.

The cost visibility composite, pools cost improvement elements in such a way that the positive impact of making certain decisions is highly visible and apparent.

Visibility of an idea does not insure that a good decision will follow, however, it is a tremendous beginning.

A cardinal rule to follow in selling ideas is to share the recognition and shoulder some of the risks.

"Cost visibility, is the ability to highlight specific cost information so that rational risk analysis decisions can be made."

Example shown: Cost visibility, down-grade analysis.

DOWN-GRADE ANALYSIS

COST VISIBILITY COMPOSITE

FRAME (Part Name)	PRESENT SITUATION Specification Material	Thickness	Material Cost/Unit	ALTERNATIVE NO. 1 Mat'l Spec	Cost/Unit	Savings PC	Savings YR
A. Mat'l Spec change -components-							
1. Wing	Hi-Alloy Steel	3/4"	$22	Lo-Alloy	$16	6	$9000
2. Platform	Hi-Alloy Steel	1/2	45	Lo-Alloy	32	13	19,500
3. Gusset	Lo-Alloy Steel	1/2	10	Carbon Steel	7	3	4,500
4. Cover	Lo-Alloy Steel	3/8	20	Carbon Steel	14	6	9,000
5. Deck	Carbon Steel	1	90				
6. Channel	Carbon Steel	3/4	60				
7. Bracket	Hi-Alloy Steel	4/8	18	Lo-Alloy	14	4	6,000
B. Thickness Change NOTE: SAME Material Spec				Alternate Thickness Existing Material			
1. Wing		3/4"	$22	5/8	$18	4	6,000
2. Platform		1/2	45	3/8	34	11	16,500
3. Gusset		1/2	10	3/8	8	12	3,000
4. Cover		3/8	20	1/4	14	6	9,000
5. Deck		1	90	7/8	80	10	15,000
6. Channel		3/4	60	5/8	50	10	1,500
7. Bracket		5/8	18	1/2	15	3	4,500

COST PLOTTING

Cost Plotting is a high visibility technique for quickly determining trend costs within multiple product lines, families of parts, or competitive designs.

It has the ability to graphically portray cost by property as a comparative device in order to highlight both effective and ineffective cost areas.

This is accomplished by a graph, and more probably a series of graphs, tables, charts or listings.

First, it is necessary to determine the total unit costs, and determine those elements that you would like to compare.

Weight would be one comparison. Horsepower might be another, say in a motor. Payload could be another.

Take for example an automobile. Divide the total cost of each auto being compared by its weight to get a cost per pound. Then plot that unit on the graph. Horsepower would be another automobile comparison. Plot on another graph the cost per horsepower for each unit.

Chances are the plotting exercise will follow a fairly straight line; however, some will not.

It is these variances that you will want to concentrate on.

- Examine the high cost (per property) item. What makes it so high cost in relation to others? Good chance for cost improvement here.
- Examine the low cost item. What especially makes this item lower in cost? It might be that these design economies could be implemented across the line.

Historical cost plotting is also useful in projecting costs accurately on Value Engineering or a new design to cost project. It pinpoints what you can expect your costs will be for a given specification.

COST CHARTING – APPLICATION

APPLICATION OVERVIEW:

To determine which motors within a given product line are cost effective and which are not.

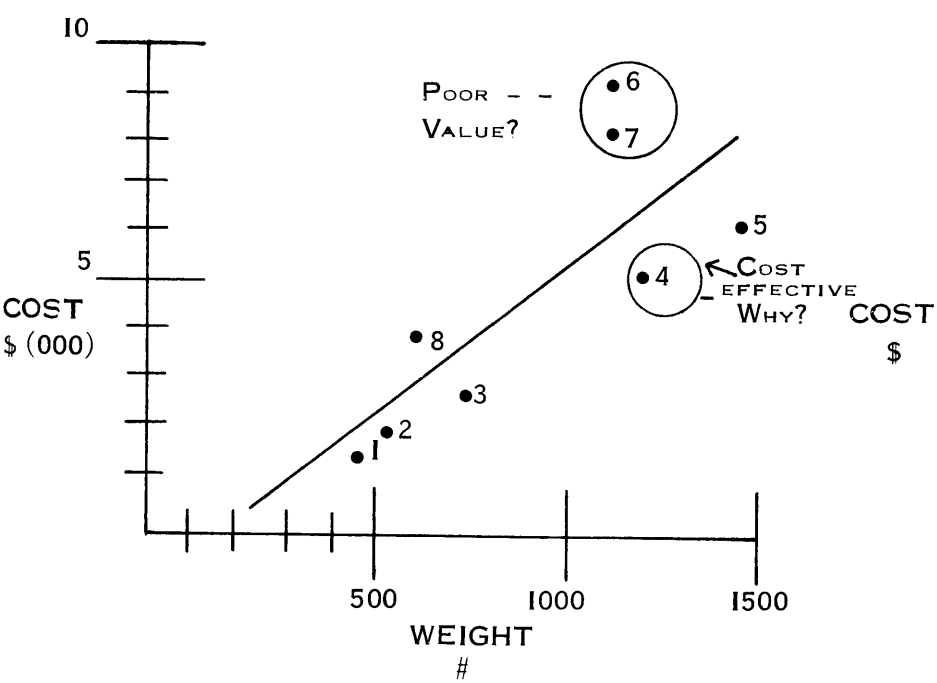
Two comparison factors, in addition to direct price comparisons, are as shown here:

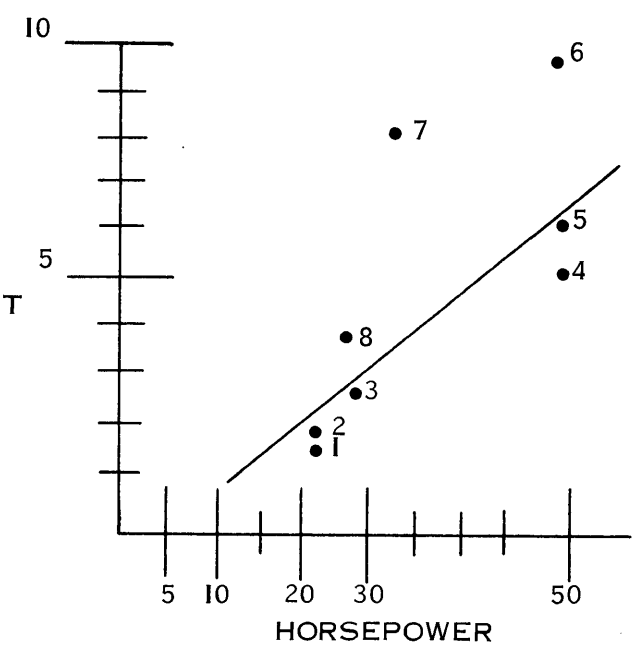
COST / #

COST / HORSEPOWER

MOTORS

IDENTIFICATION	COST $	WEIGHT #	HORSEPOWER HP
1	$ 1,500	500	25
2	1,800	560	25
3	2,500	750	30
4	5,000	1,300	50
5	6,000	1,500	50
6	10,000	1,200	50
7	8,000	1,300	35
8	3,500	700	30





THE MAN WITH THE HOE

Written After Seeing the Painting by Millet

God made man in His own image, in the image of God made He him.

—Genesis.

Bowed by the weight of centuries he leans
Upon his hoe and gazes on the ground,
The emptiness of ages in his face,
And on his back the burden of the world.
Who made him dead to rapture and despair,
A thing that grieves not and that never hopes,
Stolid and stunned, a brother to the ox?
Who loosened and let down this brutal jaw?
Whose was the hand that slanted back this brow?
Whose breath blew out the light within this brain?

Edwin Markham

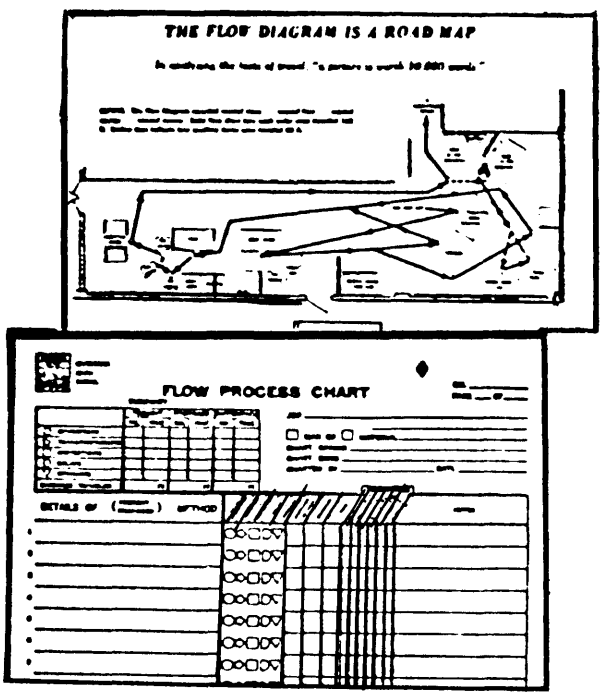
WORK SIMPLIFICATION [1]

Work Simplification is defined as the act of making work simple, or eliminating the complexity from work practices. Work Simplification is an organized application of common sense to find simpler and better ways of doing work. It is a systematic analysis of any work operation, hardware or software, to:

- Eliminate unnecessary work.
- Arrange workplace and work sequence in the best manner.
- Insure that a proper method is being used.

Work Simplification umbrellas a group of techniques which enables one to look at work processes, objectively.

Work Simplification techniques are largely based on Industrial Engineering motion-economy principles and focuses through charts and checklists directed at the analysis. Two of these useful tools are:



FLOW DIAGRAM CHART

This diagram shows the physical arrangement of work areas. On it is plotted the flow of material, paper, or personnel. It is useful in analyzing problems of space utilization and travel of people or material from one spot to another.

FLOW PROCESS CHART

This is the most universal tool of improvement. It is used to break an activity down, detail by detail, in the order in which it happens. The flow process chart is both a detailed record listing the sequence of a job, and a device for visualizing the method of improving it.

[1] Developed by Allen Mogenson

THE BIG FOUR OF WORK SIMPLIFICATION

To Conserve

Energy, Time, Space and Materials

STEP 1--Observe–look for improvements, Pick a job, List all details

STEP 2--Think–Analyze the problem

Why is it necessary

What does it accomplish?

Where can it best be done?

When should it be done?

Who is best fitted to do it?

How is the best way to do it?

STEP 3--Decide–develop improvements

CAN IT BE ELIMINATED?

CAN IT BE COMBINED?

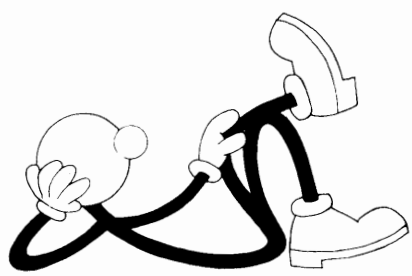
CAN IT BE REARRANGED?

CAN IT BE SIMPLIFIED?

STEP 4--ACT– Apply and follow up improvements, Discuss Improvements with others, Sell your ideas to win cooperation, Find and teach the person best fitted, Apply, standardize and follow up improvements.

WORK SIMPLIFICATION lets you get into the act of cutting costs in your own area of expertise.

- SELECT THE JOB TO IMPROVE
- BREAK DOWN INTO ELEMENTS
- QUESTION EACH ELEMENT
- DEVELOP A NEW APPROACH
- IMPLEMENT
- FOLLOW–UP



MOTION ANALYSIS

Motion Analysis is the study of motions used in performing an operation in order to eliminate unnecessary motions and arrange the most favorable work sequence.

CLASSES OF HAND MOTIONS

There are five classes of hand motions; the lower classifications usually require less time and effort, consequently, less fatiguing.

They follow in ascending order of complexity:

1. Finger motions.
2. Motions involving fingers and wrist.
3. Motions involving fingers, wrist and forearm.
4. Motions involving fingers, wrist, forearm and upper arm.
5. Motions involving fingers, wrist, forearm, upper arm, and shoulder. This class necessitates disturbance of the posture.

BIO–MECHANICAL RELATIONSHIPS

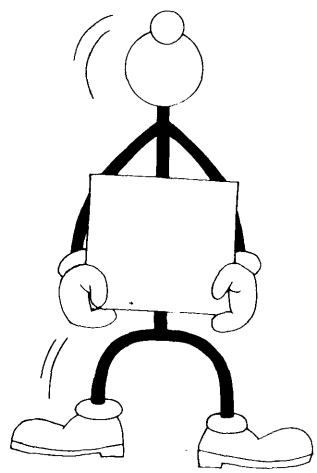
It might surprise you to learn that men and women are not built alike. It is true.

Because of this, there are some unique consequences. Women must exert more effort in lifting the same weight as a man.

LIFTING WEIGHTS

You can lift thirty pounds in close to your midriff with the same effort that would be required to lift ten pounds, twelve inches away from your body.

Also, in lifting weights it is a good idea to lift items off an elevated platform, rather then directly off the floor.



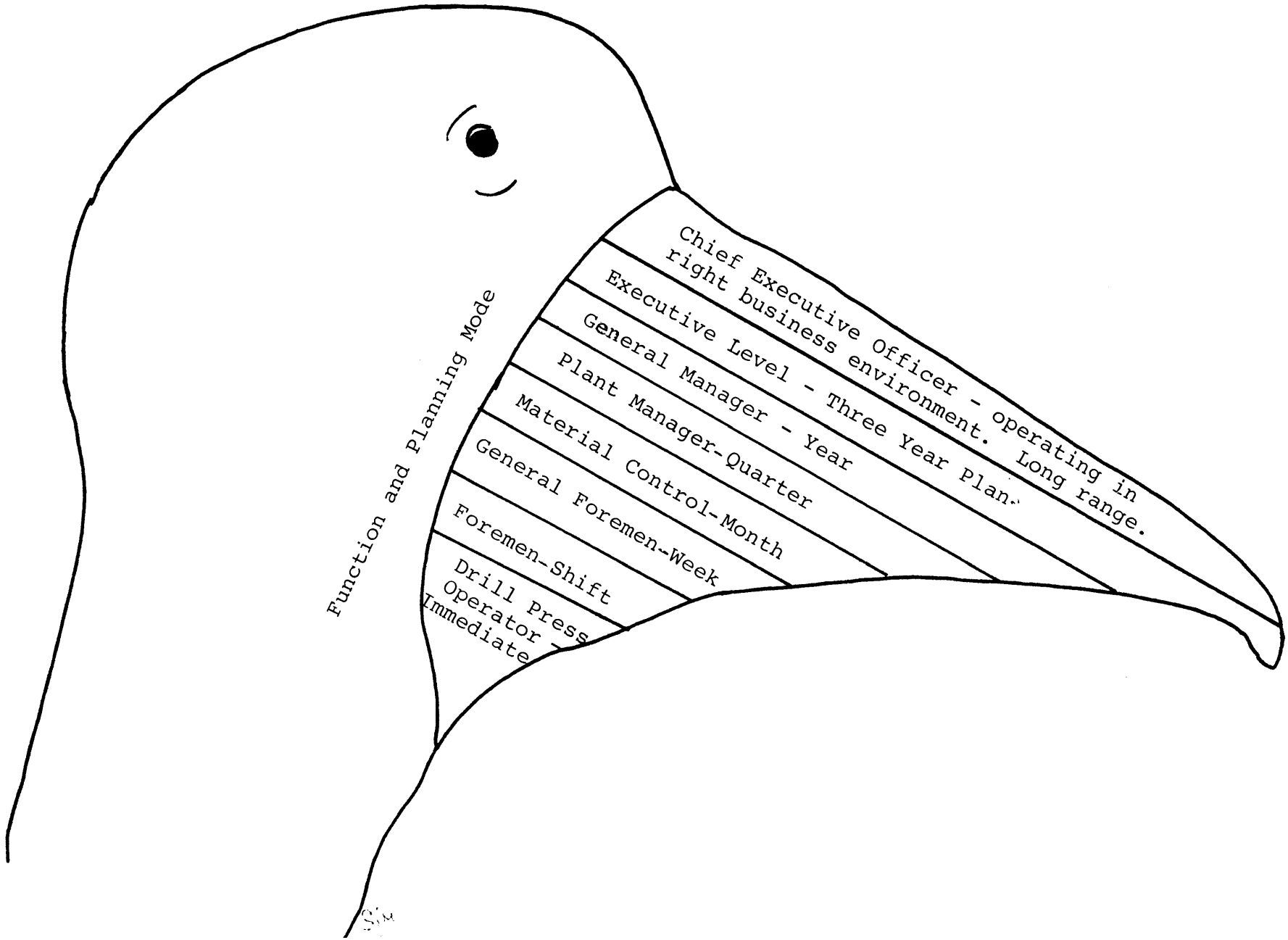
CASE STUDY

One example of this was a dolly truck used for moving goods from one operation to another. Production was poor. People had injuries; primarily back trouble.

Later, they found that by putting a dummy block in the bottom that productivity improved. Workers were happier

THE OSTRICH THEORY

Business Outlook By Job Position



OSTRICH THEORY

One day while discussing business strategy with a colleague, it dawned on me that all functions have different planning horizons.

In laying these out, the planning modes took the shape of a beak; hence the name, OSTRICH.

Chief Executive Officer – His thoughts must necessarily be on the long range.

Is the company working in the right business environment?

Dramatically, the chief executive must also be capable of reading very correctly, the near term. Take for example the manufacture of hula hoops. Or a less volatile product such as car radio antennas. Business could be booming today, gone tomorrow. Someone has to be charting the courses; flying over the field as an eagle, spotting objects distant, and details amiss, just below.

NO STEROTYPES

While functions cannot be stereotyped, the following represents a typical planning horizon – as regards business activity.

. CHIEF EXECUTIVE OFFICER	Long range, operating in the right business environment.
. EXECUTIVE MANAGEMENT	1–3 years, long range planning.
. GENERAL MANAGER	Annual, formal profit plan.
. PLANT MANAGER	Quarter, meeting the commitment.
. MATERIAL CONTROL	Month, good shipments for.
. GENERAL FOREMAN	Week, production output.
. FOREMEN	Daily, critical lists and hot sheets.
. DRILL PRESS OPERATOR	Now, about this hole.

MANAGING DURING DOWNTURNS

Managing during downturns is a good test of management skills and separates the good manager from the outstanding one.

Sometimes the dynamics of the situation are such that intelligence alone will not lead to a proper solution.

For example, downturns may be caused by both internal and external factors.

If a plant is inefficient, marketing strategy lax, or whatever internally is lacking, a company will eventually lose market share in a competitive marketplace. These are internal factors within managements control.

More often, external factors trigger a downturn, particularly in the near term. Markets can shrink due to economics, alternate commodities being introduced or even strikes/problems within the customer community being served.

A downturn normally puts Management in a reactive mode. Management's action plan, or lack of one, can be attributed to their perception of how long the downturn will last, how severe it will be, cash position of the company, future business outlook and consequences of paring the workforce.

ETHICAL CONSIDERATIONS – FAIRNESS AND INTANGIBLES

One of the first questions is that of reducing manpower – both in production and overhead.

In all probability if it is a large plant, unions will be involved, and special contract procedures must be followed. Should manpower reduction be across the board? A first thought would be that this would be a fair approach.

More reflective thought would indicate that it is not.

Failure not to treat each group according to its own merits will mean that in the future, the groups will not want to maintain their identity and specialities. Plainly speaking, equal treatment for Management Personnel and Union Members alike will mean that Management in the future will expect full negotiating privileges, and withhold services – dollar for dollar, treat casual overtime as an encroachment and assume fewer limits of accountability.

Along with responsibility and accountability must come some rewards.

COST REDUCTION AND CAPACITY CURTAILMENT

Two forces are put in motion during the downturn; they are at once complementary and opposing.

Curtailing capacity to become more in line with dwindling sales opportunities will cut direct labor costs but as a negative consequence, decrease burden absorbtion.

Decreased burden absorbtion increases overhead rates and unit costs.

Indirect costs can be trimmed proportional to direct labor cuts but will not offset the loss in burden absorbtion.

Several techniques are available for reducing costs in the near term.

MANPOWER

- LAYOFF – Personnel reduction for an indeterminate period.
- VOLUNTARY LAYOFF – Voluntary reduction for an indeterminate period.
- FURLOUGH – Personnel reduction for a specified period.
- SHUTDOWN – General plant shutdown normally for a specified time period, 1 week, 2 weeks, etc.
- TRANSFER – Moving employees to other locations with better business conditions, currently.
- LEAVE OF ABSENCE – Permitting those who want, excused absence without pay.
- SHORTENED WORK WEEK – Less than five day, normally.
- SHORTENED WORK DAY – Less than eight hours, normally.
- EARLY RETIREMENT FOR THOSE WHO QUALIFY.
- PAY CUT – Generally for those in non-bargaining units.

Some of these elements will result in reduced out of pocket company expense, others will serve only to curtail production and be in line with requirement realities.

Taking vacations during a slack period is a good strategy; it retains the workforce, curtails production, and makes for more consistant work schedules later, if volume increases.

The tradeoff being that an employee likes to take a vacation when he wants it; perhaps the children are in school, the spouse working and it is knee deep in snow outside. It's fine for skiers, not so good for gardeners.

And the objective of a vacation is to free the clutter from one's mind, and reinvigorate him for the daily activities. This can't be accomplished if the worker's needs for having a vacation are not met.

ICING

A spirit of austerity must exist and be recognizable at higher levels.

Deferring business trips, seminars and fringe programs will in reality, yield little. Yet, if some sacrifice is not made there, the visibility and interpretation thereof of management actions will have a negative impact on subordinates.

SPECIAL TECHNIQUES

Overtime work should be largely discontinued. Non-urgent functions should be judiciously suspended, and the available manpower used to fill approved – must positions.

One cautioning note: Reducing costs may not be tantamount to maximizing earnings, particularly if shipment levels are threatened. Rather than curtailing production to match a schedule, it is probably better to do some up front planning: Pinpoint the schedule requirements and then identify the resources necessary to meet that commitment.

Perhaps there are ways to increase revenues through more liberal credit allowance, better terms, take now-pay later or any number of ingenuous devices.

Recalling all subcontracted work for utilizing in-house capacity is one consideration, but must be examined in light of ethical and long range plans. You will probably need that supplier again, and it's a two-way street.

Forces of organization often work opposite to needs during a downturn.

In Product Engineering, for example, junior engineers and draftpersons do the ticketwork; the more senior members perform the higher level needs such as research and development.

But during a downturn it is precisely the lower level needs which are (generally) most urgent and where the workload sees an atypical increase. The increased workload comes as a result of taking less desirable work orders and greater challenges in order to maintain sales volume.

THINGS TO KNOW AND DO

1. GIVE A GOOD DEFINITION OF WORTH.

2. CONTRAST THE MEANING OF VALUE AND WORTH. DISCUSS THE RELATIONSHIP.

3. USE NUMERICAL EVALUATION RATING YOUR PREFERENCE FOR THE FOLLOWING FRUIT: BANANA, APPLE, ORANGE, PEAR AND AVOCADO.

4. USING MATRIX EVALUATION - SIMPLIFIED, DETERMINE THREE POTENTIAL CANDIDATES FOR A POLITICAL POSITION, (PRESIDENT PERHAPS), RATING THEM ON - EXPERIENCE, CREDIBILITY, INTERNATIONAL SKILLS AND OVERALL SKILL LEVEL.

5. NAME SIX METHODS FOR DETERMINING WORTH.

6. WHAT IS PARTICLE ANALYSIS?

7. APPLY PARTICLE ANALYSIS TO A GIVEN HARDWARE PART OR SOFTWARE ITEM (FORM) OF YOUR CHOOSING.

8. EXPLAIN HOW A COST VISIBILITY COMPOSITE CAN BE USED BOTH AS AN ANALYTICAL AND DECISION MAKING TOOL.