WORK SIMPLIFICATION

Work simplification can be described as the intelligent use of well-established human patterns to encourage and expedite the finding and implementation of more efficient work methods. Over the years the work simplification approach rooted in bio-mechanics has earned a rapidly expanding popularity.

Many industrial companies have sponsored formal work-simplification programs. Most of these have been quite successful in delivering a multitude of cost-reducing and profit-increasing innovations.

Originally, work-simplification was conceived as an application concentrated in the area of production methods. Experience has broaden his applicability. Work-simplification concepts are now utilized to improve performance in many other activities, including clerical functions, supervisory techniques, research, and maintenance.

In fact, the term work-simplification has become almost a synonym for an organized grass-roots methods improvement technique.

The traditional approach to methods improvement has been to employ highly trained specialist in industrial engineering techniques to spend full time on this activity. These experts are assigned the task of studying one activity after another throughout the entire organization.

They are expected to locate opportunities for improved performance develop ways for these improvements to be achieved, evaluate their feasibility, sell their acceptance, and assist in their implementation. A great deal of progress has been achieve in this manner. Nevertheless, it has been found that the effectiveness of this traditional approach may become diluted in two ways:

1 Much time and effort is expended by the expert to become familiar with each new activity studied in order to ascertain that all pertinent aspects and interactions with related activities are uncovered and properly evaluated.

2 Improvements developed by the experts are usually resented by prospective users, mainly due to typical reaction to outsiders usually found among company employees.

The work-simplification approach is designed to minimize these difficulties. Each employee is assisted to become his own expert and is encouraged to study and recommend way to improve the performance of his own job.Motivation is develop by demonstrating the value to both workers and management of the results they can achieve by working together as a team.

Training in the use of a collection of simple but ingenious techniques provides each employee with adequate know-how to make the required methods-improvement studies.

Work-simplification is more productive when there is widespread participation by many individuals from all levels in the company in an organized program.

Carefully planned indoctrination sessions must be provided to develop effective motivation. All participants should receive training in basic methods-improvement tools and techniques.

A means of handling ideas, such as a suggestion system, should be developed to make a method of communication readily available, to provide a way for obtaining prompt management review of improvement proposals, to facilitate recognition for contributions and to provide adequate rewards for achievements.

THE LAW OF INTELLIGENT ACTION

Willian J. Reilly, in his book entitled the law of intelligent action, states that "When confronted with a problem, the intelligence of an individual's actions is dependent upon:

His desire to solve the problem

His ability to perform the tasks required and

His capacity to handle the human relations involved."

DESIRE

Motivations for the actions of human beings can be divided into two basic categories:

1 To gain (What is in it for me?)

2 To avoid loss (That is mine. Hands off)

Thus the employee seeks employment as a means of gaining:

Security or reasonable control over his own future

Material reward or money to buy things

Opportunity to improve his position in an economic or social way.

A sense of participation (belonging to the group and having a say in the activities of the group)

It can be expected that the attitude of the individual toward an opportunity for personal gain will be almost entirely selfish. His controlling interest will be "What is in it for me?" but his decisions and actions will tend to be rational, logical, and based on facts.

A direct appeal toward actions which will result in benefit to him and others can be expected to receive objective analysis.

However, the attitude of the individual toward the possible loss of something he already possesses can be expected to be entirely different. Decisions will tend to be base on emotion rather than facts.

Actions taken in connection with a possibility of losing existing possessions may often be devious and will sometimes appear completely illogical.

This difference in attitudes is of great significance when the acceptance of methods improvement is being sought.

To an individual not directly involved, the introduction of a cost-saving proposal involving the use of a new piece of equipment or a new method can have the appeal of intelligent selfishness, but to a person directly involved, a change from the existing implies the loss of his own know-how applicable to the old procedure or equipment.

The fear generated by the prospect of such a loss can be completely cancel out any appeal of mutual benefit. Therefore, to be successful a work-simplification program must have identified with it specific management policies and practices which will assure the individual that the can gain and will not personally lose as the result of implementation of the proposals.

A suggestion system can provide recognition and financial rewards, but an additional

guarantee by management indicating that participants will not suffer personal loss through downgrading or layoff is essential.

An agreement to achieve force reductions via attrition or transfer of displaced individuals to other expanding activities is often a mutually acceptable approach. With careful planning, this method is usually adequate to absorb force reductions made possible by work-simplification proposals. Reductions via layoffs can eliminate any possibility of a successful program.

After all, the cooperation of the individual just cannot be expected if he can see that this cooperation will result in direct losses to himself, his friends, or his associates.

ABILITY

Until the introduction of participating work-simplification programs, which provided both the receptive climate and the necessary training of the participants, the idea that the average employee could successfully conceive, develop and implement worthwhile methods improvements was only a hypothesis.

Management possessed little evidence and even less faith that such efforts were likely to be really productive of meaningful results. Today, however, the impressive results of many successful industrial work-simplification programs amply documents the validity of this hypothesis.

It has been unquestionably proved that the latent ability to develop methods improvements exists in the majority of individuals and can be effectively utilized if proper motivation and training are provided.

It has been shown that with only minimal training in a few of the simple basic industrial engineering tools the average individual can develop an amazing ability to recognize

opportunities for improvement and to implement workable solutions.

HUMAN CAPACITY TO CHANGE

The basic pattern of human nature has been fairly well established and demonstrated to be essentially unchangeable. Human behavior, however, can be modified and to a certain extent controlled. In fact, human behavior, is relatively predictable and can be measurably influenced by anyone with a thorough understanding of the basic mechanics of human nature plus a willingness to take the prerequisite actions.

In respect to influencing attitudes toward prospective methods-improvement installations, it is usually sufficient to learn to recognize and deal with two of the most basic traits of human nature:

A Resistance to change or to accept something new

B Resentment of criticism

The fundamental idea of searching for a better way to perform a task has the built-in assumption that, when it is found, the new way will be substituted for the old. Thus, improvement implies change.

From the point of view of the user of the old way, change tends to disrupt complacency and create a fear of possible unfavorable consequences. The firm feeling of 'All is well' is replaced with a queasy feeling that perhaps he, the current user, may also become obsolete and have to be retrained, perform a harder task, or perhaps even be replaced.

The user can see nothing in the change for him and an excellent chance of insecurity. Naturally, he resists change. It is almost a conditioned reflex. Everyone tends to be critical or, and resistant to change.

A successful work-simplification program must make provision to assist participants to become familiar with this universal reaction and to learn how to minimize its hampering effect.

Participants must:

1. Learn to avoid confusing fact and opinion. Practice results in habits and can lead to the development of biased opinions that cannot be properly extrapolated. Experience increases knowledge of facts which provide a sounder basis for extrapolation.

2. Learn how to avoid misunderstandings. Failure to ascertain all the facts which provide a sounder basis for extrapolation.

3. Learn how to avoid rush judgment. Time is required for mature judgment. Lack of experience must be taken into consideration in making evaluations.

A change for the better implies criticism of the old method and what is even worse, criticism of the user of the old method. Direct or implied, constructive or destructive, the immediate reaction is fast and always the same. No one likes criticism. It is always taken as a personal affront. It is resented.

To develop a successful work-simplification program, participants must learn to expect this reaction in others and in themselves. They must learn to minimize offending others, to keep criticism from improperly affecting their own judgment and to help others keep it from confusing their decisions.

However, by far the biggest assist in minimizing both resistance to change and resentment of criticism is the basic premise of the work-simplification approach which substitutes the participating development of new methods for the expert approach. The participant is most

unlikely to develop resistance to, or resentment of, what he believes are largely his own ideas.

METHODS FOR SOLVING PROBLEMS

A problem occurs when people believe they want to know the exact relationship between two or more measurable facts. For example, if a person wants to make an increased profit by reducing the costs of materials used in a work process, there is a problem.

What would happen to profits if plastic instead of steel parts were used in a machine? What would happen to quality and safety? Plastic, steel, profit and safety can be measured in exact ways. Therefore, a person can test the specific relationship between these facts to obtain an answer. A result of using the answer would be increased profits and productivity.

All problem-solving techniques have ways of identifying the exact problem, getting facts, testing for results, reaching conclusions and verifying what you believe to be true. Several methods exist for modern problem solving, each has its advantage.

THE SCIENTIFIC METHOD

This how all research in science and industry, medicine and business takes place. A hypothesis (statement of relationship between measurable facts) is formed and test facts gathered. A conclusion is reached based on math (probability theory) patterns and later verified with additional or varied testing.

According to A. D. Little there are four facets to be considered by the scientific approach:

1 The simplicity to wonder

2 The ability to question

3 The power to generalize

4 The capacity to apply

The work simplification approach applies each of these in a very literal fashion.

Maintaining an open mind.-(The simplicity to wonder)

The participant with an open mind wonders about everything. He is willing to explore all alternatives. He is not restricted by past practice, precedent, tradition, habits, customs, or fear of the consequences of change.

Observing the present way.-(The ability to question)

Few people know how to do an adequate job of questioning. Most of them stop asking too soon. Sometimes this is merely to avoid embarrassing the person questioned. To succeed in work simplification, one must get use to question everything. Work simplification provides an organized plan for questioning. It is called the questioning pattern and it is a definite sequence of question:

What is done?

Where is it done?

When is it done?

Who does it?

How is it done?

Why is it done at all?

Why is it done here?

Why is it done then?

Why does this person do it?

Why is it done this way?

This is a training pattern which is to be followed literally at first but which soon becomes simply an organized way of thinking.

Exploring opportunities for improvement.- (the power to generalize)

From the answers, tentative conclusions (generalizations) can be developed. Possibilities for improvement are then investigated:

What?, Where?, When?, Who?, How?, Why eliminate?, Why change place?, Why change sequence?, Why combine?, Why change a person?, Why improve method?
It should be remembered that the person is searching for possible solutions. If it has never been done before, it may be a better way.

Do not admit it cannot be done or you are defeated before you start. Try to find ways to make new ideas work, not to prove then unworkable.

Implementing the new method.-(The capacity to apply)

It is not enough to wonder, ask why and develop a workable improvement. An idea has no value until it is put to use. The capacity to apply implies two things:

The ability to see the application of a general rule to a specific problem.

The ability to convert an understanding of human nature into an approach to the new method which will gain the cooperation of the people involved.

THE STATISTICAL METHOD

Observational facts are gathered until a

recognizable pattern is identified. Comparisons are then made to the experiences we usually expect under normal or average conditions.

THE CORRELATION METHOD

Using records of events that happened in the past, relationships between what you are investigating and what your are measuring can be identified mathematically.

THE BRITISH METHOD

After describing the problem and getting facts, the person or group describes their present and future position. A plan of action is then organized, followed and adjusted periodically.

THE JAPANESE METHOD

This method calls for describing the problem and asking the staff for volunteers. Young, inexperience people usually volunteer. It emphasizes improvement of the situation at a slow but firm pace along with company culture and work satisfaction improvement.

THE ORDIONE METHOD

This method stresses time. Its basic idea is that, if things do not change, results remain the same. Therefore, if your work results change you have a problem. One or more factors must have changed at the same time. Find out what changed in the same time frame and that should correct the deficiency.

THE BRAINSTORM METHOD

This method uses a group to identify several answers rapidly. First you select a group of five to seven people, some with experience with the problem area. Some are warned in advance about the job and others are not. A short time limit is set.

One person records the answers group members rapidly fire; objections or explanations are not allowed at first. What you wind up with is a variety of answers, some better than others.

One offshoot method is called the Delphi method, in which members of the group are hidden from each other. The idea is that some members with a great deal of power or prestige can influence other's ideas excessively, so this method prevents such influence.

DEDUCTIVE REASONING

After gathering specific facts or clues, the solver uses them to reach a general conclusion. For example, a person might say, 'Because the wind is blowing, the clouds are darkening and the lightning is flashing.... I believe the rain will come down in the next thirty minutes.

INDUCTIVE REASONING

In this method, a person starts with a general conclusion and then looks for supporting facts or clues. In law enforcement, an officer might hear a confession and later search for clues or evidence that the crime actually happened in that manner. In business, if a bankruptcy happens, auditors may search for exact problem areas they know may exist.

JUDICIAL THINKING

To solve problems or reach decisions with this method, a businessperson might assign someone to present all the facts possible to support a 'yes' decision to buy a mainframe computer. Another person should then present all the 'no' facts about the possible purchase. The company executive team would then judge where its best interests lie.

NEW THINKING TECHNIQUES

This method suggest that people often think only in straight-line fashion, using normal logic. This can be symbolized by a person thinking one-two-three-four-five-six and so on.

New thinking techniques suggest entirely changing the framework of reference of the problem situation to achieve results in different ways. This kind of thinking could be symbolized by a person thinking one-two-three-four-a-b-c-five-six and so on. An example of this kind of problem solving technique would be the following:

An office building six stories high with old/slow elevators causes tenant complains. Renters are threatening to move out. Lack of profits would be catastrophic for the owners. Engineers are hired to devise a solution. No luck. Repairs to the elevators would be too expensive because they are built into the inner office structure(the engineers are thinking along logical or usual lines).

The problem is solved by an employee in the boiler room who used absolutely different thinking. He purchased six full-length mirrors from a department store. The installed them, one at each of the elevator doors on six floors. People were so busy looking at themselves, they did not notice or complain about the slow elevators afterward.

THE KISSINGER METHOD

This method depends on language. The exact problem is re-described in various ways. Questions by an outside expert are used to encourage two or more arguing parties to define what they can and cannot accept in the way of a settlement or answer. This method is based on the fact that language is vague, and people usually do not get angry if they are asked questions that concentrate on facts instead of repeated emotional statements.

HARD WORK METHOD

In this procedure, you assume hard work will accomplish any task. Past generations were often trained to work hard regardless of any situation. So this method is still popular with supervisors, regardless of results.

LAZY MAN'S METHOD

If you have a problem, just hire and expert to solve it for you. Why try to invent the chicken when you live next to a farmer with a front yard full of the birds? At times consultants or experts are very cost-effective.

THE SUBCONSCIOUS METHOD

With this method, you define your problem and get all the facts you can. Decide which characteristics the solution must have. Relax your mind and body in a quiet, interruption-free place. As your mind moves from relaxation to sleep, it enters the Alpha condition which registers ten megacycles per second on an electronic measuring device.

The average person can better identify the Alpha stage by merely noting that he is fully relaxed and is moving toward sleep. Curiosity disappears, too.

During this stage, people seem to access most of their memory and make creative associations that help find solutions to difficult problems. The answer often comes all at once, not in pieces, so be prepared to write it down quickly! Bio-feedback training can help you train yourself to get into and out of this Alpha condition with ease whenever you wish.

PROBLEM SOLVING GENERAL FACTS

A problem exists when you want to establish the relationship between two or more measurable facts.

All problems have answers. There are no exceptions!

Problems usually have several answers, not just one.

No one solves a problem without first defining it exactly.

Logic is not enough. Since we never have all the facts, we must depend on creative intuition to some degree. Therefore, logic and intuition are equally valid.

All elements of the problem situation must be measurable.

Everything is measurable. There are no exceptions.

Finding the answer is not the last step, merely the last point before taking action.

It is human to seek solutions even before the problem is understood. But do not do it yourself.

Let your purpose guide your choice of alternatives.

THE FIVE STEPS OF METHODS IMPROVEMENT

A definite and permanent advance is seldom made until use is made of measurement. This is particularly true where human factors are involved.

Human performance tends to vary so much that unless some form of measurement is provided and used as a basis for decisions, there is little possibility of repeating a process accurately or

predicting or controlling future conditions sufficiently to allow introduction of improvements.

Mere observations done objectively, is a form of measurement. It can be used to classify, label, and compare. An interesting demonstration is to pick a task with which you are familiar but not directly involved.

Now, subject the performance of this task to your concentrated and undivided attention. Chances are that you will find that you were completely unaware of many important aspects. It can be truthfully said that the commonest article of commerce is misinformation about fundamental things.

An organized pattern of observation is of great assistance. Work simplification suggests a step-by-step program for studying tasks:

1.- Select the task to be studied.

Be careful that only one task is studied at the time. Failure to observe this caution can lead to confusing results or to ineffective efforts.

Because time is valuable, the best possible use of it must be made by doing first things first. Pick the job that needs improvement most. But remember the human problem. do not rush in too fast. Start by improving your own job or jobs in your department.

Remember, if you work on someone else's problems, they will probably resent your help as implied criticism.

Look for situations as:

a. Bottlenecks.

Leave the smooth-flowing jobs alone until you crack troublesome ones.

b. Time-consuming operations.

Lengthy jobs usually offer the greatest opportunity for improvement.

c. Chasing around.

Activities of this type are almost always unproductive and often can be eliminated or drastically reduced.

d. Waste.

We become so accustomed to some forms of wasted materials, time, or energy that we have difficulty in recognizing it as such. Increases go unnoticed. Look carefully.

2.- Observe the present way in which the task is performed.

Get all the facts. Be sure to include all the requirements for the performance of the task. Do not forget to determine interactions with related tasks. Make a process chart. use it to record all details.

3.- Challenge everything. Question what is done.

a. Challenge the whole job being investigated. Why is it done? Is it necessary? Can it be done another way or at another time or place?

b. Next, challenge each 'do' operation. This is because if you eliminate the 'do' you automatically eliminate the make-ready and put-away that go with it.

c. Then supply the checklist of questions to every detail.

WHAT?

What is done? What is the purpose of doing it? Why should it be done? Does it do what it is

supposed to do?

WHERE?

Where is the detail being done? Why should it be done there? Could it be done somewhere else?

WHEN?

When is the detail done? Why is it done then? Could it be done at some other time?

WHO?

Who does the detail? Why does this person do the detail? Could someone else do it?

HOW?

How is the detail performed? Why is it done that way? Is there any other way to do it?

This questioning attitude helps develop a point of view that considers the good of the whole operation rather than that of any one department or individual. It will often bring to light possibilities for eliminating useless or unnecessary work which adds no real value to product.

It tends to bring out the type of operation or equipment needed to perform the required work most economically. Do not overlook the possibility of obtaining ideas from other people working on the same operation. And do not forget that when you ask for these ideas you have a human problem.

You will get the ideas only if they want to give them to you. they must be convinced that improving performance will help them.

4.- Explore opportunities for improvement.

Consider all possibilities. examine each in detail.

Evaluate, compare, and select the best alternative. Use the flow process chart or multiple-activity chart to pretest and demonstrate the feasibility of new methods.

a. Can operations be eliminated?

What is done?, Why is it done?, Is it necessary?. In far too many instances a good deal of time is spent studying major operations for possibilities of improvement without asking the question, 'Why is this operation performed?'

If it is found that an operation has been in the plant in the same way for a year or longer, it should be questioned. A better way is probably available. If operations cannot be eliminated, perhaps there are unnecessary transportation and storage. Question every handling.

Then, if handling is absolutely necessary, look for:

Back-tracking of work
Heavy lifting or carrying
Trucking
Bottlenecks
Skilled operators doing handling work

b. Can activities be combined? Can sequence, place, or person be changed?

This is an important opportunity for improvements. Whenever two or more operations can be combined, they are often performed at a cost approaching or even equal to the cost of one.

Likewise, transportation and storage between the operations may be eliminated. If operations cannot be combined, find out if it is possible to combine a transportation and an operation. By changing the sequence of an operation, one may eliminate backtracking and duplication of work.

The order in which operations are performed may have been derived from the original nature of the process. The process or product design may have been changed since then. But has the order of operations been restudied and changed to regain optimum efficiency?

Sometimes, just changing the place where the work is done or by whom it is done will help. Better lighting, better ventilation, better tools may be available elsewhere. Perhaps another operator is better equipped to do the operation.

c. Can the 'do' operation be improved?

How is it done?, Why is it done that way?, Is better equipment available?, Are other materials available?, Can new techniques be applied?.

Unfortunately, it is here that a great deal of work simplification started in the past. We must learn to consider this step the last resort. Major savings can usually be found, but the price of the new equipment, materials, training, etc., is also usually high, sometimes beyond our reach.

Often relatively small rearrangements, method changes, and layout revisions will accomplish almost as much with negligible cost.

5.- Implement the new method.

See that all people involved understand the objective of the task and desirability of the new method. Take care that each person involved knows and understands his or her part in the new method. Be sure that none involved will lose financially or socially as a result of the change. And, even more important, be sure that they know it!

CHARTING TECHNIQUES

There are many charting techniques which have been designed to assist in the development of

improved methods. They are:

Flow process chart
Multiple-activity process chart
Pareto
What if?
Gantt chart
Critical path network
PERT

All these charting techniques are similar in principle. They are a means of recording and studying activities required to perform a task. The above list is in order of increasing complexity.

The flow process chart is used to record a single sequence of activities. The multiple activity chart is used when several sequences of activities occur at the same time and their relationship with respect to time are significant.

The Gantt chart is utilized when the number of simultaneously occurring sequences of activities becomes large. The use of the critical path method network is desirable when some of the sequences of activities are time-related and some are not. This approach can become quite complicated and then computer programs must be used in conjunction with it.

PERT (program evaluation and review technique) is a variation of the critical path technique into which another variable, probability, has been introduced.

APPLICATIONS OF WORK SIMPLIFICATION TO QUALITY

Quality control work is different from production work in two basic ways:

1. Most quality control work input is assigned and controlled on a job-by-job basis rather than unit-of-time or product-output. For this reason, work content is usually non-repetitive in nature.

2. Direct correlation between work output and product or service output is seldom feasible. This tends to make verification of savings difficult.

These differences do not limit the usefulness of the work- simplification approach. But they do change the emphasis somewhat.

IMPROVING MANAGEMENT EFFICIENCY

The problems encountered in applying intelligent management to quality control are very complex. Effective management usually requires a great deal of data. A huge volume of records are often generated. Work simplification can give a big assist to the streamlining of these activities. For instance:

1. Work-control procedures.

Efficient assignment and control of work on a job-by-job basis requires much planning and a large volume of paper work. This work is very repetitive in nature and an excellent subject for work simplification.

On work of caution: simple elimination of paper work or arbitrary reduction in the number of work orders is not the answer if it results in loss of control. Much can be done, however, to reduce complexity of this documents and decrease the effort and time required to process them without destroying their effectiveness.

2. History records.

The development of maintenance history records is absolutely essential to carrying on a productive quality control program. But these records are often quite voluminous and time-consuming in both preparation and use. The methods used for the assembly and retrieval of information from these records represent an excellent area for work simplification.

IMPROVING TECHNICAL DECISIONS

The following are areas of effort which can greatly benefit from the use of the work-simplification approach, specially when equipment grows more and more complex:

1. Pre-detection of incipient failures.

Effective preventive quality control will require improved techniques for predicting when, where and how failures are likely to be incurred. This probably involve the development of better inspection techniques, the introduction of the use of more diagnostic instruments, and perhaps the introduction of continuous monitoring techniques.

2. Post-failure remedial-action decisions.

The determination of the exact nature and extent of equipment malfunctions and remedial action indicated is becoming increasingly difficult as the variety and complexity of facilities increase. The predevelopment of standard diagnostic routines offers and excellent opportunity for the development of better methods.

3. Repetitive-job standardization.

Use of standardized, pre-selected procedures for the same or similar jobs will increase the volume of work upon which detailed methods-improvement studies can be justified.

IMPROVING MANPOWER AND MACHINE UTILIZATION

The multiple-activity process charting technique provides an excellent vehicle for exploring ways to:

1. Reduce crew sizes.

Use of pre-planned, shop make-ready,

prefabrication or pre-assembly, special-handling equipment or tools, etc., can frequently reduce the amount of work done by field crews.

2. Reduce out-of-service time.

Careful pre-scheduling can often appreciably reduce the total time required to complete jobs. The multiple-activity process chart is a good tool for this purpose. When jobs are large and complicated, it is usually necessary to resort to the more complex critical-path technique.