

Chapter II. Organization

1. Zones of Management

1.1 Introduction

There are, in an efficient company, various zones or levels of management which are separate and distinct. Each can be identified by the nature of the functions and responsibilities. The possibility of effectiveness can be measured by the extent to which functions are defined, authority is specified, and accountability is actually required.

The purpose of this educational unit is to review the concept of “Zones of Management”. It is hoped that after careful study of the principles discussed it will be possible for each top management executive to better analyze the present management structure of his company and recognize its weakness. The study of sound principles is valuable only to the extent these can be and are practically applied. We consider the application of these principles vital to the future of any company.

At the outset it is important to have an understanding of the use of terms. When a title is used it will not necessarily be comparable to the title used in your company. We have found that in various companies, whether American or Japanese, the title in one company may mean something entirely different than the same title in another company. So do not take any title or term used in this discussion and apply it as such without careful analysis. Instead, study the job functions, the responsibility, the authority and the accountability. The title is just an empty bucket — look at what the bucket contains.

1.2 General Concept

The first step in recognition of the zone structure of management is illustrated in Chart # 11 – 1.1, which shows the “Pyramid of Management Structure”. At the base of the Pyramid are the Workers. These are the real doers; the people who actually make the product; who do the work.

Above these, and dependent on the worker base are the lower management levels which we will call the Supervisory Management Zone.

Over this comes the group which we will call the Top Management Zone with the President at the Apex of the Pyramid.

If you will examine this Top Management Zone you will observe that it is divided into two sub-zones, the lower being referred to as Departmental Administration and the upper as General Administration.

At the right of the company Pyramid you will observe another Pyramid which is inverted. This Pyramid which parallels the General Administrative Zone of Top Management we call the Board of Directors and its zone we have called the Trusteeship Zone.

1.3 Detail Analysis

A. Trusteeship Zone

Trusteeship is used here in the sense that the Board of Directors is acting for, and in the interests of the stockholders. This is a different type of responsibility than that of the President and Top Management for the internal functioning of the company.

Referring to Chart # 11 – 1.1 you will see that on the Board of Directors we have shown a portion of the Pyramid (outside Directors) which is beyond the Company Management Zone. In the United States many companies have such directors who are elected by the stockholders either to represent groups having a large stock ownership or because their experience and background is valuable in maintaining a well-balanced company. These outside directors are not regular employees of the company and are not a part of the company's internal management. Selection of such outside directors by the stockholders is apparently not very common among Japanese companies at the present time and is not absolutely essential *if the company management representatives on the Board of Directors are efficient, experienced, capable, and exercise sound judgement. But it is essential if the Board of Directors is merely a rubber stamp for the President or some other strong or influential individual.* In the United States it is generally recognized that outside Directors contribute much to the balance and continued progress of successful companies.

Also, referring to Chart # 11 – 1.1 you will note that the Pyramid cuts off at the bottom of the General Administrative management level. While there are cases where this is not advisable it has been found that generally the men who are in charge of Departmental Administration are so involved in the organization, functioning and administration of their own unit that they do not have the general experience and background needed for the execution of responsibilities required of the Board of Directors. Further, it is very difficult for them to divorce themselves from the problems of their own Department and consider problems objectively from the standpoint of overall company operation.

We have found in Japan that a great deal of prestige is attached to the title of Director or Managing Director. Appointment to such a position, which carries with it a place on the Board of Directors, is too frequently the result of long company service, friendship, university connection, or family relationship to some powerful individual. Such a custom or tradition is not in the best interests of either the stockholders or the company.

Reference to Data Sheet # 11 – 1.2 and a careful analysis of the responsibilities in the Trusteeship Zone will show the dangers of poor selection for the Board of Directors. It cannot be emphasized too strongly that for continued success the members of the Board of Directors *must learn their responsibilities and actively execute them* (Discuss Data Sheet # 11 – 1.2) Also refer to Data Sheet # 11 – 1.3 — Example of U.S. Co.

Advantages and Disadvantages - Top Management Board

(Develop these points through guided discussion.)

ADVANTAGES

1. Generally, all important functions are represented for consideration of basic problems and policies.
2. Matters requiring consideration receive quick action.
3. Special meetings can be called easily.
4. More frequent meetings *should* result in constant Board consideration and deliberation on company affairs.

DISADVANTAGES

1. Difficult to maintain objective viewpoint which properly protects stockholders interests in considering business needs.
2. The Board, in effect, merely endorses the action of its members as company executives.
3. Members of the Board are in the peculiar position of reporting to the President as executives, while as a Board, he is supposed to report to them.
4. The President may (and often does) dominate and run a one-man show.
5. The Board may consist of good and capable specialists, but be lacking in all around good business men. This results in unbalanced decisions.
6. The Board lacks an outside point of view in considering its problems.
7. There is absolutely no check on management, and no one to question the soundness of decisions or actions.

B. Top Management Zone

As indicated on Chart # 11 – 1.1 this zone has been divided into two sub-zones, the first being referred to as General Administration and the second as Departmental Administration.

In order to understand what is meant by each of these sub-zones let us analyze Chart #11– 1.4. Here we continue to use the concept of a Pyramid. In the Pyramid of General Administration are to be found the major functions of the company, each headed by a general management executive such as a Managing Director and all responsible to the President.

It is important to remember, at this point, that the example used is not a *recommended structure* for the company. It is used *only* to illustrate the fundamental principle of management zones. Actual organizational structure and practical application of structural principles are covered in a subsequent unit.

Another important fact to keep in mind *at all times* is that the members of the General Administration Zone who are also members of the Board of Directors have a *dual responsibility*.

They are responsible not only to the President of the company for the proper *General Administration* of the phase of the business which is assigned to them, but also to the stockholders in the trusteeship functions.

The Pyramid concept is also applicable, regardless of *organizational structure* in considering the Top Management sub-zone of Departmental Administration. Here, the general administrative head (such as Managing Director) is the Apex of a Pyramid. Under him are the major Departmental functions associated with the particular general management function.

Frequently, in Japan, it has been observed that selection and appointment to this General Administration Zone has not been on the basis of ability, experience, and background, but rather for the same unsound reasons that were outlined in discussion of the Board of Directors. (Review these again.)

Reference to Data Sheet # 11 -1.5 and a careful analysis of the Types of Functions, Accountability, Responsibility and Authority of the General Administrative Zone will show the importance of proper selection of personnel in this zone to fulfil adequately the needs for successful business operation. (Discuss Data Sheet # 11 -1.5) Refer to Data Sheet # 11 - 1.6 — Example of U.S. Company.

C. Supervisory Management Zone

In previous discussions of Top Management and Trusteeship zones it has been evident that the people comprising these zones have been interested in general policies, general programs, general performance. Their responsibilities, functions and authority have been in the broad fields of administration. It should be equally obvious that these people have no business attempting to devote themselves to the detail functions which are part of the operation of lower management levels. Further, they do not have time to do their own job properly for the successful management of the company if they do devote their time to such details.

As we progress downward to the Departmental sub-zone of top management it can be observed that there is a gradual change in what is expected of the executive. At this level we find that the Department head may not have the broad business background, the experience and viewpoint which are essential for the General Administrative functions of higher levels of management. Frequently he may be younger, or less experienced.

One point that cannot be stressed too often or too greatly is that limitations of individual ability must be considered in determining advancement. Because an individual is competent as a department head (or any other management position) does not necessarily mean he will be equally competent in a higher position. All too frequently this fact is overlooked and as a result people are advanced because of long service or some other reason. When this happens and the employee is incompetent, the business suffers. Every other management employee is handicapped and has to carry a greater load.

Much less of the Department Heads' thinking and effort are concerned with general planning than at higher levels. He is focusing most of his attention on his own department. His primary interests are specific problems of operation, efficiency and results as they concern his department. He is required to carry out many policies, plans and programs established at higher levels. And while he has considerable influence in shaping the course of his own department he has less to do with the establishment of general policies and programs. Even within the department he must conform to basic and general policies and programs in establishing his own departmental plans policies.

This change which we have observed through the top management zones is one of viewpoint as well as functions. The emphasis is changing from administrative, organizational and planning ability, from objective analysis of overall operation, to the more limited but equally important supervisory functions of executing these plans, programs and policies in the day-to-day operation of each phase of the business.

Therefore when we come to the supervisory management zone it is important to recognize at the outset that the change which has been observed downward through the top levels is further accentuated as we progress through the supervisory zone.

Thus the lowest level of management, the foreman, will be found to have very little to do with planning except from the standpoint of the day to day effectiveness of his workers. He will have little to do with policy making. Primarily he will be responsible for the execution of the plans, policies, programs and objectives which are set for him at higher levels.

In the analysis of the supervisory management zone we continue to use the Pyramid concept. Chart # II - 1.8 illustrates this concept. But again, it is important to stress that the title we have used at each level is meaningless as such. For your own analysis of your own company you must consider the functions, responsibility, and authority that are essential rather than the empty title.

Data Sheets # II – 1.9, 1.10, 1.11 outline the types of functions. Accountability and responsibility in the various levels of the supervisory management zone. (Discuss these.)

D. Summation

In our review of the subject of zones of management we are sure that most of the types of functions and responsibilities that we have discussed are familiar to you. You recognize them as things you have thought about either specifically or in a vague way. But if this is true why do we spend our time and yours reviewing them?

One very obvious reason is that our observation of Japanese managements has convinced us that even though you know these things you are not applying them in a logical manner and one which will give you the best results.

For one thing you do not zone your responsibilities and authorities in a manner that will make top management or lower management effective. The President of a company will be so involved in small details, in approving what should be routine action, that he does not have the time to be President. A managing director will be interesting himself in the details of operation of a small part of his job rather than planning and coordinating his entire organization. And the people at lower levels who should be responsible and accountable for and have the authority to do these detail functions are confused by the lack of proper definition of their job and by the lack of true responsibility and authority. Further any initiative and interest they may have in trying to do a job is often destroyed by the interference and meddling of higher management.

Do not misunderstand what we mean by interference and meddling. We expect the President, the Managing Director, every management employee to be very interested in what is happening in every part of his organization. We expect that when he sees something wrong, or something that can be improved he will see that steps are taken to change the condition. But he will observe lines of organization in having the change made. Interfering and meddling as we talk about them are when the higher level management man, such as the President, goes directly to the lower supervisor or worker and tells him what to do instead of making the comment or suggestions through the various levels of management that are between the President and the individual. In America we call such direct interference “Short circuiting” because the intermediate management levels are short circuited or by-passed.

Traditionally, many of the things we discuss are not the Japanese way of doing. But while we appreciate and understand tradition we also recognize that the rest of the industrial world is not going to be concerned about tradition. They are going to continue to forge ahead, applying more and more scientific principles. We do not believe we need to draw you a picture for you to understand what that is going to mean to Japanese industry if you continue in the old ways.

We have gone through a series of logical steps in building the concept of zones of management. We know that the principles are sound and workable. But such principles are of value to you only as they are practically applied.

Note: To be certain that the group understands what has been reviewed, a guided discussion should be held at this point. Below are some questions that can be asked, together with comments as to what answers should be expected. These comments are for the guidance of the instructor and *not* to be read as a lecture.

1. *Within any management level in any company, foreman for example, should there be appreciable differences in the type of function, responsibility or authority?*

Answer: No. Regardless of the type of job to which the foreman is assigned, the type of functions, responsibility and authority should be the same. The difference is in the actual job which requires specific job knowledge rather than in the “zone” responsibilities all of which require the same basic knowledge and application for the particular level.

2. *Does a company have to change its organizational structure in order to properly define the type of functions, responsibility and authority that should be delegated to each level and zone?*

Answer: No. The type of functions, responsibility and authority should be the same regardless of organizational structure for any level or zone in an efficient company. The only change that is required is a recognition by management at each level of what it *should be doing*. And following this, some *action to really do it*.

3. *What should be the major considerations in the selection of all management personnel?*

Note: The application of scientific principles of analysis is a most important phase of this and every other management problem. Obviously there can be all kinds of answers to such a question. Therefore it is advisable to use analysis in arriving at a sound answer. To do this we must ask ourselves other questions. For our purpose we will refer to data sheets # II – 1.5, General Administrative sub-zone; and # II – 1.11, Foreman. Comparing these two sheets let us see what some of the factors are that require consideration.

- (a) *Is the viewpoint of a Managing Director the same as a Foreman?*

Answer: No. The foreman is concerned with his job in minute detail. He is answerable specifically for each and every worker; how he does the job; what his efficiency is. Little is required of the foreman in understanding of the overall business, or of General Administration. The Managing Director however, must look at his job from a broad viewpoint which takes into account not only his own phase of the business but also the company as a whole. He cannot devote his time and effort to minute detail. His job is to plan, to observe, to evaluate results, to assure a subordinate management structure which will do the detail job effectively. His approach must be fundamentally administrative rather than supervisory. The Managing Director plans, the foreman executes.

- (b) *What difference is there in Experience and Background required of the Foreman and Managing Director?*

Answer: In the case of the foreman it is obvious that he should know every detail of his specific job because otherwise he cannot train his workers. Beyond this he must either have some knowledge of company policies or be trained. He must also have some ability to handle people. He must meet the problems and emergencies of day to day operation which requires ability to do simple planning and make minor decisions.

However, in the case of the Managing Director complete detail knowledge of the job over which he has direction is not essential. Actually it would be

impossible for him in most cases to know all the details of every minute sub-unit of his organization.

Instead, he must be able to organize and plan for the job as a whole, leaving details to his subordinates. He must be able to analyze the performance of his organization, coordinate the activities of his departments, find the managerial weaknesses of his subordinates and correct these by education or change. He must devote most of his time to general planning rather than detail supervision.

Therefore the Managing Director is required, for effective performance, to have a wide experience in administration, in organizing and planning, in measuring quickly and accurately the performance of his organization. He must have sound judgement which is to a considerable extent the result of experience and background.

There is another factor which is vitally important to this managing director. It may be called a management skill. This skill is the thing we sometimes call executive ability. This is rather difficult to define but it might be described as the ability to visualize and conceive ideas of what is needed and get others to execute these ideas. Further, it is the ability to obtain from others ideas and suggestions which can be incorporated in these plans. Some people lack this ability, and others have it to a minor degree. However, it is one of the very important factors that must be considered if higher level executives are to do an effective job.

It should be very evident that the selection of management personnel is not something that can be done without careful analysis and study if you are to have an efficient company. You cannot base promotion solely on length of service. University or family connections, or friendship do not make any man more competent. Fundamentally, your company will progress or fail dependent upon the ability of people selected for key positions. *Be sure you select wisely.*

4. *Should the decision as to functions, responsibility and authority of any management level be based on the qualifications of specific people who now hold those jobs?*

Answer: No In developing this answer the following points should be made:

- (a) Building any management level position around an individual rather than upon the proper functions and responsibilities of the level is dangerous. When this is done, every time there is a change in individuals there must be a corresponding change in the type of function and responsibility.
- (b) Further, such a procedure results in the building up of “one man” organizations because the individual will have types of functions and responsibilities which should be in other zones than his own. For example, a President or a Managing Director because of his experience may interest himself (and interfere) in the operation of a

particular unit or phase of the business instead of holding the proper “lower zone” supervisor accountable and making sure that this supervisor is properly trained or else is replaced by someone who is capable of doing the job.

1.4 Practical Application of Analysis of Zones of Management

We stated earlier that sound principles are of value only to the extent practical use is made of them. The time you spend on this course is wasted unless you can go back to your company, instruct others, and begin practical application. The following is a proposal for initiating action to apply the principles developed in discussing zones of management. It is our belief that this step *must* be taken if the industry is to get results.

1. Review your own company organization and separate present jobs into proper zones.
2. Consider the types of responsibilities that *should* accompany each management level and compare with types of responsibilities that *actually* accompany each job.
3. Review delegation of authority (if any) to see that authority is adequate to meet responsibilities of each level.
4. Define the responsibilities and authority proper for each zone and management level.
5. Train present personnel to meet requirements of their proper management position or select and train competent personnel if present personnel is incompetent.

2. Design of Organization

2.1 Introduction

People, machines, financial resources and physical facilities must be grouped together into a particular pattern specifically designed to accomplish a stated purpose. This is the essence of organizational design.

Creating a company organization requires the same thoughtful planning that is needed to set up any other kind of sound, stable structure. For example, if you were to have a building constructed in which you planned to manufacture a product, you would not go to some builder and say: “Build me a factory; I am going to be a manufacturer.” At least, we hope you would not!

You have many things to be concerned about, not only roof, walls and a floor. You can expect to spend a great deal of time and money having this building put up. You have to be assured that it is going to meet all of your anticipated needs. So, how are you going to deal with this problem?

The common sense thing to do is to determine and decide upon your needs, not only your immediate needs, but as well as you can identify them, also your future needs. These needs must be based on facts and firm plans. For example, what kinds of machines and equipment will your business require? How will the production, shipping and office facilities be arranged? The building is to accommodate how many people? How many offices will be needed? What will be required for storing materials, process parts, products, inventory, chemicals or other special materials? All of these questions must be answered, and many more facts must be gathered, before design requirements of the building can be settled.

It is only after an analysis of this kind is done that you can go to an architect with the necessary particulars to discuss and test a design and develop a plan of action. Now, you may have to consider alternatives. For example, you may not be able to build the most perfect building of your dreams because the cost may be too great. You may have to make some practical compromises that will give you the most function for the least expenditure that satisfies your basic requirements. Only after this part of the total effort is accomplished are you then prepared to go to a builder to have the design of your concept converted into a tangible structure.

We have been using the example of creating a factory building as a way of introducing the subject of designing and building a business management organization. Let us recognize at the outset that we understand that you already have a management structure in your companies. You are not starting out new to build something from the ground up. It is agreed that it is much more difficult to change something that already exists than it is to start afresh with something new. But, where change is indicated as a necessity as a matter of existence, change must be done. We know that change, especially major changes, take time to accomplish. We also know that change brings with it great rewards. Reaping those rewards is the goal of our organizational design effort.

As engineers and management people, we are convinced that the logical approach to determining what changes are needed and the benefits to be derived from them stems from the use of the Scientific Method. It merely involves careful, common sense, analytical thinking. Simply stated, the scientific method approach consists of five steps. They are:

1. Define the problem precisely.
2. Get the facts — all the facts.
3. Analyze those facts to decide upon a proper plan of action.
4. Put that plan of action into effect with the expected results identified.
5. Monitor the plan in process; make necessary timely adjustments.

The problem that we are dealing with in this course is quite easy to define. Manufacturing productivity and reliability is at an economically unacceptable low level. That calls into question the effectiveness of management organizations. We want to turn the situation around. In order to

accomplish that we must determine all the factors that influence organizational operations. The next section will consider Factors that Affect Organizational Design.

But, this is only a part of the information that is needed in constructing an organization. “Forms of Organization” will be covered in the following section and, following that, is the section on “Construction of an Organization”. After these topics have been studied, we will be ready to proceed with considerations of practical applications of the principles we have learned to the situations in our own companies. The last section of this chapter on organization is devoted to an analysis of existing companies, both American and Japanese. This will help in visualizing how the factors we have studied have been applied in actual practice.

2.2 Factors Affecting Organization Design

Here are the more important factors that affect the design of an organization:

a. The location and arrangement of factories.

1. Are all factory operations consolidated in one location or are they scattered?
2. If factory operations are scattered do some of the plants act as satellite or feeder locations which provide only materials and components of the products? Or is each factory a self contained unit which manufactures certain products complete?
3. What is the size of the organization (number of personnel) at each location?
4. What are the problems of product distribution, transportation, and sale? Are markets concentrated or scattered? Are most sales through dealerships or direct?
5. What is the internal arrangement of each factory location? Do physical limitations and arrangement of factory buildings necessitate more elaborate or complex organization design?

b. The amount and kinds of management controls required

It is not our intent, at this point, to consider in detail the subject of management controls. This is covered later in the course. All we will do now is briefly study the factors that should be considered in designing the organizations.

Controls may be defined as the functions, procedures and checks required to assure the satisfactory accomplishment of plans, policies, and objectives. In the final analysis, all controls have as their ultimate purpose either the control of quality or the control of cost, or both.

The first item to be considered is the nature of the product.

1. Is it simple or complex in design?
2. Does the design require complex and intricate manufacturing equipment, tools processes?
3. Are there special product requirements that necessitate particular care in manufacture to assure control of quality?
4. Are complex cost controls necessary in order to insure economical manufacture or sales?
5. Is the product mass produced, or does it have to be made on an individual order (job-shop) basis to fit the customer's needs?

The second item to be considered is the number of products to be made.

1. How many and what kinds of products are to be made?
2. Are any or all of the product inter-related?
3. Do the products require different types of processes and equipment? Do they require different types of cost and quality controls? Or can they be integrated under the same controls?

c. Type of personnel

In the introduction to this subject of organization design we used as an example the construction of a building. In a sense your organization structure is also a building which is equipped, or should be equipped with the facilities and tools which management, *made up of people*, must use in accomplishing the objectives of the company. These people, who comprise all levels of management from foreman to president, use this organization structure to help them do their respective management jobs.

But people are all different. No two will ever have the same ability, the same view point, or exactly the same way of doing a job. Some will be more skilful than others in the use of "management tools", regardless of what these tools are. Some people can be easily trained and will use initiative. Some will be capable of handling a bigger or more complex and diversified job than others.

These things must be considered in designing the organization because a good organization plan on paper is worthless unless it can be made to function by the people who are management.

You already have organizations which are built to some extent around the present personnel. Practical consideration of both immediate and long range objectives in

organization design require that you evaluate these present personnel as the first step. Determine these things:

1. Are competent people available and are they properly assigned to key positions?
2. Is the experience of key people limited to narrow specialized fields or small units of company operation?
3. Are special quality or cost controls necessary because of the inadequacy or inexperience of present personnel?
4. Is the present organization design built around the present people — their individual abilities, expense and background?

In reviewing these questions the first one regarding competent people is going to assume major importance in your minds. We know that in most cases you will immediately say to yourselves: “We lack people who are competent, who have the ability and initiative that are needed to make a good organization design workable”, we know this because we have heard it repeatedly in our contacts with your companies in the past. But we also know it because we have experienced the same thing in the United States.

It is true that there is always a shortage of men of special ability, and that we can seldom reach the goal of an ideal organization design because of this. However, we also know that part of this shortage of men does not exist except in our own minds. The reasons are that frequently we do not establish any means for measuring ability and performance or provide the incentives which encourage or develop these things.

For example, there is a tendency to evaluate ability and performance on the basis of the personal opinion or feeling of the superior rather than any actual measurement by this superior of accomplishment. Also, where people are given responsibility without authority, where there is too strong domination and control from above, ability and initiative are stymied. And, any person, no matter how capable, will do a better job sooner if properly trained.

But how can any person, no matter how capable, be trained unless his job is defined? Certainly the superior is in no position to train his subordinates unless both he and the subordinates know the scope of their jobs. The experience that the subordinate gains in this case is hit or miss. It is not comprehensive and does not really give him what is needed for either his present job or a better job.

Of course, there will always be a few men of outstanding ability and initiative who will be able to move ahead and learn by their own efforts. But this is not enough because the number of such people is too limited. Also, we fail to make the best use of these people if we do not train them and thereby accelerate their progress and make the most of their

ability. The large majority of people must be trained if we are to broaden their experience and develop their ability and usefulness.

The problem of whether competent people are available and properly assigned in their present positions must be approached from the standpoint of careful analysis. We must evaluate these people and to do this we must know the job they are expected to do. We must also find out, through sound personnel evaluation, whether we have other people who are competent but who have not been given a chance.

The question of limited experience is also a very obvious factor in organization design. But here also, while people may be limited at the present time, a well planned training program based on defined jobs, together with a program of job rotation aimed at broadening experience, will place us in the position of progressively reducing such limitations.

During the interim period when we are going through the necessary steps of developing key personnel it may be that special controls, indicated under the third question, may be necessary. But as progress is made under a program of personnel selection and development many or all of these special controls can be relaxed or eliminated.

The fourth question is particularly important, and should be the subject of unbiased, objective study. The easiest way to design an organization structure is to build it around the ability, experience, and background of individuals who are available. By doing this you do not have to worry about how the job is going to be done.

But this is the most dangerous thing you can possibly do and in the long run will cause great inefficiency and confusion. Suppose, for example, you have a man who is competent and experienced in engineering, manufacturing, and inspection. You design your organization so that he is responsible for these three phases of the job. But something happens to this man and he has to be replaced. The only replacement available is a man who knows manufacturing and inspection. Then, either the engineering suffers or you have to *change* your organization design and put engineering under a separate man.

If you follow such a practice you are constantly at the mercy of conditions over which you have no control and must be continuously ready to change your organization design or else take a chance on loss of efficiency.

Sound judgement would dictate that we plan our organization design on a logical basis of job functions, and select and train our personnel to fit the job rather than be continuously changing the job to fit the person.

There are other features affecting organization design which we will touch on only briefly, although we recognize that they are real problems for Japanese industry at the present time. First is the tendency to reward long service through promotion, regardless of the ability of the man to do the job. And sometimes, people are placed in responsible positions because

of “influential connections”. But in either case, if ability is lacking, the company will suffer.

A second feature, which reflects tradition to some extent at least, is that once a man has been assigned to a job it is difficult to demote him regardless of how incompetent he is because he will “lose face”. We will not comment further on this except to point out that in the future you can save yourselves much worry and difficulty if you make sure of the man’s ability and competence *before* the promotion rather than *after*.

2.3 Practical Considerations in Organization Design

In presenting the factors affecting organization design we recognize that you already have management structures. It is realized that it is much more difficult to change something already built than to build something entirely new. If you are going to consider changes; if your present management structure is not adequate for present or future needs; if it is too costly, then before you start you must have a plan. Be sure you have defined your needs, determined all the facts, established a plan that is not only sound on paper but is also workable before you proceed with such changes. Changes without an ultimate objective are meaningless in themselves. They must be introduced logically, step by step, as they are justified. Major changes may take a long time to accomplish if they are not to be excessively costly. If you are not absolutely sure, try out the plan in a single unit of the company such as a section or department. Analyze the results and check the plan for soundness. Then you are in a sound position to proceed.

3. Forms of Organization

In our previous discussion we reviewed some of the things that affect the design of an organization. Now we will briefly cover the general forms of organization that are usually an outgrowth of the proper consideration of the factors we talked about. Please remember, in considering these forms of organization, that they are general. They do not give you a formula to be used in your own company structure.

A. Line Organization

The first form of organization we will refer to is the *Line Organization*. This is illustrated in simple form of Chart # II – 3.1 This form of organization is perhaps the oldest and most natural. This is because most companies begin with a few men. As the duties and responsibility of the president grow with the expansion of the business there is too much for him to do himself. As a result he selects a man under him who could assume part of the responsibility. He delegates certain duties (and presumably authority) to this man.

Progressively this happens at each level until there are a series of management people between the president and worker, each with duties and authority delegated from the next higher level.

The distinguishing feature of this form of organization is that the *lines of direction and instruction are vertical. At any level of management no one can receive instructions or command from another person at the same level. It is assumed that each man on whatever level of authority is capable of performing the duties of his position regardless of how numerous or different in kind these duties are.*

Now what are the advantages and disadvantages of this kind of organization?

Advantages

1. Discipline is direct and relatively simple.
2. Duties and responsibilities are clear. There is no chance of misunderstanding as to spheres of activity.
3. This is probably the least expensive form of organization where the size of the company is very small, and its functions are simple.

Disadvantages

1. With growth in size and complexity the use of this form results in overloading a few men with a variety of duties.
2. Since few men are capable of doing a variety of unrelated things equally well some phases of their responsibility will be neglected. This weakens the efficiency and effectiveness of the organization.
3. Instructions issued to any level, including the worker must of necessity be meagre because the people at any level are so busy with a variety of responsibilities and duties that they are unable to devote adequate time and attention to any one phase. Reliance must be placed on the experience, ability, and skill of each individual including the worker.
4. This form of organization tends to concentrate the possibility for success on the ability of a few strong men. The loss of one or more of these men usually results in the company deteriorating. Often such a company fails when this happens.

B. Line and Staff Organization

The second form of organization to be considered is the *Line and Staff Organization*. This is illustrated in simple form in Chart # II – 3.2 The reason for the development of such a form of organization is simple. The management of companies which have grown in size and complexities realise (or are forced by economic conditions to recognize) that men are required for the efficient management of business who have special knowledge and special skills. The reason such a form is called Line and Staff is that all executive orders, and all direct supervision are

handled through the Line Organization. The Staff specialists have no authority to issue orders directly. They act in an advisory capacity to the line executive or supervisor. All suggestions and advice pertaining to the special field of each staff member are passed through the line officer or supervisor. One thing to be remembered however, in the proper functioning of a Line and Staff organization, is that “staff” members, while they cannot issue orders to anyone in the Line Organization, can and do in effect furnish “advice” which may be the equivalent of a command. This will be more clearly understood in detail discussion of controls later in the course. However, here is one example:

If the engineering department furnishes plans and specifications for a product, the Line Organization would not change these specifications without obtaining prior approval of the engineering department.

There are two features of the Line and Staff form of organization that are sometimes confusing. This confusion arises from the concept which is usually developed in theoretical discussion of this type of organizational structure, because the “Line Organization” is considered to be the Manufacturing or “Operations” group and other functions such as Finance, Engineering, Marketing, and Industrial Relation are considered to be “Staff Organizations”.

Frequently a question may be raised as to why marketing should not also be considered an “Operations” function and therefore a “Line” organization. Such a concept is perfectly reasonable and sound. From a practical standpoint the company has two main functions. The first is to make the product and the second is to sell the product.

If such a concept of two line organizations is used, then Finance, Engineering and Industrial Relations are Staff organizations furnishing advice and guidance to both Manufacturing and Marketing.

It should also be remembered that within any Staff organization there may be an internal Line organization, and also internal staff groups advising this line organization.

Let us review the advantages and disadvantages of the Line and Staff form of organization:

Advantages

1. By obtaining advice and recommendations from staff members, the line management is freed from the necessity of time consuming consideration of problems that are not related to the performances of "Line" duties.
2. A more effective job is done by "Line" management because it concentrates on phases which it is most competent to handle.
3. The danger of developing a few strong men and depending on their individual abilities is greatly reduced. This adds to the stability of the business.
4. Control of the organization from the standpoint of assuring consistency and proper application of policies is greatly simplified.

Disadvantages

1. Specification of functions, particularly at lower levels of management tends to retard the development of flexibility and breadth of experience of individuals, which is important as these men advance to higher levels.
2. Unless continuous and close scrutiny is maintained, staff organizations may develop into "empires" which grow because of internal complexity rather than real need and effectiveness. It is easy to develop a group of "paper shufflers" who do not contribute to the effective operation of the business.
3. The advisory nature of staff functions often results in line management using staff organizations as a crutch to do things these line people should do for themselves.

C. Functional Organization

The third form of organization is the *Functional* type. As in the case of the Line and Staff form, this is an outgrowth of the need for specialists in various phases of the business enterprise. The major difference however, is that at any level, the specialist can and does issue instructions or orders to each subordinate on the phase in which he is a specialist. A simple form of this structure is shown in Chart # II – 3.3.

You will note that one feature of this form of organization is that in his own special field each organization head is supreme. Every subordinate in every organization is answerable to the head of each special organization for the following of instructions in the particular field of that organization.

Following are some of the advantages and disadvantages of the Functional form of organization.

Advantages

Disadvantages

- | | |
|--|--|
| <ol style="list-style-type: none">1. Specific knowledge and guidance are conveyed to each individual and group by experts, rather than through those who may have had only partial education in the various fields of activity.2. Activities are separated with reference to the function being performed.3. The number of functions any individual must perform is reduced to a minimum, creating high functional efficiency. | <ol style="list-style-type: none">1. There is a marked tendency to weaken disciplinary or line control because each individual is answerable to more than one superior.2. Elaborate means may be required to coordinate the work and efforts of all members of any management levels.3. Managing authorities must have a high ability to correlate the work of strong personalities to assure cooperation and harmony. |
|--|--|

C. Summation

It is not possible to specifically recommend the form of organization any company should adopt. In actual practice it has been found that often a combination of forms is effective. In any case, however, it should be recognized that any company that has grown and expanded without an understanding of the fundamental concepts of organization is not in any true sense an organization. It is a conglomeration that makes efficiency and control difficult if not impossible.

We are going to ask you, at this time, to analyze your own company structure in general and see how far you can go in determining whether you use Line, line and Staff, Functional or combination forms. This “homework” has two purposes. The first is to develop familiarity with practical analysis. The second is to prepare you for intelligent consideration and application of these general principles in subsequent phases of the course and also in practical use in your own company.

4. Construction of an Organization

4.1 Introduction

Before proceeding further, let us review briefly the field that has been covered in the earlier phases of this management course.

First we reviewed the subject of policies. What are the purposes of policies?

- a. To provide guides, rules, or laws for the conduct of the business.
- b. To insure stability of purpose for the protection of the integrity of the company.
- c. To provide for the protection of the interests of the stockholders.
- d. To provide for the protection of the interests of the employees.

Second, we reviewed the Zones of Management. You will recall that in this section we were interested in the types of functions, the nature of the responsibility and authority that is logical and sound at each management level. Further, we developed the fact that these zones of management apply regardless of the organization structure that is set up.

Summarized, the study of zones of management showed that:

- a. At all levels of management, from the Foreman to the President, it is not possible for the man at any level to personally accomplish all the functions for which he is responsible.
- b. That at each level of management certain responsibilities and authorities must be delegated to subordinates.
- c. That these delegations of responsibility and authority become more specific and detailed as we progress downward, from the President to the Foreman.
- d. That the individual at any level must be held accountable for the execution of the responsibilities for which he has been given authority.
- e. That at any level of management it is not humanly possible to do well the job required at that level and also do the work of a subordinate or group of subordinates which should have been delegated to these subordinates.

Following the study of zones of management we reviewed the factors affecting the design of an organization, and the theoretical forms of organization that are applicable to various business enterprises.

Actually, then, we have considered two types of things. One might be called the active management phase, which embraces the development of policies or laws for conduct of business, and the nature of management application of these policies through the assignment of responsibility and authority. The second might be called business structure or organization.

It may help our concept and understanding if we consider the organization as a structure which is necessary for the efficient and economical operation of the business. Management uses the organization structure as a tool for the accomplishment of these objectives. But like any tool,

organization structure should not be considered as a permanent, fixed design. It must be adapted and improved as better concepts or ideas are developed.

4.2. Functions Necessary to a Company

Now in taking a scientific approach to the consideration of organizational structure we must define our problem. Suppose we state the problem like this:

What structure must be provided for the organization of my company in order to assure that the most efficient results are obtained by management?

Obviously there are many facts that must be obtained before any plan can be developed. These facts may be separated into two groups:

- a. What functions are essential for the operation of the Company?
- b. What factors must specifically be considered in the practical incorporation of these functions in an organizational structure?

Note: These factors were developed under the previous unit #2 “Design of Organization”. Our objective in the present unit is the development of the functions that are essential for the operation of the company. (Question “a” above.)

Now what are the general functions that are essential to any business?

First, of course, the company develops from an idea for a product which is needed or demanded by the public. This idea must be translated into a form which can be produced and sold. In order to accomplish the development of a design and translate this into a practical form the company requires *engineering*. This is one of the general functions.

Second, the company needs money. It must finance the factory, provide facilities, buy materials, pay salaries, establish cost and sales price, and keep records of expenditures to be sure the company is not losing money. This function could then be called *finance*.

Third, the product which has been designed must be produced. Somebody has to make the product, using the factory, the facilities, the people. This function can be called *manufacturing*.

When the product is made it must be sold to complete the cycle and get financial returns that will permit the manufacture of more products. Earlier, we reviewed briefly some of the phases of this function during our discussion of policies. We can call this function *marketing*.

It may be argued that these four functions are all that are required. In the past this would probably have been true. However in the last few years there has been a tremendous change in the relationship between the employer and the employees. One of the evidences of this change is the increased prestige and power of labor through the unions. And with this change has

developed the necessity for management to devote more thought, attention, and time to the problems associated with labor dealings.

Not only must considerable time be devoted to labor negotiations, but also it is becoming increasingly evident that the basic company policies and operational policies must be more clearly defined and more far reaching. Also, the dissemination of these policies so they are known and understood by all employees, and their proper administration, are absolutely vital. Therefore a major function must be added in Japan as it has been in America. This function can be called *industrial relations*.

In addition to these five general functions there will usually be the company offices of Secretary and Treasurer.

Now, in order to make certain that we arrive at a complete list of detail functions which we will eventually group and arrange around the general functions, we will take each general function and find all the detailed functions (all the facts) that might be considered to be of the nature of the general function. In some cases we will later find that some of the so-called functions will actually be sub-functions. That is, they will fit into the organization structure at a lower level. In other words, these functions and sub-functions are subject to the same concept of “zones” that we studied in the unit on “zones of management”.

For the moment, however, do not try to fit these functions into zones, or try to decide whether they should be assigned under the heading (general function) we list them under at this time. For example, under the first function of “Engineering” we have listed Sales Engineering. Sales Engineering is an important engineering function but in the company structure it is not necessarily a part of the engineering organization but is often a part of the Sales organization.

The one important step to be taken at this time is the analysis of each function to make sure we have a common understanding of what is included. It is important to be able to recognize the general scope of each activity in order that we can logically plan the organization structure. Later it will be important also, to recognize these activities as they relate to controls and operations.

The following Data Sheets # II – 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 incorporate the important individual functions.

4.2.1 Engineering

Before proceeding with the detail consideration of each of the necessary functions we should devote some time to the consideration of engineering as it applies to industries. Specifically you are interested in engineering as it applies to the functioning and successful operation of your own company.

Now what is an engineer? Actually there may be several definitions depending upon whether you are considering the question from an academic standpoint, or from the narrow viewpoint of specialized fields, or from the general viewpoint of a practical industrialist.

For our purpose we might say that an engineer is a man whose technical training makes him capable of the analysis, assignment and application of knowledge in a logical manner to produce a desired result.

What are the differences between a good technically trained engineer and a man who has had only practical experience? Through technical training the engineer has at his command the knowledge and experience of several generations. This accumulated experience has been sorted and reduced to fundamental principles which are filed in logical “reference libraries” in his mind. He can refer to these fundamental principles and apply them in a wide variety of ways to the problems for which he is expected to provide a sound and practical answer. But the man of practical experience who has not had technical training also has a mental “reference library”. His library is the accumulation of his own experience. He has learned by trial and error, and therefore will not make the same mistake a second time. But usually this practical man does not know why something worked or failed. He does not have the advantage of understanding the fundamental principles through which he can make general application of what he knows.

It is very easy to consider that an engineer is someone much different from the man of practical experience. Sometimes engineers even encourage such a concept. But in the final analysis the only difference between the two is that the engineer has at his command the understanding of fundamental principles and a more extensive mental “reference library” that the man of practical experience lacks. Please remember that we said at the start a *good engineer*.

It is important, however, to recognize this difference because unless we do we fail to realize that there are some types of functions, some jobs within an industry that can only be done in an effective manner by technically trained engineers.

It is generally recognized, for example, that Research & Development require the services of engineers whose technical knowledge is a prerequisite to such work.

It is not so generally recognized that engineers have an important place in the actual manufacturing phases of a company’s operations, and in the planning and execution of functions which are essential for establishment of sound quality and cost as well as the subsequent control of these two vital factors.

Also, wider recognition is needed of the contribution the engineer can make in increasing sales and broadening the market for products manufactured.

A concept of the scope of engineering in an industrial concern will be clearer if we consider the purpose of the various engineering functions. This is again an application of the scientific approach.

If we start with the idea for a product which is needed, or for which a need can be stimulated by the buying public (the potential market) this idea must be translated into practical form or design which can be produced and sold. The idea may have come from some basic fact or the property

of some material that has been discovered or disclosed as a result of fundamental research. It may have come from field surveys to find out what people want but which is either not available at all, available in limited quantity, or unsatisfactory because of design, quality of cost. Or it may have come from a suggestion of an individual or group either within or outside of the company.

4.2.1.1 Research

a. Fundamental Research

Obviously if the idea resulted from fundamental research this research must have been done by a special group of engineers within the company who were devoting their time to such research or else have been obtained from information supplied by some outside group engaged in fundamental research.

Until World War I it was not generally recognized by companies in the United States that fundamental research had an important place in industry. However, since that time there has been a growing understanding of its importance. It is generally understood and acknowledged today that fundamental research is important to the future of industry.

However, it must be remembered that there are practical considerations in the determination of the extent to which any company can and should support such fundamental research. For example, in Japan today much of industry is behind the rest of the world in the application and use of principles and fundamental research information that is already known. Obviously it is important first to catch up with what is already known before going too far in exploring new fields. Actually, there is grave danger of re-exploring already discovered basic fields if you do not first determine what has already been accomplished somewhere else. This is a waste of time, energy and money.

There are, of course, some engineers whose minds are peculiarly fitted to fundamental research, and who would not be fully effective in any other phase of engineering work. However, the vast majority of engineers can be trained (if they are not trained already) to apply the disciplined logic of a scientific approach to the solution of practical development, manufacturing and sales engineering problems. We believe these fields are the ones on which Japanese industry should place major emphasis under present conditions.

b. Practical (or applied) research

Most companies, particularly medium and small sized concerns will probably start their work in the practical research stage. That is, they will start on the basis of fundamental research done by others. The function of this phase of research is the conception or visualization of some practical application of an idea. At this point the development work necessary to convert this visualized application into a product design has not yet begun. It is possible that the man (engineer) who visualizes this concept may not be able to develop even a preliminary design of the product.

But unless the engineering staff of a company is large, it will probably be found that the man who does develop the practical concept will also usually have to carry on the preliminary work in the succeeding stage of Product Development.

4.2.1.2 Development

Development Engineering is in itself a complete phase of engineering work. However, in order to better analyze the progressing steps between Practical Research and Production Engineering we have divided the discussion into three components. Each of these is essential in a properly integrated engineering setup, and their lack can and does cause difficulty and inefficiency in manufacture as well as waste and excessive cost.

a. Product Development

This is the first step in the actual development into a product of a visualized application of an idea. You will recall that the practical research phase was where the application of the idea was conceived, but design for manufacture and use was not initiated. Product development, then, takes this application of an idea and translates it into a preliminary design for experimental purposes. This design may still be far from the final design which is to be manufactured. Its purpose is to test, through preliminary models whether the application is practicable. It is important both from the standpoint of proving the workability of the application, and as the source of information and analysis which will contribute to the final development stage of product design for commercial production. It is in this experimental or laboratory model stage that errors are corrected. It is in this stage also, that data are collected which will make possible any essential improvements needed in the final design.

b. Product Design

The last stage of engineering development in the route from an idea to a product that can be manufactured is the final or Product Design. This is a vital phase because it is here that the plans, specifications, drawings and requirements are developed which govern the success of the product both in manufacture and with the customer.

Following are some of the more important factors that must be considered in Product Design:

- (1) Consideration of the problems of commercial manufacture including manufacturing facilities that are available or required, the skill of workers, the special tools or processes which may make manufacture excessively expensive, designs or tolerances on components which are too severe for commercial processes without high losses through scrap and defective parts, and other related items.

- (2) Consideration of the materials specified to insure that the product will have the maximum service life and the minimum of instability and deterioration consistent with cost and customer satisfaction.
- (3) Consideration of design features other than materials which will improve performances. This will include determination of adequate margins of safety, etc.
- (4) Consideration of design features that will facilitate operation and simplify maintenance.
- (5) Consideration of design features that will enhance the saleability of the product through “eye appeal”. It is generally recognized that possibilities of sale are greatly influenced by appearance.
- (6) The final design should be given an adequate trial in which normal operating conditions are simulated or created. This is in order to determine whether there are any shortcomings which might result in an unfavorable customer reaction after the product is on the market. An unproved product can often cause a bad name for the manufacturer that it is very difficult and costly to overcome.

You will note that in this review we have repeatedly mentioned cost. It should be remembered always by development engineers that it is just as important to design for the simplest and lowest cost as it is to design for the required features of the end product. Cost must always be as low as possible for the quality required. Cost consciousness begins with product design.

c. Standardization

What do we mean by standardization in connection with Development Engineering? Previously we emphasized the fact that development engineers must be cost conscious. It was also indicated that product quality is an equally important consideration.

Standardization as applied to product design is the simplification of design structure to permit the maximum usage of designed components on several products (where possible) and the incorporation of previously designed parts or components in new products wherever this can be accomplished without seriously affecting the end requirements of the new product. Also, in the preparation of design, standardization includes the application, wherever possible, of commercially available items rather than those of special design. These things are part of the economic considerations which are the development engineer’s responsibility.

Product quality as a factor in development of design may be considered as the features which are built into the design through adequate planning to insure a finished product quality level (assuming that adequate control of quality is maintained in the manufacturing

processes). One of the major problems in the provision of a product design whose quality can be controlled is the use of proper materials.

By proper materials we mean not only the selection of the best kind of material for each part dependent upon its serviceability and cost, but also the repetitive procurement of such materials within predetermined limits of variability. In other words specifications for materials must be developed which will insure that the manufacturing organization can order, and verify the receipt (through inspection) of materials which conform to these predetermined limits.

Here again the economic aspects must be considered. If the development engineer specifies materials with special requirements that are more expensive to purchase than commercially available items which would serve the purpose he is not doing a proper job. Further, in the selection of materials consideration should be given by the development engineer to the problems of manufacture such as the machinability or workability of the material.

d. Summation

The work of Development is completed only when the steps covered in this discussion have been adequately covered and the product design is ready to be turned over to the Production Engineer who will integrate it into the manufacturing program.

Complete information must be furnished to the Production Engineer including; specifications for special materials where required; drawings showing piece parts, components and assemblies and indicating the material, dimensions, tolerances (limits of variability); requirements as to appearance, performance, etc.; stock lists covering the entire product.

Beyond this, the Development Engineer is expected to be continuously on the alert to find or develop new designs, or modifications, materials applications etc., which will make possible the production of the product at a lower cost, or improve the quality where this is determined to be advisable. In this phase of his work the engineer must also consider what effect such changes will have on the obsolescence of manufacturing equipment and tools and interferences in manufacturing processes that will, in effect, increase the cost of manufacture.

4.2.1.3 Production

Production Engineering is the term we have applied to cover all phases of engineering associated with the actual manufacture of the product. It is an arbitrary term, and you may use any other terminology. The important thing to remember is that this phase of engineering covers specific functions which we will review.

a. Operating Standards

In the United States there are several organizations which have been working for many years in the development of standards which are accepted and used by industry. Among these are the U.S. Bureau of Standards, American Standards Association, and American Society for Testing Materials. The standards developed by these groups serve as a guide both in the development of product design and in the production engineering for manufacture. It is a production engineering responsibility to consider and use such standards wherever applicable.

Beyond this, there are many cases where it is desirable to establish standards which will serve as a guide in machine and tool design; tolerances which can be allowed on dimension where no variability limits are specified; special processes which must be used repetitively on one or more products and where the technique is complex or special controls are essential. In many cases these standards, particularly on processes, are in the form of process specifications which define, in detail, the complete operation, controls, etc. This has the dual purpose of insuring the consistent repetitive performance of the process and reducing the amount of detail required in the issuance of manufacturing layouts (Working Sheets).

b. Process

In discussion of this phase of production engineering we are listing in some detail the functions of such engineers.

- (1) Analyze new product designs for features that would interfere with commercial production; possible design modifications to facilitate production and reduce cost (these *must* be referred to the development engineer for approval); new equipment, tools, etc., required.
- (2) Determine equipment (machine and tool) capacity and availability of manufacturing capacity and insure provision of additional machines, tools, etc., as required.
- (3) Determine manufacturing techniques to: insure product quality; reduce material usage and scrap; eliminate excessive materials handling.
- (4) Plan shop arrangement and machine location to insure efficient operation.
- (5) Furnish ordering information and specifications on materials to interested organizations.
- (6) Prepare manufacturing layouts (shop instruction sheets) for product manufacture indicating all operational steps; specifying machines; tools, fixture etc.; listing materials and stock lists; and referring to manufacturing standards, process specifications, etc.

- (7) Study existing methods and equipment for possible improvement and cost saving.
- (8) Cooperate with manufacturing, accounting, and other organizations to correct manufacturing difficulties.
- (9) Furnish basic data to cost accounting organizations for the establishment of cost forecasts on new products and cooperate in the verification of the soundness and accuracy of manufacturing cost estimates.
- (10) Cooperate with Machine and Tool Design organization in the development of new machines and tools; furnish basic requirements for operating characteristics required.
- (11) Provide instructions and specifications for the proper maintenance of equipment such as type of oils, etc.

c. Inspection

This phase of production engineering has, in general, functions which are almost identical in nature with those of process engineering except that they are applied to inspection. Often, however, there is tendency to leave the major burden for inspection planning, and frequently much of the provision of inspection gauges, fixtures etc., to the Manufacturing Department.

On products where the design is simple, and *complete manufacturing information* and *end product requirements are available*, it may be argued that a statement to the effect that the product must meet all requirements is all that should be required for the manufacturing organization to verify that the product is satisfactory. And in theory this may be true.

However, such a concept ignores the fact that there are many ways that individuals will find to accomplish any job and that all of these ways are not equally efficient. Further, not all of these ways provide the best assurance of complete or accurate results. Therefore it is important that technically trained engineers with sound background and experience be assigned to the problems of inspection in the same manner that engineers are assigned to other phases of production engineering. When we refer to inspection we are referring to all phases; Purchased Materials (and parts), Process and Final.

Following are the major engineering functions in relation to inspection engineering:

- (1) Analyze the product requirements, special specifications, and materials requirements of new products to determine whether existing inspection equipment (including test equipment) is adequate from a design standpoint to inspect the new product.
- (2) Determine whether present equipment capacity is adequate or if additional equipment (of present design) will be required. Insure provision as required.

- (3) Develop the new types of equipment and facilities that will be necessary for inspection purposes. Insure provision as required.

Note: Frequently, the processes and methods developed for production will affect the planning and design of inspection facilities. Therefore close coordination and cooperation with the process engineering functions are essential.

- (4) Develop inspection methods and techniques to insure *adequate* and *economical* inspection. This is extremely important because techniques may be developed which are actually too comprehensive. It is as easy to “over-inspect” as “under-inspect”. “Over-inspection” results in waste of money and high cost, while “under-inspection” results in unsatisfactory product reaching the customer. Special note should be taken of the fact that giant strides have been made by many American companies to develop and apply systematic statistical quality control methods and procedures, not only to their manufacturing operations, but also to their other business functions. The effectiveness and economic value of these methods have, to a large degree, made ordinary inspection operations of less importance in the total production process.
- (5) Plan inspection operations location and arrangement, in conjunction with process engineering plans to assure proper location, efficient performance and adequate control.
- (6) Prepare Inspection Layouts (inspection instruction sheets) indicating all inspection steps and specifying inspection gauges, fixtures, etc., test equipment, and referring to inspection standards or standard methods.
- (7) Study existing inspection methods and equipment for possible improvement and cost savings.
- (8) Establish standards of maintenance, allowable tolerance variability of gauges, fixtures, and test equipment and frequency of checks on such facilities to insure accuracy of performance.
- (9) Cooperate with other organizations, (manufacturing, engineering, purchasing, etc.) to correct deviations from standards.
- (10) Furnish basic inspection cost data for incorporation with process engineering data in the establishment of cost forecasts. Cooperate in the verification of the soundness and accuracy of inspection cost estimates.
- (11) Cooperate with Machine and Tool design organization in the development of new inspection gauges, fixtures, etc. Furnish basic requirements for characteristics, tolerances, limits, etc.

Note: Frequently, test equipment is of special or complex design which will require the services of Development Engineering. Cooperation and coordination on such joint projects is essential.

d. Machine and Tool Design

The functions of such a group do not require special analysis because these are self evident. However, in considering these functions it is important to remember that this group has an economic responsibility for design which will insure maximum life commensurate with cost and productivity requirements. In other words do not design machines or tools that are more complex than can be justified by production programs and requirements, but build each machine or tool of the materials and with the design that will give long life. A further design responsibility is to make maintenance as easy as possible. Standardization of design, materials tolerances, and application are also important functions. Information furnished for construction in the form of drawings, specifications, requirements, tolerances, etc., *must be complete.*

e. Time and Motion Study

Time study may be defined as the function of observing and recording the time required to do each detailed element of an industrial operation.

Motion study may be defined as the study of the movements, whether of a machine or a person in performing an operation. The purpose is to eliminate useless motions, change motions to reduce fatigue, and arrange the sequence of *useful* motions in the most efficient order.

Generally, motion study precedes time study because time study of an inefficient operation, while it would provide a measure of performance, would not provide a sound measure of industrial efficiency.

Time and motion study may be considered as management tools (furnished by engineers) to insure the maximum of production efficiency and worker time utilization with minimum of fatigue and waste. It follows that analysis which is a fundamental part of such study will result in reduced cost, establishment of sound measures of worker performance, and will in turn result in better management control of both operations and workers. This phase of engineering is a specialized field to which much study should be given both by management as such, and engineering organizations. One important fact should not be overlooked. *Time and motion study are not limited to productive work, but are equally valuable in all phases of company operations.*

f. Safety

There is much that could be said about the place of engineering in the field of safety. However, it is a subject of such magnitude that it could not be covered in a course of this

nature. Effective application of safety engineering presupposes a recognition of the importance of the welfare of human beings. It also presupposes a recognition of the economic loss to any company which results from disabling injuries. This loss is not only in time of the injured employee, but also in machine output, group efficiency and company expense for the treatment of the injury.

Safety engineering applies to every phase of company operation. It begins with the planning of buildings and facilities and proceeds through the development of machines, tools, processes, handling methods, arrangement of equipment, etc., to the actual work effort. It is important to provide guards on moving parts and tools. But it is equally important to so protect the worker that he will not injure himself by the improper application of his own physical effort in lifting, moving, or other expenditure of energy.

4.2.1.4 Sales Engineering

This term is applied here to the application of technical engineering training in the expansion of markets, exploration of customer needs, and technical advice to the sales organization and customers on product application and use. The first prerequisite of the Sales Engineer in accomplishing these objectives is a comprehensive knowledge of company operation, company products, facilities and skills. Without such a background to support technical training much of his effort will be wasted. Following are brief reviews of the Sales Engineer's functions in various fields:

a. New Products

Provide, through analysis of market surveys and study of customer requirements, ideas for new products which can be considered for development and manufacture. This should be an important source of such ideas because the technical training of the engineer makes possible the analysis of fundamentals through which he can recognize the possible application of these fundamentals for new products.

b. Product Adaptation

The same ability to analyze fundamental principles is invaluable from a sales standpoint in the consideration of products already being manufactured to determine whether minor modifications (which are known to be possible through knowledge of company operation processes, etc.) can extend the field of applicability.

c. Application

Technical knowledge of fundamental principles, which is a working tool of the engineer, furnishes a sales organization with an increased market. The Sales Engineer, because he can recognize the possibility of application of present products to a variety of uses that are not evident without engineering analyses, can provide wider product use. The Sales

Engineer is in a position to advise the customer, either directly or through the salesman, on the technical problems associated with the actual application.

Frequently the Sales Engineer is called upon to present to the customer a complete recommendation for application and installation of the company's products. Such customer service is an important part of marketing responsibility and frequently provides a tremendous increase in business.

d. Summation

As we stated at the beginning you are interested in engineering as it applies to the functioning and successful operation of your own company. Later we will consider what should be determined structurally for the best accomplishment of engineering objectives.

In our presentation of engineering, the sub-division between Development and Production Engineering is, as you will recognize, an arbitrary one. We established the premise that all engineering in connection with the manufacture of the product should be called Production Engineering.

To avoid any misunderstanding it should be made clear that from the standpoint of organizational structure and job titles, this term of Production Engineering is not universally used. Some companies consider the development work connected with new products, such as new processes, new machines, methods, etc., as part of their Development Engineering function. Some companies sub-divide the engineering associated with product manufacture into several phases. Still others have a separate group who are referred to as industrial engineers whose functions are much broader in that they interest themselves not only in the economies of engineering, but in such things as management organization, company structure, etc.

At this point however, the important consideration is whether you have these functions in your company now. Are these functions clearly recognized and defined? Are there any links in the engineering chain that are weak or lacking? Do your engineers recognize their duties and responsibilities? Are they trained to perform their job?

Chart # II – 4.7 illustrates graphically the phase of engineering in industry.

4.2.2 Finance

This subject, as we are considering it, embraces only the internal workings of the company. No attempt is made to consider the phases having to do with corporate financing such as stocks, bonds, loans, etc. However, the importance of internal finance, the establishment of adequate cost and accounting procedures, methods and controls, cannot be over-stressed as a major function both to assure the sound continuing operation of the business and also as a better

guarantee of favourable consideration by investors, banks and loaning agencies in corporate financing.

4.2.2.1 General Accounting

Business methods are included with accounting methods in this review because of the close inter-relationship of the two. Frequently, where there is a special organization set up on Business methods it is a part of the General Accounting structure because this financial group serve as the “watch dog” guarding the company’s financial position. It is through the establishment of Standard Practices which are defined and implemented through Business Methods, that the functioning of all phases of Accounting and Cost are made effective.

Earlier in the discussion of “Policies” it was pointed out that the decision as to basic policies, such as the general accounting and cost policies were made at top management levels. However, as should be true of any specialized field, these policy decisions must be based on the sound experience, background and advice of experts in the fields of Accounting and Costs. It is not enough to depend only on the views and opinions of men with practical experience who do not have the fundamental knowledge of accounting and cost that comes from specialized training.

Accounting, of which costs is a special branch, is not a productive function in the usually accepted use of the word. It does not directly add anything to the value of the product. Neither does it contribute to product quality. It is not unusual, therefore, to find management people who look upon accounting as a troublesome evil whose usefulness is questionable. Usually such views are evidence of two things.

The first is a lack of understanding on the part of such management people of how accounting can help them in the efficient operation and control of their job. The second is the failure on the part of accounting to do a complete job, which includes the provision of data and analyses which are of practical use for operations and control.

Most of the phases of General Accounting are recognized by management, and it should not be necessary to discuss them here in detail. But as a review for the purpose of checking and verifying the conditions in your own company we will briefly outline the basic functions of General Accounting.

- a. The orderly and systematic collection and recording of all expense data of the business and receipts from the business.
- b. The allocation of expense into proper accounts in accordance with the nature of the expenditure and the phase of the business where the expense occurs.
- c. The evaluation of general company overhead expense (excluding factory overhead which is included in cost) in order to determine and establish the selling price of the product.

- d. The determination of profit or loss.
- e. The provision of reports and analyses for comparative purpose to all management levels.
- f. The provision of reports and analyses for external agencies and stockholders.

4.2.2.2 Cost Accounting

Cost Accounting is the process of determining the detail cost components which make up the total cost of the product. To be fully effective and accomplish the necessary objectives of analysis and control, cost data are accumulated in such a manner that not only can a proper selling price be determined by the General Accounting Group, but also the cost of any phase or particular operation can be determined. This allows comparison of the cost of the various ways of doing an operation and permits analyses for the purpose of locating the *source* of inefficiencies.

From a practical industrial standpoint it must be recognized that while cost accounting is normally considered a part of the accounting function, costs and the understanding of the basic principles used by the accounting organization are also part of the responsibility of every management employee from the Foreman to the President. But recognition of this is not enough. If you are ever going to have an efficient company in the modern concept of the word your people must know how to adequately discharge this responsibility.

Beyond this, it is a management responsibility to achieve results which will protect and advance the position of the employees. Any company management which fails to do this is a bad risk for the employee too because the security and stability of his job is endangered.

In determining the cost of a product there are three methods of approach which are commonly used. These are:

a. The Historical

The simplest method of determining the cost of a product in a going concern is from records of the actual cost over past periods. This is the historical method. Under this system information may be taken from regular accounting records with little additional expenses and statements are usually prepared in comparative form which shows the current cost against the cost in previous periods. Where such a method is adequately used, that is where it is in sufficient detail that each management employee can measure his own job performance, cost data use some unit of measurement such as the cost per unit of production, cost per hour of labor, and cost per machine hour. This places all factories and factory departments on a comparable basis. But usually such data is provided so long after the fact that correction of unsatisfactory conditions is delayed with resulting further losses, or else nothing is done.

This historical method has several other disadvantages. Costs are not established or measured on the basis of best-known possible performance. Generally, also they do not provide any sound or adequate basis for delegating authority, responsibility or accountability for cost results. Often coverage of expense in sufficient detail is limited to productive operations which results in little control of non-productive functions. Lack of a sound basis for evaluating expense necessitates approval at high levels before any expenditure can be made.

In general it may be stated that the historical basis for costs and cost accounting is most effective only in small companies whose operations are simple, and where control is assured through the ability and experience of individual executives.

b. The Predetermined Cost

The cost of a product may be estimated in advance (or predetermined) on the basis of past experience in producing products of similar natures; engineering estimates taking into account the material, labor, overheads, etc., which will be required to produce the product.

In our previous discussion of Engineering, we indicated an engineering responsibility for providing the accounting organization with data for the purpose of establishing cost estimates on new products. Such estimates could be referred to as predetermined costs.

This procedure involves a comprehensive analysis of what needs to be done, and presumes a careful analysis and study of what is presently being done. The aim, as implied in our review of engineering is to adequately study the factors of quality and safety as well as cost.

Estimated, or predetermined costs are chiefly applicable in companies where production orders are based on sales orders or forecasts previously obtained. They are much more satisfactory for operation and control than the historical cost.

c. The Standard Cost

The simplest method of determining the cost of a product in a going concern is from records of the actual cost over past periods.

One of the Engineering functions we referred to was Time and Motion Study. This function coupled with the other phases of engineering, plus the establishment of an efficient planned company organization structure make possible the establishment of a basis or standard cost. In other words, the product cost is established as a cost which should be obtained “under a given or assumed set of operating conditions and volume of output”. This cost is not an ideal cost, but is one which *could be reached* if the company were operated with the highest practical degree of efficiency.

Such a standard cost requires that a standard or goal be set for plant operations, for volume output, for raw material and process quality and cost, for minimum material usage and

waste, for labor efficiency and cost, and for each element of overhead expense. Standard cost is a basic standard of measurement of efficiency.

Standard cost requires basic analysis of every phase of operations, including manpower, wage and salary structures, the organization structure, materials procurement and control, manufacturing process control, expense control, and also what is needed and how to most efficiently apply sales, clerical, staff and supervisory effort.

It is recognized that in most Japanese companies the accomplishment of the objective of a standard cost structure must be long range. However, it is not too soon to begin the analysis and study of your present systems, and the preparation and institution of a program aimed at progressive development of more comprehensive and adequate cost systems. We believe that in the case of most companies, the objective of a standard cost system is most desirable.

Time will not be devoted here to the detail analysis of the functions listed under cost accounting because these are self evident.

4.2.2.3 Budget Control

Budgeting is a system of preplanning all operations of the company in advance, and for committing the various departments or phases of the business in advance to a well considered performance estimate. Budget control is obtained through the comparison of this performance forecast against actual performance. This provides the means for checking results, disclosing inefficiency, waste, and excessive costs and making corrections before it is too late.

Usually budget forecasts are based on an estimated production program for the succeeding year. This program is established on the basis of sales forecasts and known business. Budget forecasts must take into account the detail program planned by every department or phase of the company, and these programs must be integrated, coordinated, and approved by the top management of the company. Such forecasts are of little value if they are padded to take care of inefficiencies and unforeseen contingencies. They should reflect the improvement that can be made by each management man in his own job performance. Ordinarily budget forecasts are scrutinized and questioned at each management level to make sure that careful thought and consideration has been given to improved performance.

Budget forecasts are subject to scrutiny and analyses not only by progressively higher levels of the line organization but also by the accounting organization and if a separate Budget Control organization is established final scrutiny is made by this organization.

Such annual budget forecasts are periodically reviewed, usually every three months, and adjusted for changes in program forecast. At such time revisions may also be made as a result of actual performance. However, for proper control, it is important to remember that an increase in budget estimates (beyond that justified by program changes) must be proven necessary and unavoidable. Each organization is fully accountable for living up to its budget forecast.

Budgets and budget control provide an effective means by which top management can delegate responsibility and authority without any sacrifice in overall control. Top management first satisfy themselves as to the reasonableness and soundness of budget forecasts and preplanned objectives. They assure themselves of the requisite conditions and the soundness of estimated expenditures for such items as payroll, salary increases, repairs, new facilities, advertising, manufacturing service costs, overhead sales, etc.

After doing this, top management can delegate the final review and approval of individual items and expenditures to lower levels *within the blanket authorization of the overall budget estimates*. Control is maintained by observing performance against budget objectives.

The person responsible for each budget figure establishes his own objectives and criteria of performance, cost, etc., and follows up with actual performance comparison to see why he failed to meet his objectives. Then he takes immediate steps to correct the weakness.

The person responsible for each budget also makes a careful check of actual results against budget forecasts and holds the person furnishing the estimate accountable for accomplishment of objectives.

Budget control is not a function of a single management level, or individual management employee but is the responsibility, within the field of his own job, of every management employee from Foreman to President.

4.2.2.4 Cost Control

Cost control is closely related to Budget control. The name cost control is self explanatory to the extent that it is in simple terms the control of costs. However, the extent to which cost control can be applied is dependent upon the extent to which sound costs are established. This goes back to which of the three basic methods are used in establishing costs. It is further dependent on the degree to which analysis is made of each function of the company in order to determine whether a better, more efficient and cheaper means can be found of achieving objectives. This applies not only to the productive operations of manufacture but also to every item of material and overhead expense.

Expected cost, which should be the immediate target of all phases of the business, is one of the yardsticks of company performance. Budget forecasts should always be aimed at meeting these expected costs.

It can be seen that if these expected costs are not based on anything other than past performance, and if every management individual and organization is not constantly on the alert to find ways of reducing costs, the establishment of budget will not provide objectives which will stimulate real effort at improvement.

If any individual or organization does not set goals that are better than he thinks he can reach without strenuous effort there will be no progress. This applies to every phase of the business enterprise.

4.2.2.5 Auditing

Auditing as we consider it here applies only to the internal company organization. Many concerns hire an impartial outside auditing concern to make an annual audit and certify to the correctness and accuracy of company reports on finances, operations, etc. Such outside audits are a guarantee to the investors, stockholders, and financing agencies as well as the Government of the validity of the company management statements.

However, within the company, it is important as a part of industrial control to have an impartial agency verify the accuracy of information and the observance of standards, methods, and records. These are the functions of auditing.

To completely accomplish these functions it is necessary to go beyond the mere verification of accounting and cost records. Such verification merely assures the accuracy of bookkeeping. Auditing should also include sampling checks on the data and records underlying the bookkeeping. Such things, for example, as the accuracy and validity of timekeeping; the proper classification of charges and expenses; the observance or violation of defined methods and practices such as approvals for expenditures, withdrawal of materials, methods of record keeping, etc.; verification of the accuracy of inventory and stock records; determination of the proper usage of materials and accounting for disposition of scrap and defectives. These are representative examples.

It may be stated, in summation, that auditing is one of the important means of control applied by company management to assure that it does not become careless in the observance of its own rules, regulations and practices.

4.2.3 Manufacturing

While the functions that comprise the manufacturing phase of the business enterprise are reasonably clear as we discussed them in connection with Data Sheet # II – 4.3, it is well to review them in order to assure that we are applying the scientific approach in our construction of a sound and logical organization plan in the next phase of this educational program. With this in view we will briefly review each function.

4.2.3.1. Production Planning and Scheduling

This function involves the translation of customer orders or of production programs, where these are the basis for manufacture, into an integrated plan for manufacture. It takes into account the availability of personnel and manufacturing capacity (present work load), normal manufacturing interval, materials and supplies on hand, procurement intervals required for delivery of additional

materials, and the specific time when new facilities, such as machines, tools, manufacturing information and personnel will be available.

4.2.3.2. Production Orders

On the basis of information developed in planning and scheduling, production orders are placed on the shop indicating the quantity, delivery date, and other information, and materials orders including complete ordering information, specifications, quantity and required delivery date are placed on supplies through the purchasing organization.

4.2.3.3. Production Expediting

This function is a management tool to insure meeting production schedules objectives and promised delivery dates. Normally this function includes the assurance that materials are available; that there are no delays due to lack of information, facilities and tools; that the manufacturing organization adheres to the production schedule; that deliveries of finished products are made on time.

4.2.3.4. Production Records and Reports

Such records and reports provide historical data on performance; furnish information for accounting, programming and sales; serve as a guide to management for operation and control.

4.2.3.5. Materials

a. Receiving

This function goes beyond the physical acceptance and handling of incoming materials. It includes also verification of receipt of quantity in accordance with purchase orders (a copy of which is furnished by the purchasing organization when the order is placed); notification to purchasing, production expediting, and inspection organizations of receipt of material; responsibility and accountability for custody of the material until delivered to inspection or storerooms.

b. Storing

This function may be called custody of materials. It involves the handling, storage, and protection of materials from the time they are delivered from the receiving department and verified as to description and quality by purchased materials inspection until they are required for use in production. Materials storage necessitates the proper segregation and identification of materials, and assurance of adequate physical protection from damage as well as prevention of unauthorized withdrawal and use.

c. Distribution

Distribution involves the withdrawal of material (only on authority of properly approved withdrawal tickets) from storage and delivery to the designated department or unit. It also involves the obtaining of the signature of authorized personnel for receipt of the material. This is an important control function.

d. Inventory and Control

Materials inventory is an essential for proper control. It serves the dual purpose of keeping production scheduling, ordering and expediting units fully informed at all times of the physical availability for use, and serves as a means of verification by accounting units for investment control, material usage, and cost control.

e. Scrap Recovery and Disposition

These functions are an important means of reducing unnecessary losses by proper selection for reuse and repair of useable items.

Further, this operation can be used as a check on the job being done by manufacturing and inspection units to assure that good product is not being wasted and also as a source of information for correction of operations or processes that are causing excessive scrap or defective product.

4.2.3.6. Manufacturing Operations

The functions of operations are self evident. However, it must be remembered that proper execution of these functions is dependent upon the provision of “management tools” — methods, instructions, defined responsibility and authority, control methods and information, etc. — as well as the provision of the physical facilities for actual performance of manufacturing operations.

4.2.3.7. Inspection

Inspection has been listed as a part of manufacturing. This has been done because of the *physical* relationship of the function to manufacturing operations. However, it is not the intent to indicate that this function is or should be a subordinate phase of manufacture from the standpoint of organization structure and control. This question will be discussed at length later in the course.

a. Purchased Materials

This function embraces a variety of responsibilities. The first is the verification of the quality of incoming materials, purchased items and parts and sub-contracted components. Payment for materials should not be made until approval has been given by P. M. inspection on the quality of the shipment. Received materials should not be released for

delivery to processing units until approved by P. M. inspection. Questions as to usability of materials which are outside limits must be handled by P. M. inspection. These involve reference to engineering and manufacturing organizations and occasionally to customers. Questions as to quality provided by the suppliers must be referred through purchasing to the supplier. Rejection and return of unsatisfactory material, including the furnishing of information to interested organizations such as production ordering, purchasing, accounting, and shipping are also P. M. inspection functions.

b. Process

This phase of inspection, as the name implies, involves the verification of quality of parts and components in the various stages of manufacture. Process inspection is one of the motor sources of control information from which can be determined whether defects are caused by workers, process operation (machines, tools methods) or by design weakness. Process inspection assures a minimum of defective parts being assembled into finished product with accompanying waste of labor, material and productivity.

c. Final

Final inspection has as its primary responsibility the assurance of satisfactory quality being delivered to the customer. Results obtained by final inspection govern whether the product is delivered, rejected and returned to the manufacturing unit for readjustment or repair, or scrapped. Data accumulated in final inspection are a major source of information for analysis of worker quality, process quality, and design weaknesses.

4.2.3.8. Quality Control

This function, like inspection, is listed under manufacturing only because of physical relationship. There is no intent to indicate that this is or should be a subordinate manufacturing function. Mention of the function is made at this point only because of its importance as a phase of scientific management. It will be discussed in detail later in the course.

4.2.3.9. Purchasing

This function includes the buying of all materials, supplies, sub-contracted components, and facilities. It involves responsibility for obtaining the best possible price *consistent with quality*, location of new and better sources of supply, negotiation of purchasing contracts (subject to authority delegated), negotiations on unsatisfactory materials received, price discounts, etc.

The remaining functions, which are listed on Data Sheet # II – 4.3 are self explanatory.

Note: Review these with the group to determine whether there are any questions.

From our previous discussions of the functions of Engineering and Finance it is obvious that while manufacturing might be termed as an “Operations” function, there is close inter-relation

with other major company functions. This will be further evidenced in consideration of Marketing and Industrial Relations. Responsibility and accountability for operations are dependent upon the provision of information, instructions, methods, standards and facilities by other groups. Responsibility devolves on manufacturing to provide information (budget estimates, performance data, etc.) to other organizations. Cooperation and coordination are required on questions pertaining to Engineering, Finance, Marketing and Industrial Relations as they affect manufacturing.

4.2.4 Marketing

We have previously discussed some phases of the marketing functions, Figure 113 in the section on policy is an example of the application of market surveys and advertising in the development of new markets. Also in our review of Engineering we covered another function, Sales Engineering, which is vital to marketing.

At one time it was probably safe for most companies to depend to a considerable extent on so-called “contacts” and friendly customers. These provided a steady marketing under these conditions and was a relatively simple matter.

But in the past as at present the companies that had well organized aggressive sales forces, who established a reputation for good customer service, and who were able to build up a reputation for quality products maintained the lead.

Changes in economic conditions require even more emphasis on the efficiency of the sales organization both from the standpoint of sales effort and of economical organization and operation. But in addition marketing requires more effort in the fields of surveys and engineering to develop new products and expand the product line into wider market applications.

We have already mentioned the importance of building and maintaining a reputation for product quality. Equally important is to establish prices on a sound competitive basis, and this will in part depend on keeping marketing expense at a minimum.

The programs of any company for production and correlated activities are dependent upon the soundness of sales forecasts. These are developed by the marketing organization and to be sound must be based not only on known and potential orders, but also on adequate market surveys and good sales objectives. It is not enough to set objectives which are based solely on past experience.

Lack of adequate information and study of the market, failure to take into account obvious changes in economic conditions and the use of “guess work” can place in jeopardy the financial and future competitive position of any company. Further, the lack of market study, market development, customer service *and* aggressive salesmanship can retard a company’s progress and also frequently jeopardize its competitive position.

An important part of the marketing function is continuous and careful evaluation of the effectiveness and results of every phase of the job. Following are some questions to ask yourselves.

1. Is advertising getting results commensurate with expenditures?
2. Does each salesman have an adequate sales objective?
3. Is each salesman accomplishing the greatest possible sales with a minimum of expense?
4. Is customer service getting results?
5. Do market surveys accomplish results?
6. Is product distribution efficiently planned or do you have delayed delivery in some areas and excessive stocks in others?
7. Are sales forecasts based on sound data and analysis, or are they just someone's guess?
8. Is engineering being applied to sales and market problems?
9. Is the marketing organization well integrated and operating on a sound budget?
10. Do you know what it is costing you to sell each product?

You must not only ask yourselves these and similar questions but you will have to see that satisfactory answers are found to make satisfactory progress in the modern competitive business world.

4.2.5 Industrial Relations

In our preliminary review of this function we pointed out that the selection of this title was an arbitrary one. But again, regardless of the title you may use, there are certain functions which are essential and which are logically grouped in this general branch of business activity.

At top management level you will recall that one responsibility is the establishment of basic and general policies. Those which must be considered in the field of industrial relations pertain to all phases of labor and employee relationships.

In reviewing the detail functions let us keep in mind that *any specific methods, standards and procedures* that are developed to apply basic and general policies *are dependent* on the *soundness and breadth of vision reflected in these basic and general policies*.

In our discussion of industrial relations there is no intent to discuss either favorably or unfavorably any of the basic concepts of labor unions or management. Rather, we are considering the things which, from the standpoint of sound industrial management, are essential considerations in scientific management planning.

4.2.5.1 Labor Relations

a. Labor Contracts

This includes the study of labor laws; analysis of past union negotiation problems; study and analysis of present labor contracts of your own and other companies; obtaining the advice, criticism and recommendations of all branches and levels of management; protection of management prerogatives in the writing of new contracts. It also requires careful consideration of the position of the worker to assure adequate worker recognition and protection in the preparation of such contracts.

b. Labor Negotiations

Such negotiations by labor relations groups may be handled in one of two ways. The first is to refer all labor questions, grievances, complaints, and recommendations to this group. In this case the line organization has no authority to discuss or take action on any labor question without at least the advice and recommendation of the labor relations organization.

The second method is to consider only problems of collective bargaining as the fundamental responsibility of the labor relations group. Collective bargaining in this case may be defined as labor problems regarding working conditions, job grading, employment, upgrading, downgrading, layoff and dismissal, wages, and other questions which affect either groups of employees or the entire employee body. Also included in this category would be contract negotiations.

You will note that for our discussion we make a distinction between grievances of individual workers and collective bargaining. What is this difference? Grievances of an individual are the result of dissatisfaction of one person with his treatment, wages, working conditions, or some other disturbing factor which applies only to this individual worker. It does not affect either a group of employees or the entire employee body. Collective bargaining on the other hand is not concerned with the grievance of an individual. Only when the dissatisfaction applies to either a group or the entire employee body is the term collective bargaining used.

Problems affecting individual workers on any subject are handled progressively by line supervision as grievances. Only when it is impossible for line supervision to reach a satisfactory conclusion on such problems are these referred to the labor relations organization.

It should be noted that the first method probably assures the consistent application of policies with less difficulty than the second method because all negotiations are made by an impartial group. However, such a procedure weakens the prestige of line supervisors, and relieves them of responsibility. It is generally true that if a supervisor is responsible and accountable for relations with his subordinates he will do a better job and keep in closer touch with actual conditions than if he knows that someone else is going to straighten out any difficulties resulting from lack of consideration, leadership, or fair treatment.

Regardless of the method that is used, sound labor relations are possible only when policies, procedures and methods are clearly defined and understood, and consistently followed.

4.2.5.2 Public Relations

This is the function which relates to company external relationship with the general public, the industry, and government. Its purpose is to insure the sound presentation of its position and actions.

Public relations aims at giving facts about the business and business management to anyone who has a right to know them. As with an individual, the character of a business may be said to be what the business actually is; its reputation is what people believe it to be. If people are to formulate sound opinions they must know the facts.

Therefore, sound public relations must begin with honest, sound policies which are properly administered. If the internal situation is not sound, if you do not have and administer good policies, no amount of publicity will hide or cover up this failing, and the company's reputation will suffer because it actually has a bad character.

One fundamental for sound public relations is to have informed and satisfied company personnel. Then everyone from the janitor to the president is an enthusiastic booster.

Company policies and activities should always take into consideration the point of view of public reaction. Announcements, speeches by officers and others, company contributions to civic and welfare activities, participation by company members in such activities, and similar things should be reviewed and considered by public relations from the standpoint of their favorable or unfavorable effect on the public.

Relations with other companies in industry through the medium of associations, such as the FJECIA, and active participation in association activities is an important aspect of public relations. Further, the associations through their public relations can do much to add to good public opinion.

4.2.5.3 Personnel Relations

a. Employment

In most companies, with the exception of very small concerns, employment is the function of a specialized group. Usually the actual hiring is only a part of this function. This is because of the many considerations involved in dealing with personnel under present conditions.

Where company managements do not take the initiative in establishing sound policies with relation to conditions of hiring, layoff, dismissal, rehiring, etc., these are frequently forced by the insistence that such policies with accompanying standard methods be incorporated in union contracts.

Therefore employment of new employees cannot usually be done if previous employees who were laid off because of lack of work are available. Further, employee layoffs are subject to question and protest unless these take into account company service or seniority.

Usually, discharge or dismissal also necessitates verification of cause. This is one of the features of protection for employees which managements of forward-looking companies have recognized as desirable, and which have been forced in other cases by union demand.

It is becoming increasingly difficult for management employees to take final action on any question relating to employment, and at the same time it is more important to be able to substantiate any action recommended or taken.

As a result, the employment function necessitates the maintenance of adequate records on employees, both active and those no longer with the company. Further, requests for additional personnel usually clear through the employment section to assure that surplus employees are not available for transfer who would otherwise be laid off. Usually also, this group verifies the recommended action of management in both layoffs and dismissal or discharge.

b. Placement

The evolution of placement as a function has paralleled the development of employment for similar reasons. As the guardian of employee interests the unions take an active interest in any employee promotions, demotions, and transfers. And in concerns where far-sighted policies for the fair and impartial treatment of employees have not been developed, these are demanded by the employees, through the unions.

Here again, it is developing more and more upon management to insure that action taken is supported by sound reasons and that these reasons be capable of verification. Frequently, this placement function also includes the study of employee skills and abilities

with a view to locating the work for which the employee is best fitted. This phase of placement is now generally recognized as of great value to the company as well as to the employee.

c. Training

Training may be said to resolve itself into three phases. These might be called:

- (1) Worker training
- (2) Supervisory or lower management training
- (3) Executive or upper management education

These three phases of training may be further classified as “on-the-job” and “off-the-job”. Progressive companies recognize that, for efficient company operation, training of all employees is essential; and that training is one of the major responsibilities and duties of all levels of management. Obviously the training of any employee is not possible unless his job is known, defined and capable of performance through provision of the proper facilities and tools. From a training standpoint the “management tools” we have talked about before are just as essential for supervision as the physical tools are for the worker.

“On-the-job” training is training which is given right on the job during working hours. This is the kind of training which is associated with job function and activities where the actual job surroundings and conditions are necessary and beneficial.

“Off-the-job” training is training where the student or trainee is removed from job surroundings and associations. It is important where the nature of the program makes it important to divorce the trainee from the interruptions, problems, and division of attention between the training course and the job that would interfere with learning.

Do not confuse “off-the-job” training with educational programs that are offered by the company on a voluntary basis and where the employee attends on his own time without pay. “Off-the-job” training is not voluntary but is required by the company, and whether the course is given during regular working hours or after hours the employee should be paid for his time. The industrial management course you are taking is a good example of “off-the-job” training.

In companies that capitalize on the benefits to be obtained from training, it is usually a function of the personnel relations organization to establish recommended programs on a company wide basis, keep in touch with developments in the industrial training field, and follow or give courses. An important responsibility is the follow-up to determine the effectiveness of such training. In the United States we make this statement: “If the student has not learned, the instructor has not taught”.

d. Employees Service

This function is so well recognized and understood that little discussion should be necessary. However, it is well to remember that the administration of the various phase: health, welfare, recreation, will govern to a considerable extent the morale and well being of both the employees and the company.

e. Safety

The extent to which workers in any company are “safety conscious” can be measured directly by the extent to which the management of the company is interested in safety. We stated earlier that safety should begin with design of the product and continue through to and include the effort of the worker.

In the United States, safety it is considered of such importance that a National Safety Council has been established. This council, whose industrial membership comprises the great majority of American industrial concerns, has as its objective the study and promulgation of safety practices and safety consciousness. It plans and executives programs on a nationwide basis through the medium of its membership. One of the major activities of this organization of and the safety groups in each company is the “Safety Education” of every individual.

f. Job Rating

The determination of the importance of any job in relation to other jobs in the company is possible only through job rating. And only through such rating can the fundamental concept of free enterprise be realized. This concept may be called the right of every individual to be measured, compensated, and advanced on the basis of ability and performance.

Where job rating is not used, it is recognized, of course, that different jobs require various degrees of knowledge, experience, skill and ability. However, there is no sound measure of the relative value to the individual or the company of these factors. As a result, there can be and usually are wide differences in the recognition and treatment of employees doing work of a similar nature even in the same company and sometimes in the same organization unit.

Job rating involves the establishment of a unit with special knowledge and training. The functions of such a unit are:

(1) Analysis

This involves the preparation of a detail description of the job. It may be done by the employee (with proper supervisory verification), by the supervisor or by the job Analyst. Where employment and organizational policies have been well established

such job information will already be available. As a matter of policy, job descriptions are usually reviewed with the employee before final approval by the responsible (delegated) supervisor.

There are two generally recognized methods of analysis and evaluation. The first is called the Ranking Method and the second is called the Point Method.

The first method is at best only approximate. It depends on comparison between jobs and the ranking of jobs by such comparison. Obviously, there can be wide differences of opinion between organizations and individuals because of the emphasis that is placed on a particular factor by an individual as a result of personal opinion. This is far from the scientific approach and results not only in disagreement between various organizations but also individual grievances which can be and are exploited by wide awake unions.

The second method is much less subject to individual opinion and is more sound in its fundamental approach.

Job analysis by the ranking method usually takes into consideration factors such as the following:

- Volume of work
- Difficulty of work
- Monotony of work
- Responsibility involved
- Supervision required
- Knowledge and experience required
- Working conditions

Job analysis and rating by the Point method evaluate factors both as to characteristic and degree. As an example, Data Sheet # II – 4.7 details the point system used by the National Electrical Manufacturers Association.

(2) Specifications

Following job analysis and evaluation, specifications must be prepared which show the final job description and job rating. Usually such specifications define the education, experience, and background required, indicate the type of physical characteristics required, nature of the actual job, etc.

(3) Wage Rates

In Japan this phase of job rating presents a serious problem. The fundamental concept of job evaluation presupposes compensation commensurate with the job level. This is contrary to Japanese tradition and present practice.

Here again, the decision will have to be made by you as to whether you can continue to follow tradition and pay employees on the old basis, or whether sound competitive company operation will necessitate the payment of people in accordance with their true worth to the company for the job performed.

In a competitive economy, wages are based on supply and demand as well as on cost of living, although this is an important factor. Further, however, people who have had good professional training such as technical engineers and accounting experts are recognized as contributing much more to the business than people who lack the basic understanding and use of scientific principles. The pay of such people is higher in recognition of their training and their contribution to the welfare of the business.

g. Organizational Control

This function will be discussed in more detail under the section on Controls. However, at this point it is important to recognize that organization structure as planned and defined by management policy and standards works to the extent that it is analyzed, checked, and reviewed for effectiveness, efficiency, and possible improvement. These are functions of organization control.

4.2.6 Secretary and Treasurer

When these are officers of the company then functions are clear from Data Sheet # II – 4.6. However, from a structural standpoint the allocation of duties will be dependent upon analysis of the needs of the business as well as the stipulated setup of company officials in the by-laws.

4.2.7 Conclusions — Construction of an Organization

The following section of the course involves practical analysis of organization structure and the application of structural principles. It should be recognized in approaching this phase of our work that it is essential to define jobs both as to content and also as to responsibility and authority. Further, to insure an efficient structure these jobs must fit together for inter-relation, coordination and cooperation without overlapping and duplication of effort.

It is important to remember the factors that must be considered in establishing organizational structure and that the progressive steps in reaching the objective of a most efficient company should be taken logically and progressively as these steps can be justified.

5. Analysis of Existing Companies

We have completed our study of the underlying principles that form the basis for the establishment of policies and the foundation upon which is built company organization. Now let us apply those principles in the analysis of some typical actual companies.

a. A Japanese Company

There (Fig. 250) is an organization chart of a certain company here in Japan. It is in the communications manufacturing business and is of a middle size. About seven thousand people are employed here in the head office, eight branch offices and about eighteen factories which are grouped into six manufacturing departments.

The chart shows the head office group and the detailed organization of one of the manufacturing departments.

To make our discussion of this organization really complete we should also have here the organization record or the manual, which interprets and explains each of the positions and functions, which are represented here.

But, unfortunately, such a record does not exist. Or rather, I should say that the company does have some sheets of paper upon which are written some vague and inconclusive statements generally concerning this chart. But, because they are so unsatisfactory compared to what they should be, it is just as well to say that there is no organization record.

Later on in this discussion I will give you an example of what sort of things are included in a company manual. But let us go ahead now with the analysis and assume that the scope of each part of the organization includes the functions normally associated with the title of each group. During the analysis of this company, let us make a list of all the criticisms we make and the first item on our list will then be the lack of an adequate organization record.

The organization chart is merely a picture, which shows the component parts, which make up the total company structure and also the authoritative relationships of the various parts of the company structure. But this is not sufficient in and of itself.

It is highly desirable, and in fact necessary, to finalize the chart with written statements that prescribe the full authority and responsibility of each executive head. This would remove all doubts in debatable fields of activities as to which individual is responsible for what function.

The absence of such a written record in this company is a course of irritation and dispute and also inaction. There is an attitude here of "Let the other fellow do it since nobody has said that this is my job". As a result of this attitude, nobody does the job and the job never gets done. Can you see too that this situation leads to poor employee morale?

The specifying of duties of the executive heads has the added advantage of making the organizer think out his plan of organization with the same care and thoughtfulness that a designing engineer would apply to the development of a piece of machinery. This point has been missed by the man who constructed this organization. We will see this more clearly as we go along.

Let us now inspect the form of the organization. It is essentially a line organization. This type of structure grew out of the military system where discipline and vertical lines of direction and instructions were required. Incidentally, there is almost no army in the world nowadays which still uses this form of organization.

The lines of authority and instructions here run directly from the president through the manager to the workers, and all the persons who are on the same authoritative level are quite independent of others in a similar situation. Thus there are separate channels reaching down from the president into each particular phase of the business.

The proportion of both mental and manual work is the same for all men on the same level. What separation of mental and manual work as does exist comes from those in the higher positions of authority, keeping for themselves only the mental work of administration and the delegation of additional duties to those in subordinate positions. The division of mental and manual work here then is incidental rather than a result of a logical study. There is an assumption made, and in actual practice it turns out to be a false one, that each man on whatever level of authority he may be is fully competent to perform the duties associated with his position, no matter how many duties he may have assigned to him and how different in nature they might be.

There is no doubt that this system has one advantage. It is possible to exercise discipline over the members of the company. It has some very serious limitations however, and for that reason this form is no longer used either in armies or in business enterprises.

This system tends to lead a few executives to the breaking point with a multiplicity of jobs of a different nature.

It tends to permit crude methods of operations since few men can do several different jobs and do each one of them well.

The instructions given to the workers in how they are to do their job are usually meager and therefore great reliance must be put on the individual skill used and the knowledge of the workmen. Where there are experienced workmen this problem may not be so acute, except that there is no standardization of the working method and hence no control over the manufacture of the product. But where there is no worker training, as is true in most of the plants here, reliance upon the skill of a new or inexperienced worker is fatal to the quality of the product and the economic condition of the company.

Finally, this line system tends to make the success of the undertaking depend upon the ability of a very few men, or as is generally the case, upon only one man. If these indispensable men should ever have anything happen to them; should they die, be incapacitated, or otherwise be lost to the

company, the company itself would be lost. There would be no reserve strength to fall back upon.

If this were a very small company engaged in a simple business, there would be no criticism made. But that is not the situation here, so our second item in the list of comments will be in the form of the organization.

One of the things that impresses me most about this plan is the large number of subordinates reporting to any one superior. There are twenty-five organizations reporting to the president. There are six groups shown in this detailed department reporting to the manager. But in addition there are similar groups reporting here from the other five manufacturing departments and six branch offices. There are nine complex groups reporting to the chief of the Manufacturing Section. Incidentally, this company suffers badly from inadequate management control. You can see why: it is a physical impossibility for any manager to adequately supervise such a multitude of different activities as is being demanded of these management people.

A technical term is used to describe the number of subordinates, which can be successfully directed by a superior. This term is "Span of Control". When the span of control is too great, as in this case here, the direction and control of the industrial enterprise is bound to suffer from delay and procrastination, friction and bad feelings between employees, and confusion on everyone's part. What is the proper span of control? A good rule to remember here is the smaller the responsibility of a group chief the larger may be the group. And conversely, the larger the responsibility of the chief, the smaller must be the number of people reporting to him. Following this rule, at the top of the organization it is desirable to have only three groups reporting to the top executive, but in the lower echelons of the company, it is possible to have one man supervise as many as six groups.

A foreman who has only limited responsibility may adequately control ten, fifteen or twenty workers depending upon the nature of the work. But the president of the company (see Fig. 250) who has twenty-five groups reporting to him and who has to bear the full responsibility of the whole company, has not the slightest chance in the world, even if he were superhuman, of adequately supervising the work of his subordinates.

In any association of people there are three types of human relationship: direct single, direct group, and cross. Usually we measure our relationships with other people only in terms of our direct connection with each of them individually. But especially in regard to industrial relations and business management, human inter-relationships are not that simple.

Suppose we have a supervisor, A, who only has two subordinates, B and C. Obviously A can deal with B and with C, each on an individual basis. This would be a direct single relationship. On the other hand, A can deal directly with B and C together at the same time on a group basis.

The behavior of B in the presence of C is apt to be different from his behavior if he were alone with A, the supervisor; and the same way with C in the presence of B.

Moreover, the attitude of B toward C and C toward B constitutes a cross relationship which A must keep in mind in arranging the work of B and C. It is necessary for A to see that a harmonious and cooperative atmosphere exists between B and C in order to get the job done right and to serve the welfare of the company.

So, in this very simple example of the relationship of three people there are from four to six relations that are the concern of A, not only two.

		Minimum	Maximum
Direct single:	A to B, A to C	2	2
Direct group:	A to B and C	1	
	A to B with C		2
	A to C with B		
Cross:	B and C	1	
	B to C, C to B	$\frac{1}{4}$	$\frac{2}{6}$

From this discussion it can be seen that whereas direct relationships increase in proportion to the number of subordinates assigned to a supervisor, the number of group and cross relations increase very rapidly out of proportion.

Suppose

- N is the number of subordinates, and
- S is direct single relationships
- G is direct group relationships
- X is cross relationships

Then the total number of relationships with which a supervisor must deal is the sum: $S + G + X$

$$S = N$$

$$G = \frac{N}{2} (N-1)$$

$$X = (2)^n - (N + 1)$$

For the case cited in Fig. 251, S equals 25
 G equals 300
 X equals 33, 569, 974

Total number of relationships equals 33, 570, 299

Fig. 251 INCREASE OF RELATIONSHIPS WITH INCREASE OF SUBORDINATES

Number of Subordinates	1	2	3	4	5	6
Value of S	1	2	3	4	5	6
Value of G	0	1	3	6	10	15
Value of X	0	1	4	11	26	57
TOTAL	1	4	10	21	41	78

According to management theory it is possible to practically control 12 cross and 28 direct group relationships. From this it appears that what should govern the decision as to how many subordinates to put under a supervisor is not the direct single relationships that exist, but rather the group and cross relationships. This would be true for all but the most simple and routine sort of work.

Of course, the problem of how many subordinates to put under a chief is not limited to this mathematical relationship. The nature of the work to be done naturally cannot be ignored. However, this mathematical relationship should be used as a guide in the problem.

Referring again to Fig. 250, it is apparent that every rule of proper span of control is violated here. There should be little wonder then that this is a poorly managed and inadequately supervised company. So for the third item in our list of criticisms we may put down span of control.

Because of the line type of organization and the absence of prescribed duties, responsibilities and authority, there exist in this company several definite ills which may not be obvious from the organization chart but which are inherent in the company's structure.

The president must be in direct personal control of every phase of the company. But since he cannot be everywhere at once – he is, after all, only one man- while he is exercising his control over one part, he is, at the same time, neglecting another part, which also is in need of direction. In exercising this control he may be able to enforce discipline, but he is also bound to cause a great deal of resentment.

For one thing, he interferes with and infringes upon the area of responsibility of his subordinates. And when he does that, as we said in our first lecture, he automatically relieves his subordinate of that responsibility.

For another thing, assuming that the subordinate is a specialist in his own field, and this is a proper assumption to make since if it were not so why then would the subordinate be assigned to his job, is it reasonable to think that when the chief executive interferes with the lower job, he could do it any better than the specialist? If he can, then the specialist should be fired and a more competent man be put in his place. But what almost always happens is that, by his interference, the executive makes a mess of things and then the subordinate must cover up the mistakes of his

boss. Let this happen only twice or three times and the subordinate loses his respect for his chief and he becomes uncooperative and antagonistic toward his chief.

Another ill inherent in this situation is this. If the top executives reserve for themselves all the decisions that could be made at lower levels, if the people in the lower levels are not given a chance to act on their own authority, if they have no opportunity to develop their own executive abilities, they are going to lose interest in their jobs and if they don't leave the company to get better jobs, they will remain and do only mediocre work. They will have lost all their inspiration and incentive to extend their efforts to do better than just average work.

It is this extra margin of effort, which so often spells the difference between profit and loss, between a successful happy company and a dispirited, falling-apart, failure of a company.

There are a number of other factors we could talk about: the question of whether the head office exercises a strict control over, or whether it coordinates, the branch plants and sales offices; also, the question of the top executives faithfully following the lines of the established organization; and the functional inter-relationship of the various departments.

But such things as this we cannot readily see just from looking at the organization chart. I could talk about these things because I know this company. But our purpose is to make a factual analysis of what we actually see here in Fig. 250. So let us leave the top management side of the picture and now look at the structure of the manufacturing department.

First of all, we see that there are some groups here, which are duplicated in the head office. Sales offices, Tokyo office, Welfare Group, Accounting Group. Now, we do not criticize this because this may not actually be duplication of activity. The chart does not tell us and we have no organization manual to tell us. But it does look suspicious and so we reserve a question about this apparent duplication.

Secondly, in the manufacturing section we see what may be more duplication. There is a General Affairs Branch that has accounting functions, there are nineteen separate technical groups concerned about production efficiency, design, and other engineering functions besides the Efficiency Research Branch. There are eight separate inspection groups and nine separate purchasing groups. In these cases there will obviously be duplication of work and the cost of operations will be excessive because of it.

A manufacturing section should be what the name implies. It should manufacture. These other functions which we have just pointed out are activities which are necessary but which are subsidiary to manufacturing.

To include so many different activities under the chief of a manufacturing shop makes too great a demand upon that individual. He must be a supervisor of purchasing, engineering, inspection, warehousing and other activities as well as production. If we cannot find a man at higher levels who is an expert in each of these fields, what chance do we have of finding one at this lower level. The obvious result of this situation is — and it is true in this company — only an inferior

inadequate and unsatisfactory job is being done at this level. And the workers do a poor job because their work is not supervised. The supervisor has no time to supervise. He is too busy on other jobs.

Another evil in this organization is the autonomy, which is bound to occur. Each of these shops is almost a self-contained company in itself. There is no need to cooperate with other groups in the company because each one is self-sufficient. How is any manager going to get one single coordinated result out of a situation like this?

Notice too that there are nine very complex shop groups reporting to the chief of the manufacturing section. Again, this man is required to be an expert in every phase of the business. That is a job, which is too much for any man. It is too much for this man and the result is that he actually does nothing.

Let us add our criticisms of this department to our list. We mentioned duplication of departments, then there is the grouping of similar functions into a combined single unit rather than having them distributed as are inspection, purchasing, etc. here. We also talked about the unfair burden placed upon the supervisor who is expected to oversee so many different kinds of jobs. We criticized the organization plan, which would permit the existence of autonomous factory shops. And finally, we again talked about the span of control of the section head being too great and the resulting lack of coordination of the parts of his organization.

The basic fault we can find here is the obvious lack of organizational planning. This structure was made without regard to the fundamental principles of grouping similar jobs together, placing them under a competent chief, maintaining a minimum span of control, and then organizing the whole into the type of structure that could be controlled by the delegation of authority, the assignment of responsibility and the exercise of supervision.

b. Large U.S. Company

Let us now consider an American company where if there were no executive control exercised the results would be disastrous. Fig. 252 is an organization chart of the top management structure of the General Motors Corporation.

At the very outset let me say that I do *not* recommend this type of organization for your own purposes. The General Motors Company is one of the largest and most complex corporations in the world. My purpose in bringing this chart to your attention is merely to show you a picture of one type of top management organization. We will discuss it briefly and see if we can determine the elements of organization, which are vital to any enterprise, large or small.

As you know, the General Motors Corporation is mainly a manufacturer of automobiles. There are five brand names of motor cars and several lines of trucks and buses. The corporation also makes its own engines, car bodies, chassis, and parts such as spark plugs, spark coils, roller bearings and all the other gadgets that go into a motor car. But a lot of parts are also bought from outside suppliers too.

General Motors also produces electric refrigerators, radio receivers, airplane engines, bicycles, and in addition, is in the real estate and the export–import business. It also operates factories in foreign countries.

About 600,000 employees work in this company and the annual gross income is about \$1,000,000,000 (one billion dollars).

There are several thousand stockholders who own this company, the Du Pont Company being the largest single stockholder (less than 5%). There are about thirty people on the Board of Directors. Two special committees report to the Board, one on corporation finance and the other on corporation administration. These groups comprise the Administrative policy-making body.

The president comes under the authority of the Board of Directors. He manages his company through four staff organizations and three assisting groups. These latter three groups are the publicity or public relations staff, the legal staff, and a staff of assistants who advise him on technical, budget, and organizational matters.

The financial staff is divided into two parts. One conducts the business of the lending of money to prospective customers. The other handles the stock, tax, financial statistics, general payroll, auditing, bookkeeping and accounting matters of the corporation.

The operations staff coordinates the work of actual production in all the various plants and subsidiary companies in the corporation. Notice that this organization is divided into four groups, one that makes automobile accessories and household appliances, one that integrates subsidiary companies, one on export, and the fourth one coordinates the automobile and parts-making factories.

The Advisory Staff coordinates the patent, research, purchasing, real estate, and such other activities that affect the company as a whole.

The Inter-Divisional Relations Committees are used to standardize on methods and operations in the different parts of the corporation. To a certain degree, the various manufacturing divisions operate with a great deal of independence. The head of each division is almost as if he were the president of a separate company. But at the same time his work is coordinated by the corporation's staff groups and the inter-divisional relations committees. There is such a cross-relation of services and cooperativeness here, for example on research, market analysis, budgeting and finance, large quantity buying, that it is possible to streamline the separate divisional organizations, eliminate duplication of activities, and secure the advantage of minimum operating costs.

To a considerable degree these (inter-divisional relations) committees set management and operational policies. They act as a clearinghouse on ideas, filtering out unusable ideas and distilling down from many views on a subject, the one best way to proceed with the problems with which they are assigned to deal. As a consultative group they also serve to check on each

manager's method of operation, pointing out unwise or undesirable action. These committees are a method of combining the best minds of the corporation in order to develop the best talent. The committees are also used as a controlling device to pass on certain actions of the managers. Thus, money expenditures or some other functions, according to the instructions, which are established, may be referred to the group for approval.

To summarize, we find these outstanding features in this organization:

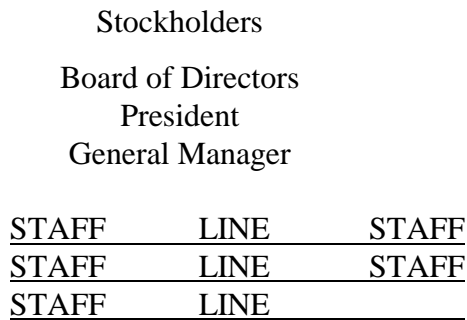
- (1) There is a Board of Directors who controls the organization for the stockholders and which is made up of a group of people of wide general experience. The Board has two specialized advisory committees to help on the two major problems of business administration and finance.
- (2) The president has only three functioning executives reporting to him, the Operations Staff acting as a committee headed by a chairman.
- (3) Each of the Staff organizations coordinates the divisions, which function within its scope.
- (4) The Inter-Divisional Relations Committees act to standardize, establish and control operation procedures as well as establish ways and means for maintaining cooperation between the various parts of the corporation.

c. Small American Company

Let us leave this large company now and consider a typical smaller sized American company (Fig. 253). The one we will investigate employs 3000 people and is engaged in the manufacture of water and gas pipes, valves, pumps and other plumbers' equipment.

The form of the organization is line and staff. That is, specialists are employed to advise the executives on problems of engineering, purchasing, production, tools, etc. These specialists cannot give orders to the workmen directly, not even within the field of their own specialty. The advice is given to the supervisor in the line organization (who would usually not possess this specialized knowledge himself) and the advice then is translated into orders, which are passed down the line through the foremen to the workers.

This type of structure looks something like this:



In a rigidly enforced line and staff organization, the staff groups would contact other lower level groups only through the central channel of command. But, in actual practice such a channelling is often found to be cumbersome. Therefore, some relaxation of the rigid form is usually allowed and parallel operations are thus permitted.

That is to say, the medical group for example, functions for the entire company, passing its advice, requirements and information directly to the lower echelon which is concerned.

The engineering department, in dealing with standards and specifications, for example, might send its instructions directly to the workshop. In this case, there is an understanding that the factory manager or some other higher executive in the line organization empowers the engineering department to act directly. The engineering instructions then become orders just the same as if the factory manager had issued them. Of course, the factory manager reserves the right to discuss, criticize, or seek a change in the instructions if he feels that such action is necessary. But, there is one very important item to note here.

The factory manager, or any other line executive, does not change the staff instructions or advice by himself. He may suggest a change, recommend it, or even demand it. But any change that is made is done by the group, which originated the original instructions or advice. People in the line organization must not arbitrarily modify the work of the staff organization without the latter's knowledge and approval. If this were to be done otherwise, the position of importance of the staff group to the entire company would be weakened and its future contributions to operation activities cheapened. The effective operation of the entire structure would be endangered.

The line people in the company must remember that the staff people are just as important to the company's welfare as they themselves are. Therefore, the proper respect and consideration must be given to the staff. The whole purpose of the line and staff type of organization is to make everyone's job easier. Specialists are employed to work on specialized problems leaving the operations people free to operate.

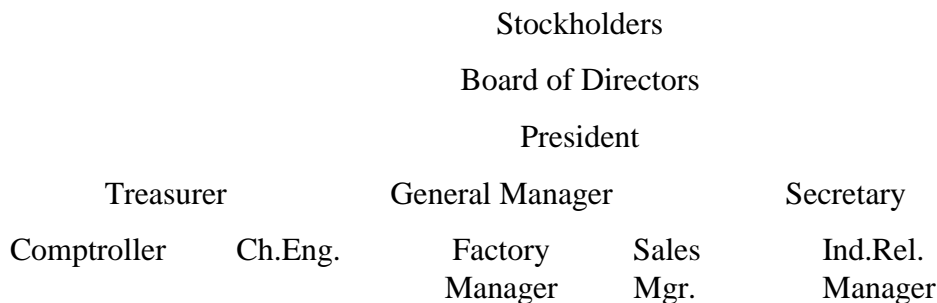
This type of structure begins to break down when this important fact is forgotten and the line people begin to do jobs, which are properly within the sphere of the specialists.

The organization chart, the organization manual, the specification of jobs, the prescribed delegation of responsibility and authority, and finally, intimate personal supervision of work – these are the devices which are used to make this type of organization work successfully.

We have discussed the general form of the line and staff structure. Now, I want you to help me draw a picture of the organization chart of the American company. Let us now take data sheets Nos. II – 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6. These sheets list the activities normally found in any company.

You will notice that each of these lists is grouped under a main heading, *i.e.* engineering, marketing, sales, and so on. These headings represent the major, inclusive functions of the enterprise. But remember this: even though some activity is listed under a major function heading, it does not necessarily follow that in our organization chart we will put that activity under the same heading. We may decide that for organizational purposes, for the sake of better supervision and control, we may (within certain limits of course) put any activity under any major function.

Let us now write the names of the major functions of the enterprise.



- Treasurer – Finance
- Secretary – Stock registry
- Comptroller – Accounting
- Chief Engineer – Engineering
- General Manager – Executive Control
- Factory Manager – Manufacturing
- Sales Manager – Sales
- Industrial Relations – Personnel

Now, taking data sheets No. II – 4.1, 4.2, 4.3, 4.4, 4.5, and 4.6, let us fit each of the activities listed there into the organization chart under the most proper heading. We will do this based on the assumption that the scope of each major function contains the activities usually associated with the name of that function. (By group discussion and participation develop the organization chart of the Lunkenheimer Company, Fig. 253.)

Now look at Fig. 253. You see that you have developed an organization, which is the same as this American company. It is not difficult to set up an adequate organization provided you base

your thinking upon sound basic principles, plan ahead for how the organization is going to work and then group the functions of the company properly under the proper head.

If this were your company that we were working on, we would now be almost half way through our organizing problem. But what we must do now is to check our organization against the Objective of the Enterprise. Does it match? Can we work toward our ultimate goal using this structure? If the answer is 'yes', then let us check the chart against our administrative policies.

Are the necessary departments established to carry out the immediate objectives of the business? Does the organization structure help or hinder operations, speed operations up and increase efficiency or delay operations causing bottlenecks and red tape barriers.

The only way we could get definite answers is to put the plan into action and watch it carefully and make such adjustments as are necessary from time to time to maintain a smoothly operating business body.

The thing that makes this organization (Fig. 253) successful is its close adherence to the ten basic principles of organization. Let us read them over together. (Reference, Fig. 254.)

Figure 255 is an organization chart for another American company. It also is line and staff. This company makes airplane parts, equipment, and accessories, radio transmitters, and radio crystals. You will notice the similarity of this company's structure to that shown in Fig. 253.

But this company is not content to draw up an organization chart and leave it at that. This company has written an organization manual, which is part and parcel with the chart. Fig. 256 is a brief copy of the manual. You will notice that every supervisor and every activity has some brief description of its roles and responsibilities.

Figure 257 is another example taken from a different organization manual, which shows how one company prescribes the duties of its departments and people. This example defines the scope, duties, functions, and responsibilities of the Comptroller and shows what functional groups comprise the Comptroller's department.

The reason I have pointed out to you these examples is to show what sort of things is included in an organization manual. You could use these samples as a guide in the writing of your own manuals.

Now for a moment, let us look at all four of the organization charts we have studied. Figures 250, 251, 252, and 255. Let's compare them. Which one would you select as the type, which would most likely succeed, in your own company?

Fig. 255 is a somewhat more simple organization than is Fig. 253. One reason for this is that the company represented by Fig. 255 is smaller than is the other company. It is possible in this case, therefore, to combine some activities under one head, whereas in the other chart that activity stands alone.

For example in Fig. 255, purchasing (procurement) comes under the Production Control Department while in Fig. 253 there is a separate Purchasing Department. The factors that will help to decide whether, in your own companies, any activity should be combined with another or whether it should be established in an independent department, are:

- (1) The relationship of the nature of the activity to the nature of the other activities in the company.
- (2) The question of an additional executive position having to be set up in the company.
- (3) The question of having the proper personnel to fit the requirements of the job.
- (4) The amount of coordination and other executive control required over the activity.
- (5) The importance of the activity as a part of the total enterprise.

In Figure 255 there is a central line organization which is made up of the Stockholders, Board of Directors, President, General Manager, Chief of Operations, Chief of Manufacturing and the operating sections of the factory. The staff organizations, Engineering, Marketing, Accounting and Personnel serve to aid, advise and guide this central command channel.

At the next lower level of authority, the staff groups, Process Engineering, Plant Engineering, Inspection and Production Control, have a similar advisory relation to the line organization.

Please do not get the idea from this that the line is any more important to the company than is the staff. It is just that this type of organization structure combines two forms that must be closely inter-related and which are completely inter-dependent.

Suppose we take a hypothetical case to show how this organization works. Let us say that the research laboratories have been working on a problem and they come up with an idea, which may be possible to turn into a saleable product. The chief engineer tells the development laboratory to get to work on the idea and come up with a model of the new product. The chief engineer, when he gets the final model, takes it to the chief of the Marketing Department to see if such a thing could be sold. A market survey is started and, finally, the results of this investigation are made known. Let us say that 50,000 of the new product can be sold if this item can be gotten on the market within ninety days in order to beat out a competitor who is planning to sell a similar product.

The decision of the president is to go ahead and the work starts. The engineering department makes final drawings, specifications, and lists of materials required. These go to the Production Control Section where the problem is analyzed and it is decided to start manufacturing in sixty days. Purchase orders for materials are written so that the materials will be in the factory before sixty days.

The engineering department's materials specifications are sent to the materials' suppliers along with the purchase order and a copy is also sent to the Inspection Department.

The Production Control Section also sends the blueprints, specifications, and other design information to the Process Engineering Section. Here the question of tools, jigs, fixtures and manufacturing processes to be used, how the work is to proceed from one operation to the next, how materials are to be handled, and all such technical problems are considered. The Engineering Department and the Manufacturing Department are called in on the discussion. One of the things that comes out of the discussion is that the factory will need some machine operators.

The chief of the Manufacturing Section writes out a draft of what the qualities and requirements for these new people should be and he sends it to the Personnel Department. There, this draft is compared with the standardized job descriptions that are on file and prospective employees are interviewed. The manufacturing chief under whom the new people will work also interviews these people and gives his recommendations on them to the Personnel Department.

The Process Engineering Department decides that in order to speed up factory operations certain machinery has to be rearranged and the Plant Engineer is called in. Incidentally, this information concerning the work, as well as all contacts between the various departments, are usually written or drawings are provided. Verbal instructions don't go.

The Process engineers work with the Engineering Department and detailed manufacturing instructions are written. Also estimates are made on labor man-hours and materials costs and these are sent to the Accounting Department.

Now the production material begins to arrive at the factory. The Purchasing group is in constant contact with the suppliers to make sure that the other materials will be delivered in time.

The Inspection Section comes up with a problem. There are two materials, which do not meet the Engineering Department's specification. The Engineering Department is contacted and it is decided that one of the materials will be accepted. The Engineering Department notifies *in writing* the Receiving, Inspection, Purchasing, Production Control and Process Engineering groups of this substitution.

The other material cannot be used and must be sent back to the supplier. The Purchasing section is notified and they go out and get the proper material.

Now the time is approaching when the factory is to start production. The Production Control section issues work orders to the Manufacturing Section according to a schedule which is designed to make the best use out of every machine in the factory. Materials are drawn out of the stockroom and the stockroom group notifies the Accounting Department of the quantity and cost of materials withdrawn. If this cost begins to approach the estimate made by the Process Engineer before the work orders are finished, the Accounting Department notifies the Operations Chief and an investigation is started to find the reason for the situation.

The Products are inspected according to the Engineering Department's specifications and any troubles that occur here are settled by agreement between the Inspection, Engineering and Manufacturing groups.

The products are shipped out according to the instructions of the Sales Department, which also follows up on how the customers react to the company's products. The Sales Department brings back to the Engineering Department the advice and suggestions of the customers for the engineers to consider in making a change in the design of the product or some other adjustment, which may be required.

This is the usual way this type of organization works. Perhaps you will say it is the same way your own company works. If it is so, then we all are very happy. We are happy because you know the secret of success of this company. This whole structure (Fig 255), and your company too, depends upon these things for its success:

1. A form of organization simplified to the irreducible minimum number of functional groups.
2. The combination of similar and directly related activities into single groups.
3. A small span of control, making possible greater management efficiency.
4. A clear definition of the scope, function, duty, inter-relation, responsibility and authority of each segment of the company.
5. A system of standard practices, procedures, controls, and supervision to make sure that the work of the organization is being properly done.
6. A coordinated and cooperating body of workers and supervisors who know what their jobs are, how to do them well, and what the sequence of jobs is so that the proper operation is performed at the proper time in the proper place using the best available methods.
7. Finally, the success of a company depends upon the planning ability of its executives. It is for this reason that management people must free themselves from petty details of work and routine functions. They must be able to devote their time to looking ahead and making plans for the future.

The devices, which are used by management to free itself from detailed operations and yet be informed of the current situation of the enterprise, are controls. These controls are the logical outgrowth of organization that, in turn, is the logical practical result of established policies. In the next section of this course, then, we will turn our attention to the various controls used by management to guide and regulate the affairs of the enterprise.