

## Unit 2 Notes : By Neha Chhabra

### Management Functions

**Management** is a universal phenomenon. It is a very popular and widely used term. All organizations - business, political, cultural or social are involved in management because it is the management which helps and directs the various efforts towards a definite purpose.

According to *Harold Koontz*, **“Management is an art of getting things done through and with the people in formally organized groups. It is an art of creating an environment in which people can perform and individuals and can co-operate towards attainment of group goals”**. According to *F.W. Taylor*, **“Management is an art of knowing what to do, when to do and see that it is done in the best and cheapest way”**.

Management is a purposive activity. It is something that directs group efforts towards the attainment of certain pre - determined goals. It is the process of working with and through others to effectively achieve the goals of the organization, by efficiently using limited resources in the changing world. Of course, these goals may vary from one enterprise to another. E.g.: For one enterprise it may be launching of new products by conducting market surveys and for other it may be profit maximization by minimizing cost

Management involves creating an internal environment: - It is the management which puts into use the various factors of production. Therefore, it is the responsibility of management to create such conditions which are conducive to maximum efforts so that people are able to perform their task efficiently and effectively. It includes ensuring availability of raw materials, determination of wages and salaries, formulation of rules & regulations etc.

Therefore, we can say that good management includes both being effective and efficient.

Being effective means doing the appropriate task, i.e, fitting the square pegs in square holes and round pegs in round holes.

Being efficient means doing the task correctly, at the least possible cost with the minimum wastage of resources.

### Nature and Characteristics of Management ( Long answer type: )

The nature of Management can be defined in detail in following categories:

1. Management as a **Process**
2. Management as an **Activity**
3. Management as a **Discipline**
4. Management as a **Group**
5. Management as a **Science**
6. Management as an **Art**
7. Management as a **Profession**

### Management as a Process

As a process, management refers to a series of inter - related functions. It is the process by which management creates, operates and directs purposive organization through systematic, coordinated and co-operated human efforts, according to George R. Terry, “Management is a distinct process consisting of planning, organizing, actuating and controlling, performed to determine and accomplish stated objective by the use of human beings and other resources”.

As a process, management consists of three aspects:

- a) **Management is a social process** - Since human factor is most important among the other factors, therefore management is concerned with developing relationship among people. It is the duty of management to make interaction between people - productive and useful for obtaining organizational goals.

- b) **Management is an integrating process** - Management undertakes the job of bringing together human physical and financial resources so as to achieve organizational purpose. Therefore, is an important function to bring harmony between various factors.
- c) **Management is a continuous process** - It is a never ending process. It is concerned with constantly identifying the problem and solving them by taking adequate steps. It is an on-going process.

### **Management as an Activity**

Like various other activities performed by human beings such as writing, playing, eating, cooking etc, management is also an activity because a manager is one who accomplishes the objectives by directing the efforts of others. According to Koontz, "Management is what a manager does". Management as an activity includes -

- a) **Informational activities** - In the functioning of business enterprise, the manager constantly has to receive and give information orally or in written. A communication link has to be maintained with subordinates as well as superiors for effective functioning of an enterprise.
- b) **Decisional activities** - Practically all types of managerial activities are based on one or the other types of decisions. Therefore, managers are continuously involved in decisions of different kinds since the decision made by one manager becomes the basis of action to be taken by other managers. (E.g. Sales Manager is deciding the media & content of advertising).
- c) **Inter-personal activities** - Management involves achieving goals through people. Therefore, managers have to interact with superiors as well as the sub-ordinates. They must maintain good relations with them. The inter-personal activities include with the sub-ordinates and taking care of the problem. (E.g. Bonuses to be given to the sub-ordinates).

### **Management as a discipline**

Management as a discipline refers to that branch of knowledge which is connected to study of principles & practices of basic administration. It specifies certain code of conduct to be followed by the manager & also various methods for managing resources efficiently.

Management as a discipline specifies certain code of conduct for managers & indicates various methods of managing an enterprise. Management is a course of study which is now formally being taught in the institutes and universities after completing a prescribed course or by obtaining degree or diploma in management, a person can get employment as a manager.

Any branch of knowledge that fulfils following two requirements is known as discipline:

1. There must be scholars & thinkers who communicate relevant knowledge through research and publications.
2. The knowledge should be formally imparted by education and training programmes.

Since management satisfies both these problems, therefore it qualifies to be a discipline. Though it is comparatively a new discipline but it is growing at a faster pace.

### **Management as a group**

Management as a group refers to all those persons who perform the task of managing an enterprise. When we say that management of ABC & Co. is good, we are referring to a group of people those who are managing. Thus as a group technically speaking, management will include all managers from chief executive to the first - line managers (lower-level managers). But in common practice management includes only top management i.e. Chief Executive, Chairman, General Manager, Board of Directors etc. In other words, those who are concerned

with making important decisions, these persons enjoy the authorities to use resources to accomplish organizational objectives & also responsibility to for their efficient utilization.

Management as a group may be looked upon in 2 different ways:

1. All managers taken together.
2. Only the top management

### **Management as a Science:**

Science is a systematic body of knowledge pertaining to a specific field of study that contains general facts which explains a phenomenon. It establishes cause and effect relationship between two or more variables and underlines the principles governing their relationship. These principles are developed through scientific method of observation and verification through testing.

Science is characterized by following main features:

1. **Universally acceptance principles** - Scientific principles represents basic truth about a particular field of enquiry. These principles may be applied in all situations, at all time & at all places. E.g. - law of gravitation which can be applied in all countries irrespective of the time.

Management also contains some fundamental principles which can be applied universally like the Principle of Unity of Command i.e. one man, one boss. This principle is applicable to all type of organization - business or non business.

2. **Experimentation & Observation** - Scientific principles are derived through scientific investigation & researching i.e. they are based on logic. E.g. the principle that earth goes round the sun has been scientifically proved.

Management principles are also based on scientific enquiry & observation and not only on the opinion of Henry Fayol. They have been developed through experiments & practical experiences of large no. of managers. E.g. it is observed that fair remuneration to personal helps in creating a satisfied work force.

3. **Cause & Effect Relationship** - Principles of science lay down cause and effect relationship between various variables. E.g. when metals are heated, they are expanded. The cause is heating & result is expansion.

The same is true for management, therefore it also establishes cause and effect relationship. E.g. lack of parity (balance) between authority & responsibility will lead to ineffectiveness. If you know the cause i.e. lack of balance, the effect can be ascertained easily i.e. in effectiveness. Similarly if workers are given bonuses, fair wages they will work hard but when not treated in fair and just manner, reduces productivity of organization.

4. **Test of Validity & Predictability** - Validity of scientific principles can be tested at any time or any number of times i.e. they stand the test of time. Each time these tests will give same result. Moreover future events can be predicted with reasonable accuracy by using scientific principles. E.g.  $H_2$  &  $O_2$  will always give  $H_2O$ .

Principles of management can also be tested for validity. E.g. principle of unity of command can be tested by comparing two persons - one having single boss and one having 2 bosses. The performance of 1st person will be better than 2nd.

It cannot be denied that management has a systematic body of knowledge but it is not as exact as that of other physical sciences like biology, physics, and chemistry etc. The main reason for the inexactness of science of management is that it deals with human beings and it

is very difficult to predict their behavior accurately. Since it is a social process, therefore it falls in the area of social sciences. It is a flexible science & that is why its theories and principles may produce different results at different times and therefore it is a behavior science. Ernest Dale has called it as a *Soft Science*.

### **Management as an Art:**

Art implies application of knowledge & skill to trying about desired results. An art may be defined as personalized application of general theoretical principles for achieving best possible results. Art has the following characters -

- a) **Practical Knowledge:** Every art requires practical knowledge therefore learning of theory is not sufficient. It is very important to know practical application of theoretical principles. E.g. to become a good painter, the person may not only be knowing different colour and brushes but different designs, dimensions, situations etc to use them appropriately. A manager can never be successful just by obtaining degree or diploma in management; he must have also know how to apply various principles in real situations by functioning in capacity of manager.
- b) **Personal Skill:** Although theoretical base may be same for every artist, but each one has his own style and approach towards his job. That is why the level of success and quality of performance differs from one person to another. E.g. there are several qualified painters but M.F. Hussain is recognized for his style. Similarly management as an art is also personalized. Every manager has his own way of managing things based on his knowledge, experience and personality, that is why some managers are known as good managers (like Aditya Birla, Rahul Bajaj) whereas others as bad.
- c) **Creativity:** Every artist has an element of creativity in line. That is why he aims at producing something that has never existed before which requires combination of intelligence & imagination. Management is also creative in nature like any other art. It combines human and non-human resources in useful way so as to achieve desired results. It tries to produce sweet music by combining chords in an efficient manner.
- d) **Perfection through practice:** Practice makes a man perfect. Every artist becomes more and more proficient through constant practice. Similarly managers learn through an art of trial and error initially but application of management principles over the years makes them perfect in the job of managing.
- e) **Goal-Oriented:** Every art is result oriented as it seeks to achieve concrete results. In the same manner, management is also directed towards accomplishment of pre-determined goals. Managers use various resources like men, money, material, machinery & methods to promote growth of an organization.

Thus, we can say that management is an art therefore it requires application of certain principles rather it is an art of highest order because it deals with moulding the attitude and behavior of people at work towards desired goals.

Over a large few decades, factors such as growing size of business unit, separation of ownership from management, growing competition etc have led to an increased demand for professionally qualified managers. The task of manager has been quite specialized. As a result of these developments the management has reached a stage where everything is to be managed professionally.

A profession may be defined as an occupation that requires specialized knowledge and intensive academic preparations to which entry is regulated by a representative body. The essentials of a profession are:

- a) **Specialized Knowledge** - A profession must have a systematic body of knowledge that can be used for development of professionals. Every professional must make deliberate efforts to acquire expertise in the principles and techniques. Similarly a

manager must have devotion and involvement to acquire expertise in the science of management.

- b) **Formal Education & Training** - There are no. of institutes and universities to impart education & training for a profession. No one can practice a profession without going through a prescribed course. Many institutes of management have been set up for imparting education and training. For example, a CA cannot audit the A/C's unless he has acquired a degree or diploma for the same but no minimum qualifications and a course of study has been prescribed for managers by law. For example, MBA may be preferred but not necessary.
- c) **Social Obligations** - Profession is a source of livelihood but professionals are primarily motivated by the desire to serve the society. Their actions are influenced by social norms and values. Similarly a manager is responsible not only to its owners but also to the society and therefore he is expected to provide quality goods at reasonable prices to the society.
- d) **Code of Conduct** - Members of a profession have to abide by a code of conduct which contains certain rules and regulations, norms of honesty, integrity and special ethics. A code of conduct is enforced by a representative association to ensure self discipline among its members. Any member violating the code of conduct can be punished and his membership can be withdrawn. The AIMA has prescribed a code of conduct for managers but it has no right to take legal action against any manager who violates it.
- e) **Representative Association** - For the regulation of profession, existence of a representative body is a must. For example, an institute of Chartered Accountants of India establishes and administers standards of competence for the auditors but the AIMA however does not have any statutory powers to regulate the activities of managers.

### **Nature and Characteristics of Management ( Short answer type: )**

Management is an activity concerned with guiding human and physical resources such that organizational goals can be achieved. Nature of management can be highlighted as: -

1. **Management is Goal-Oriented:** The success of any management activity is assessed by its achievement of the predetermined goals or objective. Management is a purposeful activity. It is a tool which helps use of human & physical resources to fulfill the pre-determined goals. For example, the goal of an enterprise is maximum consumer satisfaction by producing quality goods and at reasonable prices. This can be achieved by employing efficient persons and making better use of scarce resources.
2. **Management integrates Human, Physical and Financial Resources:** In an organization, human beings work with non-human resources like machines. Materials, financial assets, buildings etc. Management integrates human efforts to those resources. It brings harmony among the human, physical and financial resources.
3. **Management is Continuous:** Management is an ongoing process. It involves continuous handling of problems and issues. It is concerned with identifying the problem and taking appropriate steps to solve it. E.g. the target of a company is maximum production. For achieving this target various policies have to be framed but this is not the end. Marketing and Advertising is also to be done. For this policies have to be again framed. Hence this is an ongoing process.
4. **Management is all Pervasive:** Management is required in all types of organizations whether it is political, social, cultural or business because it helps and directs various efforts towards a definite purpose. Thus clubs, hospitals, political parties, colleges, hospitals, business firms all require management. When ever more than one person is engaged in working for a common goal, management is necessary. Whether it is a small business firm which may be engaged in trading or a large firm like Tata Iron & Steel, management is required everywhere irrespective of size or type of activity.

5. **Management is a Group Activity:** Management is very much less concerned with individual's efforts. It is more concerned with groups. It involves the use of group effort to achieve predetermined goal of management of ABC & Co. is good refers to a group of persons managing the enterprise.
6. **Management as both Science and Art:** Management is both an art and a science. It is considered as a science because it has an organized body of knowledge which contains certain universal truth. It is called an art because managing requires certain skills which are personal possessions of managers. Science provides the knowledge & art deals with the application of knowledge and skills. A manager to be successful in his profession must acquire the knowledge of science & the art of applying it. Therefore management is a judicious blend of science as well as an art because it proves the principles and the way these principles are applied is a matter of art. Science teaches to 'know' and art teaches to 'do'. E.g. a person cannot become a good singer unless he has knowledge about various ragas & he also applies his personal skill in the art of singing. Same way it is not sufficient for manager to first know the principles but he must also apply them in solving various managerial problems that is why, science and art are not mutually exclusive but they are complementary to each other (like tea and biscuit, bread and butter etc.). The old saying that "Manager are Born" has been rejected in favour of "Managers are Made". It has been aptly remarked that management is the oldest of art and youngest of science. To conclude, we can say that science is the root and art is the fruit.

### **Levels of Management**

The term "**Levels of Management**" refers to a line of demarcation between various managerial positions in an organization. The number of levels in management increases when the size of the business and work force increases and vice versa. The level of management determines a chain of command, the amount of authority & status enjoyed by any managerial position. The levels of management can be classified in three broad categories: -

1. **Top level / Administrative level**
2. **Middle level / Executory**
3. **Low level / Supervisory / Operative / First-line managers**

Managers at all these levels perform different functions. The role of managers at all the three levels is discussed below:



#### **1. Top Level of Management**

It consists of board of directors, chief executive or managing director. The top management is the ultimate source of authority and it manages goals and policies for an enterprise. It devotes more time on planning and coordinating functions.

The role of the top management can be summarized as follows -

- a. Top management lays down the objectives and broad policies of the enterprise.
- b. It issues necessary instructions for preparation of department budgets, procedures, schedules etc.
- c. It prepares strategic plans & policies for the enterprise.
- d. It appoints the executive for middle level i.e. departmental managers.
- e. It controls & coordinates the activities of all the departments.
- f. It is also responsible for maintaining a contact with the outside world.
- g. It provides guidance and direction.
- h. The top management is also responsible towards the shareholders for the performance of the enterprise.

## **2. Middle Level of Management**

The branch managers and departmental managers constitute middle level. They are responsible to the top management for the functioning of their department. They devote more time to organizational and directional functions. In small organization, there is only one layer of middle level of management but in big enterprises, there may be senior and junior middle level management. Their role can be emphasized as -

- a. They execute the plans of the organization in accordance with the policies and directives of the top management.
- b. They make plans for the sub-units of the organization.
- c. They participate in employment & training of lower level management.
- d. They interpret and explain policies from top level management to lower level.
- e. They are responsible for coordinating the activities within the division or department.
- f. It also sends important reports and other important data to top level management.
- g. They evaluate performance of junior managers.
- h. They are also responsible for inspiring lower level managers towards better performance.

## **3. Lower Level of Management**

Lower level is also known as supervisory / operative level of management. It consists of supervisors, foreman, section officers, superintendent etc. According to *R.C. Davis*, "Supervisory management refers to those executives whose work has to be largely with personal oversight and direction of operative employees". In other words, they are concerned with direction and controlling function of management. Their activities include -

- a. Assigning of jobs and tasks to various workers.
- b. They guide and instruct workers for day to day activities.
- c. They are responsible for the quality as well as quantity of production.
- d. They are also entrusted with the responsibility of maintaining good relation in the organization.
- e. They communicate workers problems, suggestions, and recommendatory appeals etc to the higher level and higher level goals and objectives to the workers.
- f. They help to solve the grievances of the workers.
- g. They supervise & guide the sub-ordinates.
- h. They are responsible for providing training to the workers.
- i. They arrange necessary materials, machines, tools etc for getting the things done.
- j. They prepare periodical reports about the performance of the workers.
- k. They ensure discipline in the enterprise.

- l. They motivate workers.
- m. They are the image builders of the enterprise because they are in direct contact with the workers.

### **Objectives of management**

The main objectives of management are:

1. **Getting Maximum Results with Minimum Efforts** - The main objective of management is to secure maximum outputs with minimum efforts & resources. Management is basically concerned with thinking & utilizing human, material & financial resources in such a manner that would result in best combination. This combination results in reduction of various costs.
2. **Increasing the Efficiency of factors of Production** - Through proper utilization of various factors of production, their efficiency can be increased to a great extent which can be obtained by reducing spoilage, wastages and breakage of all kinds, this in turn leads to saving of time, effort and money which is essential for the growth & prosperity of the enterprise.
3. **Maximum Prosperity for Employer & Employees** - Management ensures smooth and coordinated functioning of the enterprise. This in turn helps in providing maximum benefits to the employee in the shape of good working condition, suitable wage system, incentive plans on the one hand and higher profits to the employer on the other hand.
4. **Human betterment & Social Justice** - Management serves as a tool for the upliftment as well as betterment of the society. Through increased productivity & employment, management ensures better standards of living for the society. It provides justice through its uniform policies.

### **Importance of Management**

1. **It helps in Achieving Group Goals** - It arranges the factors of production, assembles and organizes the resources, integrates the resources in effective manner to achieve goals. It directs group efforts towards achievement of pre-determined goals. By defining objective of organization clearly there would be no wastage of time, money and effort. Management converts disorganized resources of men, machines, money etc. into useful enterprise. These resources are coordinated, directed and controlled in such a manner that enterprise work towards attainment of goals.
2. **Optimum Utilization of Resources** - Management utilizes all the physical & human resources productively. This leads to efficacy in management. Management provides maximum utilization of scarce resources by selecting its best possible alternate use in industry from out of various uses. It makes use of experts, professional and these services leads to use of their skills, knowledge, and proper utilization and avoids wastage. If employees and machines are producing its maximum there is no under employment of any resources.
3. **Reduces Costs** - It gets maximum results through minimum input by proper planning and by using minimum input & getting maximum output. Management uses physical, human and financial resources in such a manner which results in best combination. This helps in cost reduction.
4. **Establishes Sound Organization** - No overlapping of efforts (smooth and coordinated functions). To establish sound organizational structure is one of the objective of management which is in tune with objective of organization and for fulfillment of this, it establishes effective authority & responsibility relationship i.e. who is accountable to whom, who can give instructions to whom, who are superiors & who are subordinates. Management fills up various positions with right persons, having right skills, training and qualification. All jobs should be cleared to everyone.



5. **Establishes Equilibrium** - It enables the organization to survive in changing environment. It keeps in touch with the changing environment. With the change in external environment, the initial co-ordination of organization must be changed. So it adapts organization to changing demand of market / changing needs of societies. It is responsible for growth and survival of organization.
6. **Essentials for Prosperity of Society** - Efficient management leads to better economical production which helps in turn to increase the welfare of people. Good management makes a difficult task easier by avoiding wastage of scarce resource. It improves standard of living. It increases the profit which is beneficial to business and society will get maximum output at minimum cost by creating employment opportunities which generate income in hands. Organization comes with new products and researches beneficial for society.

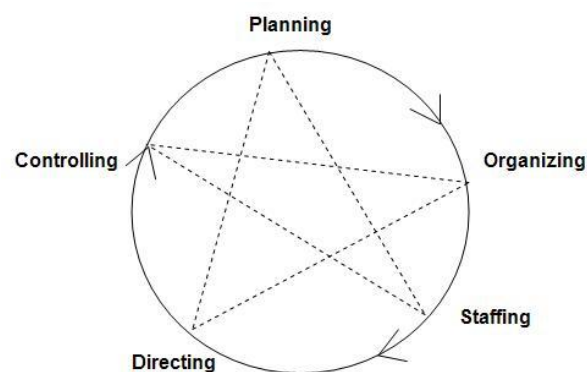
## Functions of Management

Management has been described as a social process involving responsibility for economical and effective planning & regulation of operation of an enterprise in the fulfillment of given purposes. It is a dynamic process consisting of various elements and activities. These activities are different from operative functions like marketing, finance, purchase etc. Rather these activities are common to each and every manager irrespective of his level or status.

Different experts have classified functions of management. According to *George & Jerry*, "There are four fundamental functions of management i.e. planning, organizing, actuating and controlling". According to Henry Fayol, "To manage is to forecast and plan, to organize, to command, & to control". Whereas Luther Gullick has given a keyword '**POSDCORB**' where P stands for Planning, O for Organizing, S for Staffing, D for Directing, Co for Co-ordination, R for reporting & B for Budgeting. But the most widely accepted are functions of management given by KOONTZ and O'DONNELL

i.e. **Planning, Organizing, Staffing, Directing and Controlling.**

For theoretical purposes, it may be convenient to separate the function of management but practically these functions are overlapping in nature i.e. they are highly inseparable. Each function blends into the other & each affects the performance of others.



### 1) Planning

It is the basic function of management. It deals with chalking out a future course of action & deciding in advance the most appropriate course of actions for achievement of pre-determined goals. According to KOONTZ, "Planning is deciding in advance - what to do, when to do & how to do. It bridges the gap from where we are & where we want to be". A plan is a future course of actions. It is an exercise in problem solving & decision making. Planning is determination of courses of action to achieve desired goals. Thus, planning is a systematic thinking about ways & means for accomplishment of pre-determined goals. Planning is necessary to ensure proper utilization of human & non-human resources. It is all pervasive, it is an intellectual activity and it also helps in avoiding confusion, uncertainties, risks, wastages etc.

## 2) Organizing

It is the process of bringing together physical, financial and human resources and developing productive relationship amongst them for achievement of organizational goals. According to Henry Fayol, “To organize a business is to provide it with everything useful or its functioning i.e. raw material, tools, capital and personnel’s”. To organize a business involves determining & providing human and non-human resources to the organizational structure. Organizing as a process involves:

- Identification of activities.
- Classification of grouping of activities.
- Assignment of duties.
- Delegation of authority and creation of responsibility.
- Coordinating authority and responsibility relationships.

## 3) Staffing

It is the function of manning the organization structure and keeping it manned. Staffing has assumed greater importance in the recent years due to advancement of technology, increase in size of business, complexity of human behavior etc. The main purpose of staffing is to put right man on right job i.e. square pegs in square holes and round pegs in round holes. According to Kootz & O’Donell, “Managerial function of staffing involves manning the organization structure through proper and effective selection, appraisal & development of personnel to fill the roles designed in the structure”. Staffing involves:

- [Manpower Planning](#) (estimating man power in terms of searching, choose the person and giving the right place).
- Recruitment, selection & placement.
- Training & development.
- Remuneration.
- Performance appraisal.
- Promotions & transfer.

## 4) Directing

It is that part of managerial function which actuates the organizational methods to work efficiently for achievement of organizational purposes. It is considered life-spark of the enterprise which sets it in motion the action of people because planning, organizing and staffing are the mere preparations for doing the work. Direction is that inert-personnel aspect of management which deals directly with influencing, guiding, supervising, motivating subordinate for the achievement of organizational goals. Direction has following elements:

- Supervision
- Motivation
- Leadership
- Communication

**Supervision-** implies overseeing the work of subordinates by their superiors. It is the act of watching & directing work & workers.

**Motivation-** means inspiring, stimulating or encouraging the sub-ordinates with zeal to work. Positive, negative, monetary, non-monetary incentives may be used for this purpose.

**Leadership-** may be defined as a process by which manager guides and influences the work of subordinates in desired direction.

**Communications-** is the process of passing information, experience, opinion etc from one person to another. It is a bridge of understanding.

## 5) Controlling

It implies measurement of accomplishment against the standards and correction of deviation if any to ensure achievement of organizational goals. The purpose of controlling is to ensure that everything occurs in conformities with the standards. An efficient system of control helps to predict deviations before they actually occur. According to *Theo Haimann*, “Controlling is the process of checking whether or not proper progress is being made towards the objectives and goals and acting if necessary, to correct any deviation”. According to Koontz & O’Donell,

“Controlling is the measurement & correction of performance activities of subordinates in order to make sure that the enterprise objectives and plans desired to obtain them as being accomplished”.

Therefore controlling has following steps:

- a) Establishment of standard performance.
- b) Measurement of actual performance.
- c) Comparison of actual performance with the standards and finding out deviation if any.
- d) Corrective action.

## Principles of Management

A principle refers to a fundamental truth. It establishes cause and effect relationship between two or more variables under given situation. They serve as a guide to thought & actions. Therefore, management principles are the statements of fundamental truth based on logic which provides guidelines for managerial decision making and actions. These principles are derived: -

- a. On the basis of observation and analysis i.e. practical experience of managers.
- b. By conducting experimental studies.

**There are 14 Principles of Management described by Henri Fayol.**

### **1. Division of Labor**

- a. Henry Fayol has stressed on the specialization of jobs.
- b. He recommended that work of all kinds must be divided & subdivided and allotted to various persons according to their expertise in a particular area.
- c. Subdivision of work makes it simpler and results in efficiency.
- d. It also helps the individual in acquiring speed, accuracy in his performance.
- e. Specialization leads to efficiency & economy in spheres of business.

### **2. Authority & Responsibility**

- a. Authority & responsibility are co-existing.
- b. If authority is given to a person, he should also be made responsible.
- c. In a same way, if anyone is made responsible for any job, he should also have concerned authority.
- d. Authority refers to the right of superiors to get exactness from their subordinates whereas responsibility means obligation for the performance of the job assigned.
- e. There should be a balance between the two i.e. they must go hand in hand.
- f. Authority without responsibility leads to irresponsible behavior whereas responsibility without authority makes the person ineffective.

### 3. Principle of One Boss (Unity of Command)

- a. A sub-ordinate should receive orders and be accountable to one and only one boss at a time.
- b. In other words, a sub-ordinate should not receive instructions from more than one person because -
  - It undermines authority
  - Weakens discipline
  - Divides loyalty
  - Creates confusion
  - Delays and chaos
  - Escaping responsibilities
  - Duplication of work
  - Overlapping of efforts
- c. Therefore, dual sub-ordination should be avoided unless and until it is absolutely essential.
- d. Unity of command provides the enterprise a disciplined, stable & orderly existence.
- e. It creates harmonious relationship between superiors and sub-ordinates.

### 4. Unity of Direction

- a. Fayol advocates one head one plan which means that there should be one plan for a group of activities having similar objectives.
- b. Related activities should be grouped together. There should be one plan of action for them and they should be under the charge of a particular manager.
- c. According to this principle, efforts of all the members of the organization should be directed towards common goal.
- d. Without unity of direction, unity of action cannot be achieved.
- e. In fact, unity of command is not possible without unity of direction.

Basis	Unity of Command	Unity of Direction
Meaning	It implies that a sub-ordinate should receive orders & instructions from only one boss.	It means one head, one plan for a group of activities having similar objectives.
Nature	It is related to the functioning of personnel's.	It is related to functioning of dept, or organization as a whole
Necessity	It is necessary for fixing responsibility of each subordinates.	It is necessary for sound organization
Advantage	It avoids conflicts, confusion & chaos.	It avoids duplication of efforts and wastage of resources.
Result	It leads to better superior sub-ordinate relationship	It leads to smooth running of the enterprise.

Therefore it is obvious that they are different from each other but they are dependent on each other i.e. unity of direction is a pre-requisite for unity of command. But it does not automatically comes from the unity of direction.

## **5. Equity**

- a. Equity means combination of fairness, kindness & justice.
- b. The employees should be treated with kindness & equity if devotion is expected of them.
- c. It implies that managers should be fair and impartial while dealing with the subordinates.
- d. They should give similar treatment to people of similar position.
- e. They should not discriminate with respect to age, caste, sex, religion, relation etc.
- f. Equity is essential to create and maintain cordial relations between the managers and sub-ordinate.
- g. But equity does not mean total absence of harshness.
- h. Fayol was of opinion that, “at times force and harshness might become necessary for the sake of equity”.

## **6. Order**

- a. This principle is concerned with proper & systematic arrangement of things and people.
- b. Arrangement of things is called material order and placement of people is called social order.
- c. Material order- There should be safe, appropriate and specific place for every article and every place to be effectively used for specific activity and commodity.
- d. Social order- Selection and appointment of most suitable person on the suitable job. There should be a specific place for every one and everyone should have a specific place so that they can easily be contacted whenever need arises.

## **7. Discipline**

- a. According to Fayol, “Discipline means sincerity, obedience, respect of authority & observance of rules and regulations of the enterprise”.
- b. This principle applies that subordinate should respect their superiors and obey their order.
- c. It is an important requisite for smooth running of the enterprise.
- d. Discipline is not only required on path of subordinates but also on the part of management.
- e. Discipline can be enforced if -
  - There are good superiors at all levels.
  - There are clear & fair agreements with workers.
  - Sanctions (punishments) are judiciously applied.

## **8. Initiative**

- a. Workers should be encouraged to take initiative in the work assigned to them.
- b. It means eagerness to initiate actions without being asked to do so.
- c. Fayol advised that management should provide opportunity to its employees to suggest ideas, experiences & new method of work.
- d. It helps in developing an atmosphere of trust and understanding.
- e. People then enjoy working in the organization because it adds to their zeal and energy.
- f. To suggest improvement in formulation & implementation of place.
- g. They can be encouraged with the help of monetary & non-monetary incentives.

## **9. Fair Remuneration**

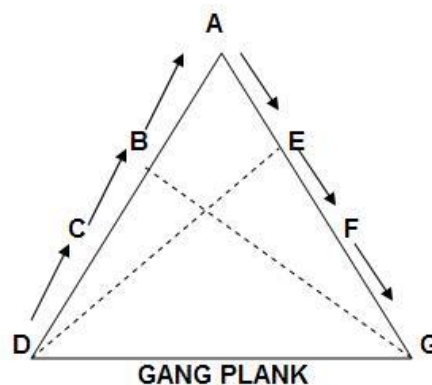
- a. The quantum and method of remuneration to be paid to the workers should be fair, reasonable, satisfactory & rewarding of the efforts.
- b. As far as possible it should accord satisfaction to both employer and the employees.
- c. Wages should be determined on the basis of cost of living, work assigned, financial position of the business, wage rate prevailing etc.
- d. Logical & appropriate wage rates and methods of their payment reduce tension & differences between workers & management creates harmonious relationship and pleasing atmosphere of work.
- e. Fayol also recommended provision of other benefits such as free education, medical & residential facilities to workers.

### 10. Stability of Tenure

- a. Fayol emphasized that employees should not be moved frequently from one job position to another i.e. the period of service in a job should be fixed.
- b. Therefore employees should be appointed after keeping in view principles of recruitment & selection but once they are appointed their services should be served.
- c. According to Fayol. "Time is required for an employee to get used to a new work & succeed to doing it well but if he is removed before that he will not be able to render worthwhile services".
- d. As a result, the time, effort and money spent on training the worker will go waste.
- e. Stability of job creates team spirit and a sense of belongingness among workers which ultimately increase the quality as well as quantity of work.

### 11. Scalar Chain

- a. Fayol defines scalar chain as 'The chain of superiors ranging from the ultimate authority to the lowest'.
- b. Every orders, instructions, messages, requests, explanation etc. has to pass through Scalar chain.
- c. But, for the sake of convenience & urgency, this path can be cut short and this short cut is known as Gang Plank.
- d. A **Gang Plank** is a temporary arrangement between two different points to facilitate quick & easy communication as explained below:



5.

- a. In the figure given, if D has to communicate with G he will first send the communication upwards with the help of C, B to A and then downwards with the help of E and F to G which will take quite some time and by that time, it may not be worth therefore a gang plank has been developed between the two.
- b. **Gang Plank** clarifies that management principles are not rigid rather they are very flexible. They can be moulded and modified as per the requirements of situations

## **12. Sub-Ordination of Individual Interest to General Interest**

- a. An organization is much bigger than the individual it constitutes therefore interest of the undertaking should prevail in all circumstances.
- b. As far as possible, reconciliation should be achieved between individual and group interests.
- c. But in case of conflict, individual must sacrifice for bigger interests.
- d. In order to achieve this attitude, it is essential that -
  - Employees should be honest & sincere.
  - Proper & regular supervision of work.
  - Reconciliation of mutual differences and clashes by mutual agreement. For example, for change of location of plant, for change of profit sharing ratio, etc.

## **13. Espirit De' Corps (can be achieved through unity of command)**

- a. It refers to team spirit i.e. harmony in the work groups and mutual understanding among the members.
- b. Spirit De' Corps inspires workers to work harder.
- c. Fayol cautioned the managers against dividing the employees into competing groups because it might damage the moral of the workers and interest of the undertaking in the long run.
- d. To inculcate Espirit De' Corps following steps should be undertaken -
  - There should be proper co-ordination of work at all levels
  - Subordinates should be encouraged to develop informal relations among themselves.
  - Efforts should be made to create enthusiasm and keenness among subordinates so that they can work to the maximum ability.
  - Efficient employees should be rewarded and those who are not up to the mark should be given a chance to improve their performance.
  - Subordinates should be made conscious of that whatever they are doing is of great importance to the business & society.
- e. He also cautioned against the more use of Britain communication to the subordinates i.e. face to face communication should be developed. The managers should infuse team spirit & belongingness. There should be no place for misunderstanding. People then enjoy working in the organization & offer their best towards the organization.

## **14. Centralization & De-Centralization**

- a. Centralization means concentration of authority at the top level. In other words, centralization is a situation in which top management retains most of the decision making authority.
- b. Decentralization means disposal of decision making authority to all the levels of the organization. In other words, sharing authority downwards is decentralization.
- c. According to Fayol, "Degree of centralization or decentralization depends on no. of factors like size of business, experience of superiors, dependability & ability of subordinates etc.
- d. Anything which increases the role of subordinate is decentralization & anything which decreases it, is centralization.
- e. Fayol suggested that absolute centralization or decentralization is not feasible. An organization should strive to achieve a balance between the two.

## **Scientific Management**

*Fredrick Winslow Taylor* ( March 20, 1856 - March 21, 1915) commonly known as '**Father of Scientific Management**' started his career as an operator and rose to the position of chief engineer. He conducted various experiments during this process which forms the basis of scientific management. It implies application of scientific principles for studying & identifying management problems.

According to Taylor, "Scientific Management is an art of knowing exactly what you want your men to do and seeing that they do it in the best and cheapest way". In Taylors view, if a work is analysed scientifically it will be possible to find *one best way* to do it.

Hence scientific management is a thoughtful, organized, dual approach towards the job of management against hit or miss or Rule of Thumb.

According to *Drucker*, "The cost of scientific management is the organized study of work, the analysis of work into simplest element & systematic management of worker's performance of each element".

### **1. Development of Science for each part of men's job (replacement of rule of thumb)**

- a. This principle suggests that work assigned to any employee should be observed, analyzed with respect to each and every element and part and time involved in it.
- b. This means replacement of odd rule of thumb by the use of method of enquiry, investigation, data collection, analysis and framing of rules.
- c. Under scientific management, decisions are made on the basis of facts and by the application of scientific decisions.

### **2. Scientific Selection, Training & Development of Workers**

- a. There should be scientifically designed procedure for the selection of workers.
- b. Physical, mental & other requirement should be specified for each and every job.
- c. Workers should be selected & trained to make them fit for the job.
- d. The management has to provide opportunities for development of workers having better capabilities.
- e. According to Taylor efforts should be made to develop each employee to his greatest level and efficiency & prosperity.

### **3. Co-operation between Management & workers or Harmony not discord**

- a. Taylor believed in co-operation and not individualism.
- b. It is only through co-operation that the goals of the enterprise can be achieved efficiently.
- c. There should be no conflict between managers & workers.
- d. Taylor believed that interest of employer & employees should be fully harmonized so as to secure mutually understanding relations between them.

### **4. Division of Responsibility**

- a. This principle determines the concrete nature of roles to be played by different level of managers & workers.



- b. The management should assume the responsibility of planning the work whereas workers should be concerned with execution of task.
- c. Thus planning is to be separated from execution.

## **5. Mental Revolution**

- a. The workers and managers should have a complete change of outlook towards their mutual relation and work effort.
- b. It requires that management should create suitable working condition and solve all problems scientifically.
- c. Similarly workers should attend their jobs with utmost attention, devotion and carefulness. They should not waste the resources of enterprise.
- d. Handsome remuneration should be provided to workers to boost up their moral.
- e. It will create a sense of belongingness among worker.
- f. They will be disciplined, loyal and sincere in fulfilling the task assigned to them.
- g. There will be more production and economical growth at a faster rate.

## **6. Maximum Prosperity for Employer & Employees**

- a. The aim of scientific management is to see maximum prosperity for employer and employees.
- b. It is important only when there is opportunity for each worker to attain his highest efficiency.
- c. Maximum output & optimum utilization of resources will bring higher profits for the employer & better wages for the workers.
- d. There should be maximum output in place of restricted output.
- e. Both managers & workers should be paid handsomely

## **Techniques of Scientific Management**

### **1. Time Study**

- a. It is a technique which enables the manager to ascertain standard time taken for performing a specified job.
- b. Every job or every part of it is studied in detail.
- c. This technique is based on the study of an average worker having reasonable skill and ability.
- d. Average worker is selected and assigned the job and then with the help of a stop watch, time is ascertained for performing that particular job.
- e. Taylor maintained that Fair day's work should be determined through observations, experiment and analysis by keeping in view an average worker.

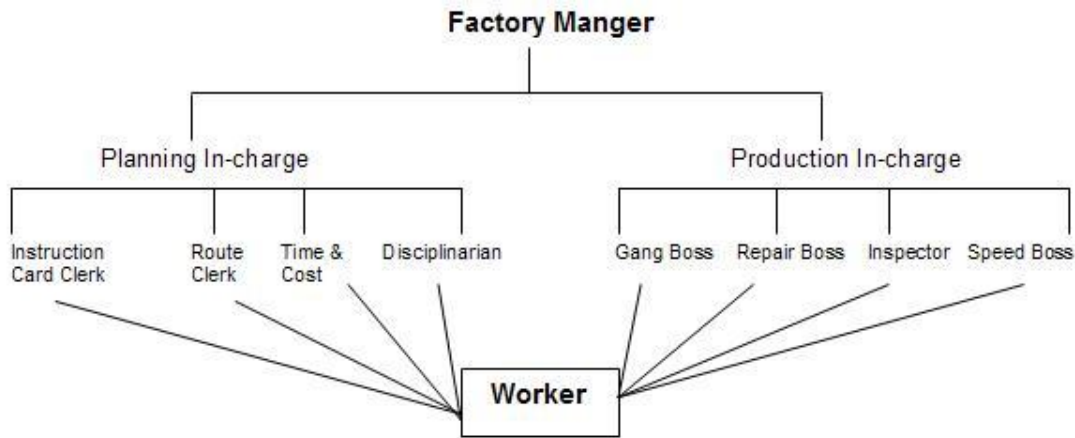
$$\text{Standard Time} \times \text{Working Hours} = \text{Fair Day's Work}$$

### **2. Motion Study**

- a. In this study, movement of body and limbs required to perform a job are closely observed.
- b. In other words, it refers to the study of movement of an operator on machine involved in a particular task.
- c. The purpose of motion study is to eliminate useless motions and determine the best way of doing the job.

- d. By undertaking motion study an attempt is made to know whether some elements of a job can be eliminated combined or their sequence can be changed to achieve necessary rhythm.
- e. Motion study increases the efficiency and productivity of workers by cutting down all wasteful motions.

### 3. Functional Foremanship



- a. Taylor advocated functional foremanship for achieving ultimate specification.
- b. This technique was developed to improve the quality of work as single supervisor may not be an expert in all the aspects of the work.
- c. Therefore workers are to be supervised by specialist foreman.
- d. The scheme of functional foremanship is an extension of principle of specialization at the supervisory level.
- e. Taylor advocated appointment of 8 foremen, 4 at the planning level & other 4 at implementation level.
- f. The names & function of these specialist foremen are: -
  - Instruction card clerk concerned with tagging down of instructions according to which workers are required to perform their job
  - Time & cost clerk is concerned with setting a time table for doing a job & specifying the material and labor cost involved in it.
  - Route clerk determines the route through which raw materials has to be passed.
  - Shop Disciplinarians are concerned with making rules and regulations to ensure discipline in the organization.
  - Gang boss makes the arrangement of workers, machines, tools, workers etc.
  - Speed boss concerned with maintaining the speed and to remove delays in the production process.
  - Repair boss concerned with maintenance of machine, tools and equipments.
  - Inspector is concerned with maintaining the quality of product.

### 4. Standardization

- a. It implies the physical attitude of products should be such that it meets the requirements & needs of customers.
- b. Taylor advocated that tools & equipments as well as working conditions should be standardized to achieve standard output from workers.

- c. Standardization is a means of achieving economics of production.
- d. It seems to ensure -
  1. The line of product is restricted to predetermined type, form, design, size, weight, quality. Etc
  2. There is manufacture of identical parts and components.
  3. Quality & standards have been maintained.
  4. Standard of performance are established for workers at all levels.

#### **5. Differential Piece Wage Plan**

- a. This tech of wage payment is based on efficiency of worker.
- b. The efficient workers are paid more wages than inefficient one.
- c. On the other hand, those workers who produce less than standard no. of pieces are paid wages at lower rate than prevailing rate i.e. worker is penalized for his inefficiency.
- d. This system is a source of incentive to workers who improving their efficiency in order to get more wages.
- e. It also encourages inefficient workers to improve their performance and achieve their standards.
- f. It leads to mass production which minimizes cost and maximizes profits.

#### **6. Other Techniques**

- a. Various other techniques have been developed to create ordeal relationship between management and workers and also to create better understanding on part of works.
- b. Those includes use of instruction cards, strict rules & regulations, graphs, slides, charts etc, so as to increase efficiency of workers.
- c.

#### **Criticism of Scientific Management:**

Although it is accepted that the scientific management enables the management to put resources to its best possible use and manner, yet it has not been spared of severe criticism.

#### **Workers Viewpoint**

1. **Unemployment** - Workers feel that management reduces employment opportunities from them through replacement of men by machines and by increasing human productivity less workers are needed to do work leading to chucking out from their jobs.
2. **Exploitation** - Workers feel they are exploited as they are not given due share in increasing profits which is due to their increased productivity. Wages do not rise in proportion as rise in production. Wage payment creates uncertainty & insecurity (beyond a standard output, there is no increase in wage rate).
3. **Monotony** - Due to excessive specialization the workers are not able to take initiative on their own. Their status is reduced to being mere cogs in wheel. Jobs become dull. Workers loose interest in jobs and derive little pleasure from work.
4. **Weakening of Trade Union** - To everything is fixed & predetermined by management. So it leaves no room for trade unions to bargain as everything is standardized, standard output, standard working conditions, standard time etc. This

further weakens trade unions, creates a rift between efficient & in efficient workers according to their wages.

5. **Over speeding** - the scientific management lays standard output, time so they have to rush up and finish the work in time. These have adverse effect on health of workers. The workers speed up to that standard output, so scientific management drives the workers to rush towards output and finish work in standard time.

### Employer's Viewpoint

1. **Expensive** - Scientific management is a costly system and a huge investment is required in establishment of planning dept., standardization, work study, training of workers. It may be beyond reach of small firms. Heavy fixed investment leads to increase in overhead costs.
2. **Time Consuming** - Scientific management requires mental revision and complete reorganizing of organization. A lot of time is required for work, study, standardization & specialization. During this overhauling of organization, the work suffers.
3. Deterioration of Quality

### Taylor v/s Fayol

Both the persons have contributed to development of science of management. The contribution of these two pioneers in the field of science of management has been reviewed as "The work of Taylor & Fayol was, of course, especially complementary. They both realized that problem of personnel & its management at all levels is the key to individual success. Both applied scientific method to this problem that Taylor worked primarily from operative level, from bottom to upward, while Fayol concentrated on managing director and work downwards, was merely a reflection of their very different careers". They both differ from each other in following aspects:

Basis	Taylor	Fayol
Human aspect	Taylor disregards human elements and there is more stress on improving men, materials and methods	Fayol pays due regards on human element. E.g. Principle of initiative, Espirit De' Corps and Equity recognizes a need for human relations
Status	Father of scientific management	Father of management principles
Efficiency & administration	Stressed on efficiency	Stressed on general administration
Approach	It has micro-approach because it is restricted to factory only	It has macro-approach and discusses general principles of management which are applicable in every field of management.
Scope of principles	These principles are restricted to production activities	These are applicable in all kinds of organization regarding their management affairs
Achievement	Scientific management	Administrative management

## Work Study

“Work study is a generic term for those techniques, method study and work measurement which are used in the examination of human work in all its contexts. And which lead systematically to the investigation of all the factors which affect the efficiency and economy of the situation being reviewed, in order to effect improvement.”

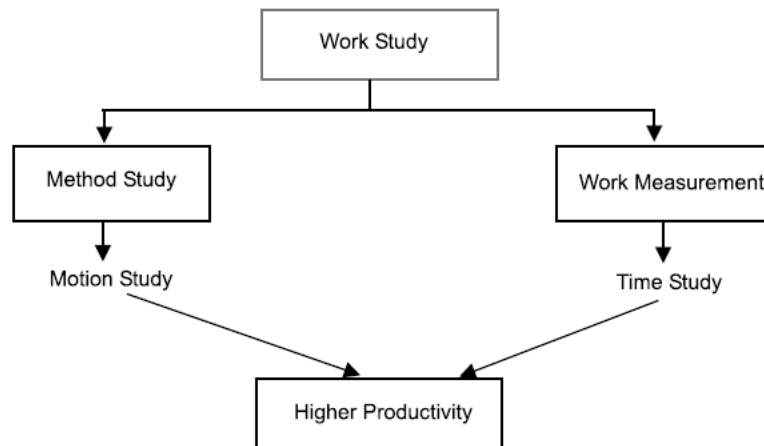


Fig. 7.2 Framework of work study

Work study is a means of enhancing the production efficiency (productivity) of the firm by elimination of waste and unnecessary operations. It is a technique to identify non-value adding operations by investigation of all the factors affecting the job. It is the only accurate and systematic procedure oriented technique to establish time standards. It is going to contribute to the profit as the savings will start immediately and continue throughout the life of the product. Method study and work measurement is part of work study. Part of method study is motion study, work measurement is also called by the name ‘Time study

## Advantages of work study

Following are the advantages of work study:

1. It helps to achieve the smooth production flow with minimum interruptions.
2. It helps to reduce the cost of the product by eliminating waste and unnecessary operations.
3. Better worker-management relations.
4. Meets the delivery commitment.
5. Reduction in rejections and scrap and higher utilisation of resources of the organization.
6. Helps to achieve better working conditions.
7. Better workplace layout.
8. Improves upon the existing process or methods and helps in standardisation and simplification.
9. Helps to establish the standard time for an operation or job which has got application in manpower planning, production planning.

## Method study

**Method study** enables the industrial engineer to subject each operation to systematic analysis.

The main purpose of method study is to eliminate the unnecessary operations and to achieve the best method of performing the operation.

Method study is also called **methods engineering or work design**. Method engineering is used to describe collection of analysis techniques which focus on improving the effectiveness of men and machines. According to British Standards Institution (BS 3138): “*Method study is the systematic recording and critical examination of existing and proposed ways or*

*doing work as a means or developing and applying easier and more effective methods and reducing cost.”*

Method study is essentially concerned with finding better ways of doing things. It adds value and increases the efficiency by eliminating unnecessary operations, avoidable delays and other forms of waste. The improvement in efficiency is achieved through:

1. Improved layout and design of workplace.
2. Improved and efficient work procedures.
3. Effective utilisation of men, machines and materials.
4. Improved design or specification of the final product.

**The objectives of method study techniques are:**

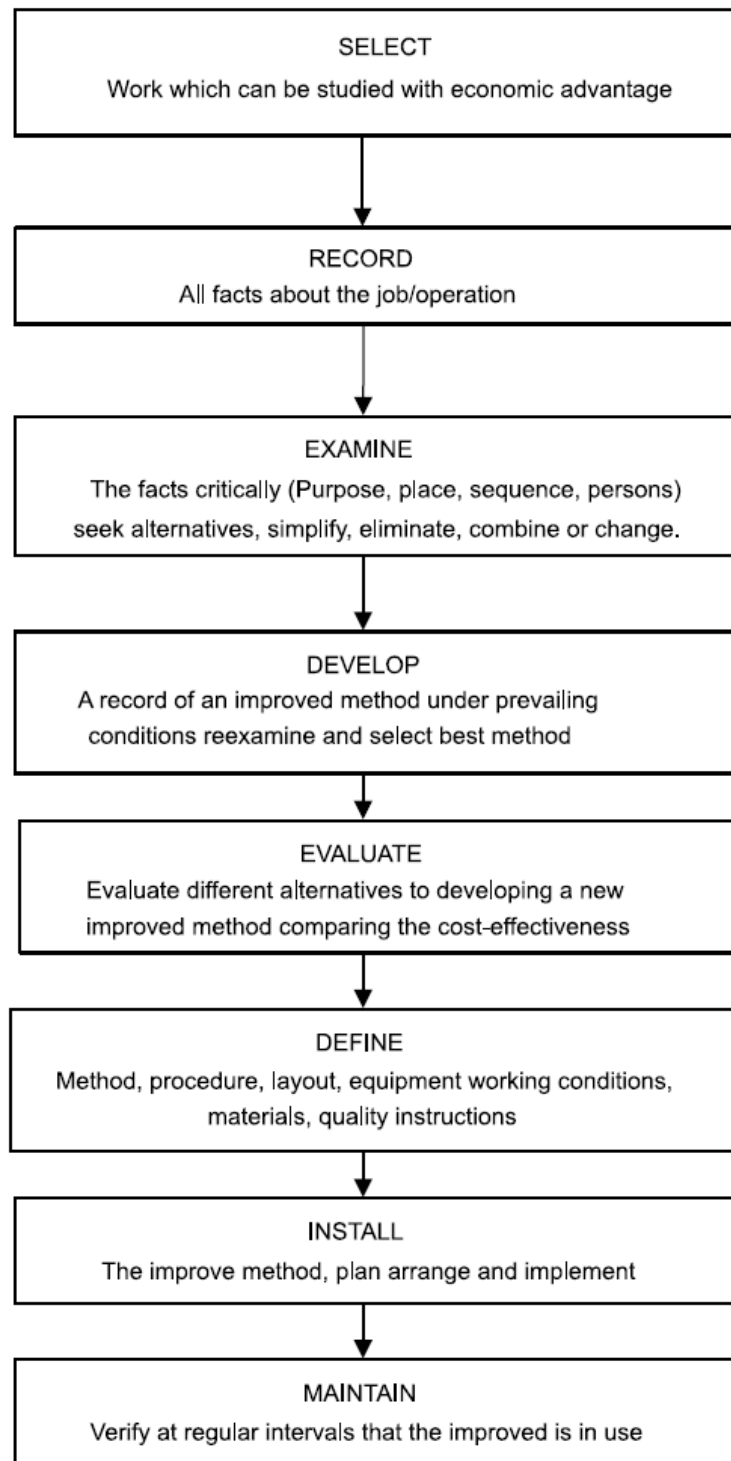
1. Present and analyse true facts concerning the situation.
2. To examine those facts critically.
3. To develop the best answer possible under given circumstances based on critical examination of facts.

**The scope of method study**

The areas to which method study can be applied successfully in manufacturing are:

1. To improve work methods and procedures.
2. To determine the best sequence of doing work.
3. To smoothen material flow with minimum of back tracking and to improve layout.
4. To improve the working conditions and hence to improve labour efficiency.
5. To reduce monotony in the work.
6. To improve plant utilisation and material utilisation.
7. Elimination of waste and unproductive operations.
8. To reduce the manufacturing costs through reducing cycle time of operations

**Process of Method Study:**



### **Recording Techniques in Method Study:**

The next step in basic procedure, after selecting the work to be studied is to record all facts relating to the existing method. In order that the activities selected for investigation may be visualised in their entirety and in order to improve them through subsequent critical examination, it is essential to have some means of placing on record all the necessary facts about the existing method. Records are very much useful to make before and after comparison to assess the effectiveness of the proposed improved method.

The recording techniques are designed to simplify and standardise the recording work. For this purpose charts and diagrams are used.

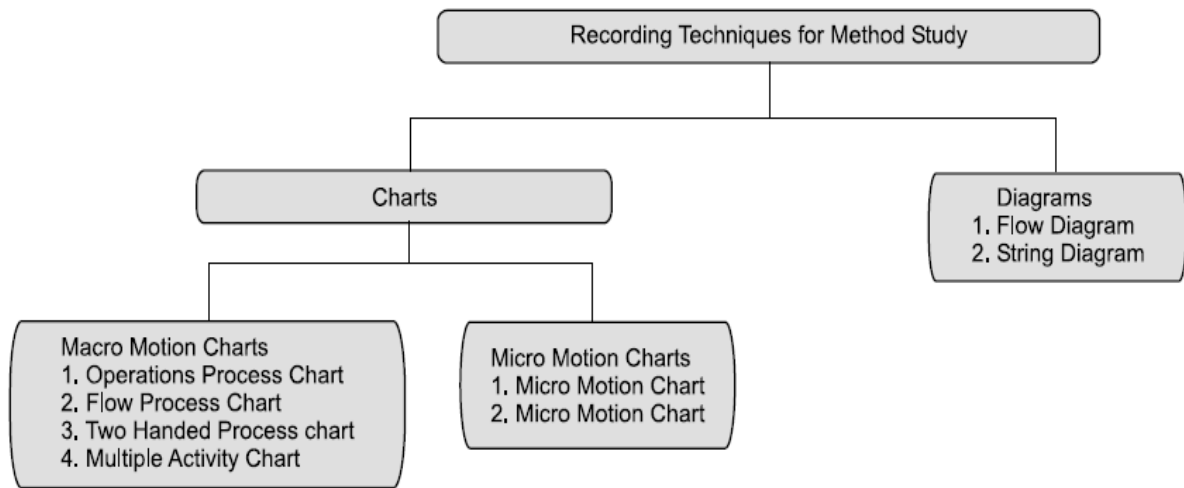


Fig. 7.4 Recording techniques for method study

## Types of Charts

It can be broadly divided into (A) Macro motion charts and (B) Micro motion charts.

Macro motion charts are used for macro motion study and micro motion charts are used for micro motion study. Macro motion study is one which can be measured through 'stop watch' and micro motion study is one which cannot be measured through stop watch.

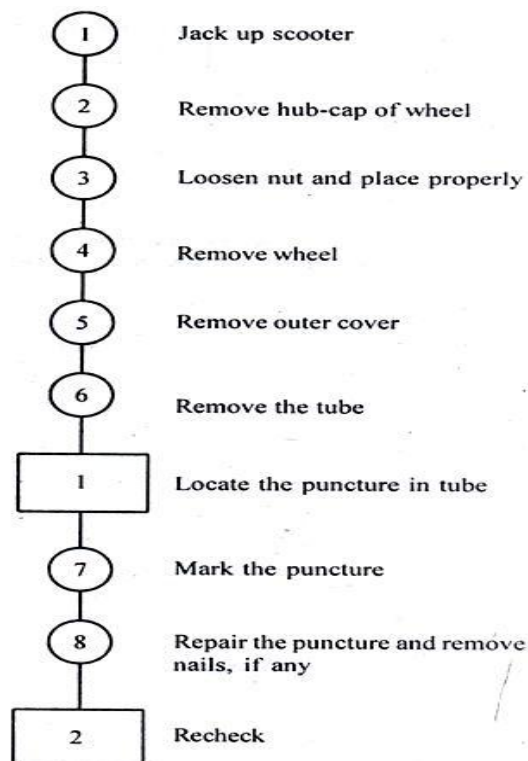
### (A) MACRO MOTION CHARTS

Following four charts are used under this type:

#### 1. Operation Process Chart

It is also called outline process chart. An operation process chart gives the bird's eye view of the whole process by recording only the major activities and inspections involved in the process.

Activity	: Repair of punctured scooter tyre
Chart begins	: Scooter ready for jacking up
Chart ends	: Tube ready after repair to mount on tyre
Method	: Present
Charted by	: Mr. Author



#### Summary

Activity	Method (present)
Operations ○	8
Inspection □	2

**Operation process chart uses only two symbols**, i.e., operation and inspection. Operation, process chart is helpful to:

(a) Visualise the complete sequence of the operations and inspections in the process.



- (b) Know where the operation selected for detailed study fits into the entire process.
- (c) In operation process chart, the graphic representation of the points at which materials are introduced into the process and what operations and inspections are carried on them are shown.

## 2. Flow Process Chart

Flow process chart gives the sequence of flow of work of a product or any part of it through the work centre or the department recording the events using appropriate symbols. It is the amplification of the operation process chart in which operations; inspection, storage, delay and transportation are represented. However, process charts are of three types:

- (a) Material type—which shows the events that occur to the materials.
- (b) Man type—Activities performed by the man.
- (c) Equipment type—how equipment is used.

Example: *Process Chart for making a cheese sandwich.*

**Process Chart**

<i>Distance in metre</i>	<i>Symbol</i>	<i>Process description</i>
10	⇒	Move to cabinet
-	○	Get loaf of bread
-	○	Remove two slices of bread
-	○	Lay slices on counter-top
-	○	Close loaf of bread
-	○	Replace loaf of bread on shelf
-	○	Open butter
-	○	Spread butter on top slice of bread
-	□	Inspect sandwich
10	⇒	Move to serving area
-	○	Serve sandwich

The flow process chart is useful:

- (a) To reduce the distance travelled by men (or materials).
- (b) To avoid waiting time and unnecessary delays.
- (c) To reduce the cycle time by combining or eliminating operations.
- (d) To fix up the sequence of operations.
- (e) To relocate the inspection stages.

Like operation process chart, flow process chart is constructed by placing symbols one below another as per the occurrence of the activities and are joined by a vertical line. A brief description of the activity is written on the right hand side of the activity symbol and time or distance is given on the left hand side.

## 3. Two Handed Process Chart

A two handed (operator process chart) is the most detailed type of flow chart in which the activities of the workers hands are recorded in relation to one another. The two handed process chart is normally confined to work carried out at a single workplace. This also gives synchronised and graphical representation of the sequence of manual activities of the worker.

The application of this charts are:

- a) To visualise the complete sequence of activities in a repetitive task.
- b) To study the work station layout.

# EX: TWO-HANDED PROCESS CHART

Job : Assembly of washer and nut to a bolt		Assembly	Bolt	Washer	Nut
Chart begins : Both hands free before assembly					
Chart ends : Both hands free after assembly					
Chart : Existing method/Proposed method		Date :	Operator		
Operator :		Chart No :			
<b>Left hand</b>			<b>Right hand</b>		
Sl. No.	Description of the activities	Symbols	Sl. No.	Description of the activities	Symbols
1.	To the bolt tray		1.	To the washer tray	
2.	Picks up one bolt		1.	To the washer tray	
3.	Returns to original position		2.	Picks up one washer	
4.	Holding the bolt		3.	Returns to the initial position	
5.	Idle		4.	Assembles washer over bolt	
6.	Idle		5.	To the nut tray	
7.	Idle		6.	Picks up one nut	
8.	Idle		7.	Returns to initial position	
9.	To the assembly tray		8.	Assemble nut to the bolt	
10.	Puts the bolt in the tray		9.	Idle	
11.	Returns to the original position		10.	Idle	
			11.	Idle	

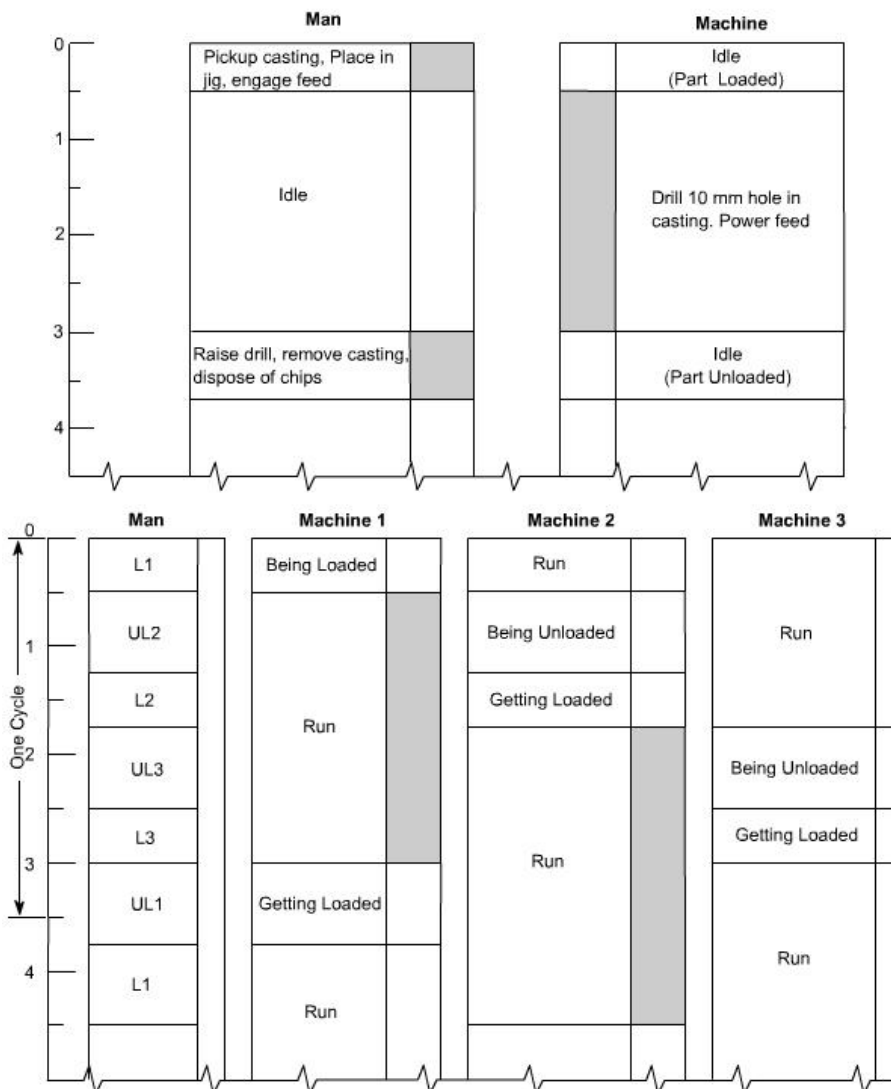
Fig. 1.4: Two-handed process chart

## 4. Multiple Activity Chart

## Worker - Machine Process Chart

Operator Name : Ram Dyal Sharma  
 Department : Machine Shop  
 Activity : Drill hole in casting  
 Drg.No : C25  
 Method : Present

Summary		
	Man	Machine
Idle time	2.50 minutes	1.25 minutes
Working time	1.25	2.50
Total cycle time	3.75	3.75
Utilization	Operator utilization = $\frac{1.25}{3.75} = 33\%$	Machine utilization = $\frac{2.50}{3.75} = 67\%$



It is a chart where activities of more than subject (worker or equipment) are each recorded on a common time scale to show their inter-relationship. Multiple activity charts are made:

- To study idle time of the man and machines,
- To determine number of machines handled by one operator, and
- To determine number of operators required in teamwork to perform the given job.

### Diagrams Used in Method Study

The flow process chart shows the sequence and nature of movement but it does not clearly show the path of movements. In the paths of movements, there are often undesirable features such as congestion, back tracking and unnecessary long movements. To record these unnecessary features, representation of the working area in the form of flow diagrams, string diagrams can be made:

1. To study the different layout plans and thereby; select the most optimal layout.
2. To study traffic and frequency over different routes of the plant.
3. Identification of back tracking and obstacles during movements.

Diagrams are of two types: 1. Flow diagram and  
2. String diagram.

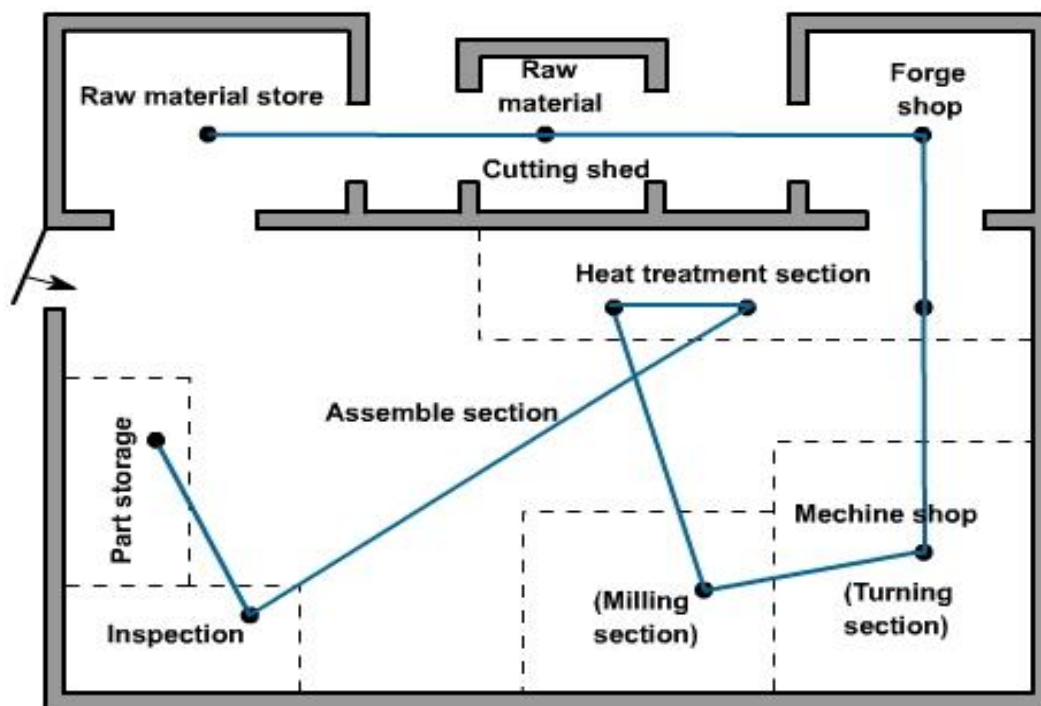
## 1. FLOW DIAGRAM

Flow diagram is a drawing, of the working area, showing the location of the various activities identified by their numbered symbols and are associated with particular flow process chart either man type or machine type. The routes followed in transport are shown by joining the symbols in sequence by a line which represents as nearly as possible the path or movement of the subject concerned.

Following are the procedures to make the flow diagram:

1. The layout of the workplace is drawn to scale.
2. Relative positions of the machine tools, work benches, storage, and inspection benches are marked on the scale.
3. Path followed by the subject under study is tracked by drawing lines.
4. Each movement is serially numbered and indicated by arrow for direction.
5. Different colours are used to denote different types of movements.

### Flow Diagram for Manufacture of Bi-cycle Pedal Axle



## 2. STRING DIAGRAM

The string diagram is a scale layout drawing on which, length of a string is used to record the extent as well as the pattern of movement of a worker working within a limited area during a certain period of time. The primary function of a string diagram is to produce a record of an existing set of conditions so that the job of seeing what is actually taking place is made as simple as possible.

One of the most valuable features of the string diagram is the actual distance travelled during the period of study to be calculated by relating the length of the thread used to the scale of drawing. Thus, it helps to make a very effective comparison between different layouts or methods of doing job in terms of the travelling involved.

The main advantages of string diagram compared to flow diagram is that respective movements between work stations which are difficult to be traced on the flow diagram can be conveniently shown on string diagram.

Following are the procedures to draw string diagram:

1. A layout of the work place of factory is drawn to scale on the soft board.
2. Pins are fixed into boards to mark the locations of work stations, pins are also driven at the turning points of the routes.
3. A measured length of the thread is taken to trace the movements (path).
4. The distance covered by the object is obtained by measuring the remaining part of the thread and subtracting it from original length.

### **Symbols Used in Method Study**

Graphical method of recording was originated by Gilbreth, in order to make the presentation of the facts clearly without any ambiguity and to enable to grasp them quickly and clearly. It is useful to use symbols instead of written description.

#### **(A) METHOD STUDY SYMBOLS**

○	OPERATION
□	INSPECTION
→	TRANSPORTATION
D	DELAY
▽	STORAGE

#### **Operation**

An operation occurs when an object is intentionally changed in one or more of its characteristics (physical or chemical). This indicates the main steps in a process, method or procedure. An operation always takes the object one stage ahead towards completion.

Examples of operation are:

- Turning, drilling, milling, etc.
- A chemical reaction.
- Welding, brazing and riveting.

#### **Inspection**

An inspection occurs when an object is examined and compared with standard for quality and quantity. The inspection examples are:

1. Visual observations for finish.
2. Count of quantity of incoming material.
3. Checking the dimensions.

#### **Transportation**

A transport indicates the movement of workers, materials or equipment from one place to another.

*Example:* Movement of materials from one work station to another or workers travelling to bring tools.

#### **Delay (Temporary Storage)**

A delay occurs when the immediate performance of the next planned thing does not take place.

**Example:** Work waiting between consecutive operations or Workers waiting at tool cribs or Operators waiting for instructions from supervisor.

## Storage

Storage occurs when the object is kept in an authorised custody and is protected against unauthorised removal. For example, materials kept in stores to be distributed to various work.

## MICRO-MOTION STUDY CHART

Micro-motion study provides a technique for recording and timing an activity. It is a set of techniques intended to divide the human activities in a groups of movements or micro-motions (called Therbligs) and the study of such movements helps to find for an operator one best pattern of movements that consumes less time and requires less effort to accomplish the task. Therbligs were suggested by Frank O. Gilbreth, the founder of motion study. Micro-motion study was mainly employed for the job analysis.

Its other applications include:

1. As an aid in studying the activities of two or more persons on a group work?
2. As an aid in studying the relationship of the activities of the operator and the machine as a means of timing operations.
3. As an aid in obtaining motion time data for time standards.
4. Acts as permanent record of the method and time of activities of the operator and the machine.

The micro-motion group of techniques is based on the idea of dividing human activities into division of movements or groups of movements (Therbligs) according to purpose for which they are made. Gilbreth differentiated 17 fundamental hand or hand and eye motions. Each Therbligs has a specific colour, symbol and letter for recording purposes. The Therbligs are micro-motion study involves the following steps:

1. Filming the operation to be studied.
2. Analysis of the data from the film.

### The Therbligs Symbols or symbols used In SIMO charts

 Search	 Use
 Find	 Disassemble
 Select	 Inspect
 Grasp	 Preposition
 Hold	 Release Load
 Transport Loaded	 Unavoidable Delay
 Transport Empty	 Avoidable Delay
 Position	 Plan
 Assemble	 Rest

Sl. No.	Code	Name	Description	Colour
1.	SH	SEARCH	Locate and article	Black
2.	F	FIND	Mental reaction at end of search	Grey
3.	ST	SELECT	Selection from a member	Light Gray
4.	G	GRASP	Taking Hold	Red
5.	H	HOLD	Prolonged group	Gold Ochre

6.	TL	TRANSPORT LOADED	Moving an article	Green
7.	P	POSITION	Placing in a definite location	Blue
8.	A	ASSEMBLE	Putting parts together	Violet
9.	U	USE	Causing a device to perform its function	Purple
10.	DA	DISASSEMBLE	Separating parts	Light Violet
11.	I	INSPECT	Examine or test	Burnt Ochre
12.	PP	PREPOSITION	Placing an article ready for use	Pale Blue
13.	RL	RELEASE LOAD	Release an article	Carmine red
14.	TE	TRANSPORT EMPTY	Movement of a body member	Olive Green
15.	R	REST	Pause to overcome fatigue	Orange
16.	JD	UNAVOIDABLE DELAY	Idle-outside persons control	Yellow
17.	PN	PLAN	Mental plan for future action	—

The recording of the data through **SIMO chart** is done as micro motion chart.

### **SIMO Chart**

Simultaneous motion cycle chart (SIMO chart) is a recording technique for micro-motion study. A SIMO chart is a chart based on the film analysis, used to record simultaneously on a common time scale the Therbligs or a group of Therbligs performed by different parts of the body of one or more operators.

It is the micro-motion form of the man type flow process chart. To prepare SIMO chart, an elaborate procedure and use of expensive equipment are required and this study is justified when the saving resulting from study will be very high.

Motion study is part of method study where analysis of the motion of an operator or work will be studied by following the prescribed methods

### **Principles of Motion study**

There are a number of principles concerning the economy of movements which have been developed as a result of experience and which forms the basis for the development of improved methods at the workplace. These are first used by Frank Gilbreth, the founder of motion study and further rearranged and amplified by Barnes, Maynard and others.

The principles are grouped into three headings:

- (a) Use of the human body.
- (b) Arrangement of workplace.
- (c) Design of tools and equipment.

### **(A) USES OF HUMAN BODY**

*When possible:*

1. The two hands should begin and complete their movements at the same time.
2. The two hands should not be idle at the same time except during periods of rest.
3. Motions of the arms should be made simultaneously.
4. Hand and body motions should be made at the lowest classification at which it is possible to do the work satisfactorily.
5. Momentum should be employed to help the worker, but should be reduced to a minimum whenever it has to be overcome by muscular effort.
6. Continuous curved movements are to be preferred to straight line motions involving sudden and changes in directions.
7. 'Ballistic' (*i.e.*, free swinging) movements are faster, easier and more accurate than restricted or controlled movements
8. Rhythm is essential to the smooth and automatic performance of a repetitive operation. The work should be arranged to permit easy and natural rhythm wherever possible.
9. Work should be arranged so that eye movements are confined to a comfortable area, without the need for frequent changes of focus.

## **(B) ARRANGEMENT OF THE WORKPLACE**

1. Definite and fixed stations should be provided for all tools and materials to permit habit formation.
2. Tools and materials should be pre-positioned to reduce searching.
3. Gravity fed, bins and containers should be used to deliver the materials as close to the point of use as possible.
4. Tools, materials and controls should be located within a maximum working area and as near to the worker as possible.
5. Materials and tools should be arranged to permit the best sequence of motions.
6. 'Drop deliveries' or ejectors should be used wherever possible, so that the operative does not have to use his hands to dispose of finished parts.
7. Provision should be made for adequate lighting, and a chair of type and height to permit good posture should be provided. The height of the workplace and seat should be arranged to allow alternate standing and seating.

## **(C) DESIGN OF TOOLS AND EQUIPMENTS**

1. The colour of the workplace should contrast with that of work and thus reduce eye fatigue.
2. The hands should be relieved of all work of 'holding' the work piece where this can be done by a jig or fixture or foot operated device.
3. Two or more tools should be combined where possible.
4. Where each finger performs some specific movement, as in typewriting, the load should be distributed in accordance with the inherent capacities of the fingers.
5. Handles such as those used on screw drivers and cranks should be designed to permit maximum surface of the hand to come in contact with the handle.
6. Levers cross bars and wheel bars should be in such position that operator can manipulate them with least body change and with greatest mechanical advantage.

## **Work measurement**

Work measurement is also called by the name 'time study'. Work measurement is absolutely essential for both the planning and control of operations. Without measurement data, we cannot determine the capacity of facilities or it is not possible to quote delivery dates or costs. We are not in a position to determine the rate of production and also labour utilisation and efficiency.

It may not be possible to introduce incentive schemes and standard costs for budget control. The use of work measurement as a basis for incentives is only a small part of its total application.



## **The objectives of work measurement are to provide a sound basis for:**

1. Comparing alternative methods.
2. Assessing the correct initial manning (manpower requirement planning).
3. Planning and control.
4. Realistic costing.
5. Financial incentive schemes.
6. Delivery date of goods.
7. Cost reduction and cost control.
8. Identifying substandard workers.
9. Training new employees.

Time study and work sampling involve direct observation and the remaining are data based and analytical in nature.

1. **Time study:** A work measurement technique for recording the times and rates of working for the elements of a specified job carried out under specified conditions and for analysing the data so as to determine the time necessary for carrying out the job at the defined level of performance. In other words measuring the time through stop watch is called time study.
2. **Synthetic data:** A work measurement technique for building up the time for a job or parts of the job at a defined level of performance by totalling element times obtained previously from time studies on other jobs containing the elements concerned or from synthetic data.
3. **Work sampling:** A technique in which a large number of observations are made over a period of time of one or group of machines, processes or workers. Each observation records what is happening at that instant and the percentage of observations recorded for a particular activity, or delay, is a measure of the percentage of time during which that activities delay occurs.
4. **Predetermined motion time study (PMTS):** A work measurement technique whereby times established for basic human motions (classified according to the nature of the motion and conditions under which it is made) are used to build up the time for a job at the defined level of performance. The most commonly used PMTS is known as **Methods Time Measurement (MTM)**.
5. **Analytical estimating:** A work measurement technique, being a development of estimating, whereby the time required to carry out elements of a job at a defined level of performance is estimated partly from knowledge and practical experience of the elements concerned and partly from synthetic data.

### **Time study**

Time study is also called work measurement. It is essential for both planning and control of operations.

According to British Standard Institute time study has been defined as *“The application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance.”*

Stop watch time is the basic technique for determining accurate time standards. They are economical for repetitive type of work.

### **Steps in taking the time study are:**

1. Select the work to be studied.
2. Obtain and record all the information available about the job, the operator and the working conditions likely to affect the time study work.
3. Breakdown the operation into elements. An element is a distinct part of a specified activity composed of one or more fundamental motions selected for convenience of observation and timing.

4. Measure the time by means of a stop watch taken by the operator to perform each element of the operation. Either continuous method or snap back method of timing could be used.
5. At the same time, assess the operator's effective speed of work relative to the observer's concept of 'normal' speed. This is called performance rating.
6. Adjust the observed time by rating factor to obtain normal time for each element

$$\text{Normal time} = \frac{\text{Observed time} \times \text{Rating}}{100}$$

7. Add the suitable allowances to compensate for fatigue, personal needs, and contingencies. etc. to give standard time for each element.
8. Compute allowed time for the entire job by adding elemental standard times considering frequency of occurrence of each element.
9. Make a detailed job description describing the method for which the standard time is established.
10. Test and review standards wherever necessary.

### **Standard time Computation**

Standard time is the time allowed to an operator to carry out the specified task under specified conditions and defined level of performance.

Standard time may be defined as the, amount of time required to complete a unit of work:

(a) Under existing working conditions, (b) using the specified method and machinery, (c) by an operator, able to the work in a proper manner, and (d) at a standard pace.

Thus basic constituents of standard time are:

1. Elemental (observed time).
2. Performance rating to compensate for difference in pace of working.
3. Relaxation allowance.
4. Interference and contingency allowance.
5. Policy allowance.

### **Allowances**

The normal time for an operation does not contain any allowances for the worker. It is impossible to work throughout the day even though the most practicable, effective method has been developed.

Even under the best working method situation, the job will still demand the expenditure of human effort and some allowance must therefore be made for recovery from fatigue and for relaxation.

Allowances must also be made to enable the worker to attend to his personal needs. The allowances are categorised as: (1) Relaxation allowance, (2) Interference allowance, and (3) Contingency allowance.

### **1. RELAXATION ALLOWANCE**

Relaxation allowances are calculated so as to allow the worker to recover from fatigue. Relaxation allowance is a addition to the basic time intended to provide the worker with the opportunity to recover from the physiological and psychological effects of carrying out specified work under specified conditions and to allow attention to personal needs. The amount of allowance will depend on nature of the job.

Relaxation allowances are of two types: fixed allowances and variable allowances.

**Fixed allowances** constitute:

(a) **Personal needs allowance:** It is intended to compensate the operator for the time necessary to leave, the workplace to attend to personal needs like drinking water, smoking, washing hands. Women require longer personal allowance than men. A fair personal allowance is 5% for men, and 7% for women.

(b) **Allowances for basic fatigue:** This allowance is given to compensate for energy expended during working. A common figure considered as allowance is 4% of the basic time.

## **2. VARIABLE ALLOWANCE**

Variable allowance is allowed to an operator who is working under poor environmental conditions that cannot be improved, added stress and strain in performing the job.

The variable fatigue allowance is added to the fixed allowance to an operator who is engaged on medium and heavy work and working under abnormal conditions. The amount of variable fatigue allowance varies from organization to organization.

## **3. INTERFERENCE ALLOWANCE**

It is an allowance of time included into the work content of the job to compensate the operator for the unavoidable loss of production due to simultaneous stoppage of two or more machines being operated by him. This allowance is applicable for machine or process controlled jobs

Interference allowance varies in proportion to number of machines assigned to the operator. The interference of the machine increases the work content.

## **4. CONTINGENCY ALLOWANCE**

A contingency allowance is a small allowance of time which may be included in a standard time to meet legitimate and expected items of work or delays. The precise measurement of which is uneconomical because of their infrequent or irregular occurrence.

This allowance provides for small unavoidable delays as well as for occasional minor extra work:

Some of the examples calling for contingency allowance are:

- a) Tool breakage involving removal of tool from the holder and all other activities to insert new tool into the tool holder.
- b) Power failures of small duration.

Contingency allowance should not exceed 5%.

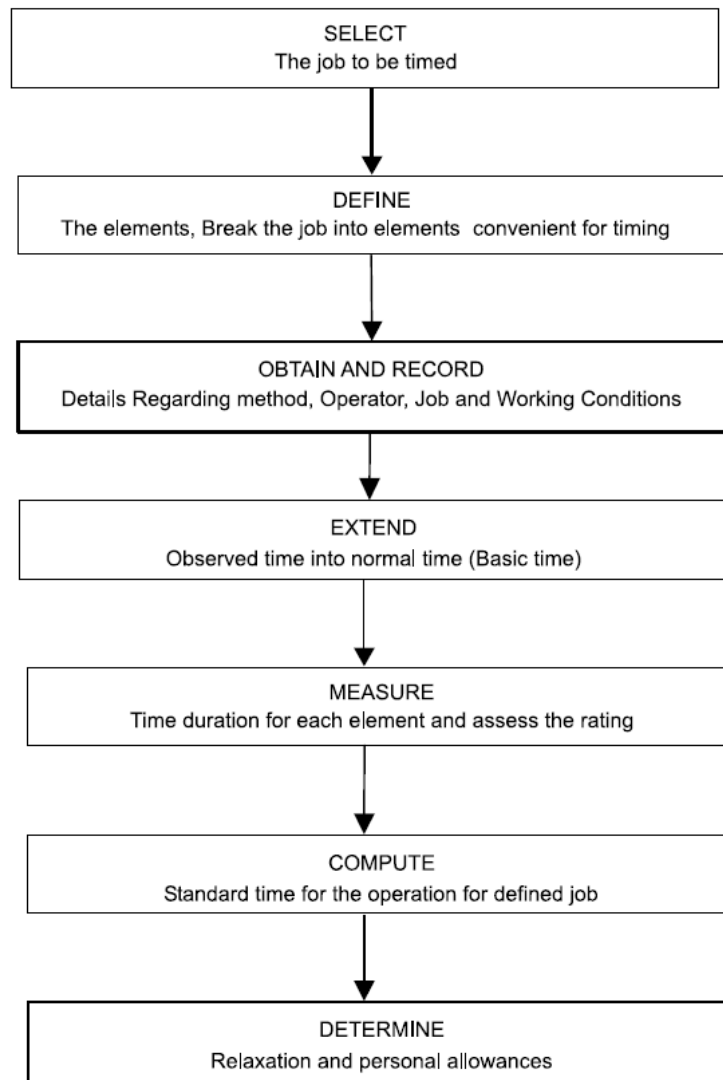
## **5. POLICY ALLOWANCE**

Policy allowances are not the genuine part of the time study and should be used with utmost care and only in clearly defined circumstances.

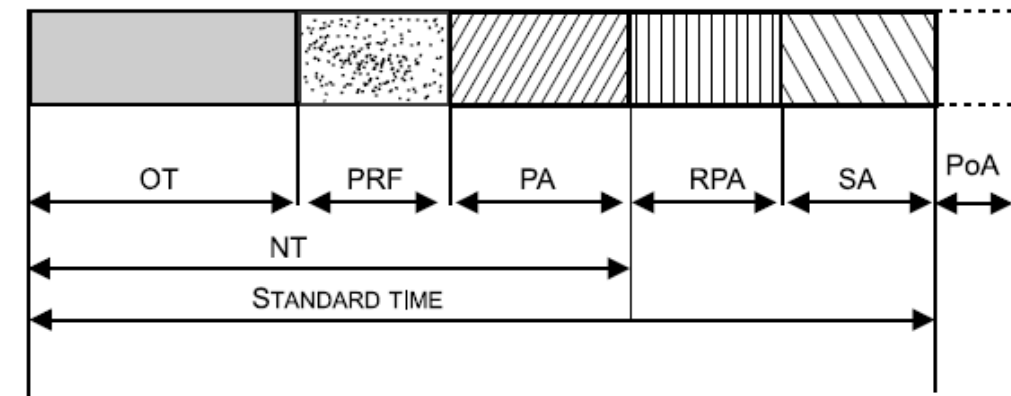
The usual reason for making the policy allowance is to line up standard times with requirements of wage agreement between employers and trade unions.

The policy allowance is an increment, other than bonus increment, applied to a standard time (or to some constituent part of it, *e.g.*, work content) to provide a satisfactory level of earnings for a specified level of performance under exceptional circumstances. Policy allowances are sometimes made as imperfect functioning of a division or part of a plant.

**Time Study Process:**



**Components of Standard Time:**



- |     |   |                              |
|-----|---|------------------------------|
| OT  | – | Observed Time                |
| PRF | – | Performance Rating Factor    |
| NT  | – | Normal Time                  |
| PA  | – | Process Allowances           |
| RPA | – | Rest and Personal Allowances |
| SA  | – | Special Allowances           |
| PoA | – | Policy Allowances            |

## **Production Planning and Control**

A production (or manufacturing) planning and control (PPC) system is concerned with planning and controlling all aspects of manufacturing, including materials, scheduling machines and people, and coordinating suppliers and customers. An effective MPC system is critical to the success of any company. An PPC system's design is not a one-off undertaking; it should be adaptive to respond to changes in the competitive arena, customer requirements, strategy, supply chain and other possible problems

### **Introduction**

For efficient, effective and economical operation in a manufacturing unit of an organization, it is essential to integrate the production planning and control system. Production planning and subsequent production control follow adaption of product design and finalization of a production process.

Production planning and control address a fundamental problem of low productivity, inventory management and resource utilization.

Production planning is required for scheduling, dispatch, inspection, quality management, inventory management, supply management and equipment management. Production control ensures that production team can achieve required production target, optimum utilization of resources, quality management and cost savings.

Planning and control is an essential ingredient for success of an operation unit. The benefits of production planning and control are as follows:

- It ensures that optimum utilization of production capacity is achieved, by proper scheduling of the machine items which reduces the idle time as well as over use.
- It ensures that inventory levels are maintained at optimum levels at all time, i.e. there is no over-stocking or under-stocking.
- It also ensures that production time is kept at optimum level and thereby increasing the turnover time.
- Since it overlooks all aspects of production, quality of final product is always maintained.

### **Factors Affecting Production Planning and Control**

The factors that affect the application of production planning and control to manufacturing are:

#### **Type of Product**

Again, it is the complexity of the product that is important, not what the product is, except as this may in turn relate to the market being served. Production control procedures are much more complex and involve many more records in the manufacture of large steam turbine generator sets or locomotives to customer orders than in the production of large quantities of a standard product involving only a few component parts, such as electric blankets, steam irons, or similar small appliances.

## **Type of Manufacturing**

This is probably the most influential factor in the control situation. For a large continuous manufacturing plant producing a standard product, we have already indicated that the routing was included in the planning of the plant layout.

## **Steps in Production Planning and Control**

### **1. Planning**

The first important step in [production planning and control](#) is concerned with the careful preparation of production plans. Production plans determine what will be produced and where, at what type, by whom, and how. For detailed planning of operations, the relevant information may be obtained from several sources in the enterprise. Information about quantity and quality of products to be manufactured may be obtained from customers' orders and the sales budget, and information about production facilities may be obtained from the management and the engineering department. Thus, the planning function formulates production plans, and translates them into requirements for men, machinery and materials.

Whatever be the planning period, [production planning](#) helps in avoiding randomness in production, providing regular and steady flow of production activities, utilizing production facilities to its maximum for minimizing operating costs and meeting delivery schedules; coordinating various departments of the enterprise for maintaining proper balance of activities, and above all, providing the basis for control in the enterprise.

### **2. Routing**

The next important function of production planning and control is routing which involves the determination of the path (i.e. route) of movement of raw materials through various machines and operations in the factory. "Routing includes the planning of where and by whom work shall be done, the determination of the path that work shall follow, and the necessary sequence of operations". To find this path, emphasis is placed on determining operating data, which usually includes planning of 'where' and 'by whom' work should be done, the determinations of the path that work shall follow, and the necessary sequence of operations. These operating data are contained in the standard process sheet which helps in making out a routing in the standard process sheet which helps in making out a routing chart showing the sequence of operations and the machines to be used. If the machine load chart indicates the non-availability of certain machines, alternate routing may also be included on the routing chart. The most efficient routing may have to be compromised with the availability of the machines at a particular time. In other words, "routing establishes the operations, their path and sequence, and the proper class of machines and personnel required for these operations."

From the above, it can be inferred that routing is one of the highly essential elements and prime considerations of production control because many production control functions are closely related processes and are dependent on routing functions. Thus, it is essential to solve the different problems concerning: appropriate personnel; [full utilization of machines](#); and [determining with precise degree the time required in the production process](#).

### **3. Loading:**

Once the route has been established, the work required can be loaded against the selected machine or workstation. The total time required to perform the operation is computed by multiplying the unit operation times given on the standard process sheet by the number of parts to be processed. This total time is then added to the work already planned for the workstation.

This is the function of loading, and it results in a tabulated list or chart showing the planned utilization of the machines or workstations in the plant.

### **4. Scheduling**

Scheduling is planning the time element of production – i.e. prior determination of “when work is to be done”. It consists of the starting and completion times for the various operations to be performed. In other words, scheduling function determines when an operation is to be performed, or when work is to be completed, the difference lies in the details of the scheduling procedure. To work out effectively, the scheduling, as a part of [production control function](#), determines the time when each operation called for on the route sheet is to be done on the specified machine in order to meet the desired delivery dates. Good control function directs not only the time that each particular operation should start but also indicates the progress of each manufacturing part, the amount of work ahead of each machine, and the availability of each machine for the assignment of new work.

#### **Types of Scheduling**

There are three types of scheduling :

**(1) Master Scheduling :** Master schedule gives the number of units of different products to be produced for the whole year. It gives the units of production for every month for different products. Master schedule is based on the basis of sales forecast. This is the first step in production planning.

**(2) Parts Scheduling :** Parts schedule gives the number of units of different parts to be produced for the given product. The schedule is prepared for a month. It gives the details of production for every week. Parts schedule is prepared on the basis of master schedule.

**(3) Machine Loading Schedule :** Machine loading schedule is the process of work load allocation for various machines. It is a time table for the working of various machines. This schedule is prepared for a period of one week. It gives details of machine loading for every day of the week. This scheduling is prepared on the basis of parts schedule.



### [I] Bar Chart

A pictorial chart, also known as the "Bar Chart" was developed by Henry L. Gantt and is used to deal with complex activities. Out of the various tools or techniques of project management, bar charts technique was probably one of the earliest one. A bar chart consists of two co-ordinate axes, one (usually horizontal axis) represents the time elapsed and the other (vertical axis) represents the jobs or activities to be performed. Each bar represents one specific job or activity of the project. The beginning and end of each bar represents the time of start and time of finish of that activity. The length of the bar shows the time required for the completion of that job or activity. Mostly, in every project there are some jobs/activities which can take place concurrently, while, there are some activities that succeed a preceding activity and cannot be started unless the preceding activity is complete. Hence, in a bar chart, some of the bars run parallel or overlap each other time-wise and some run serially with one bar beginning after another bar ends.

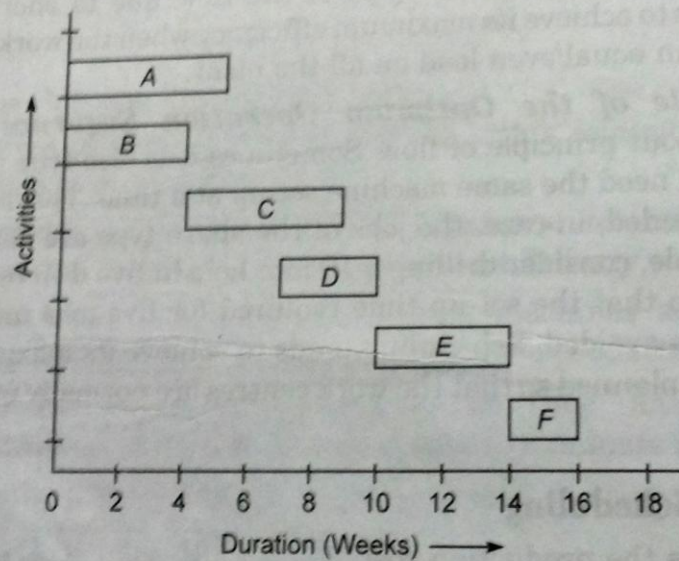


Fig. (2) Bar Chart

Figure (2) shows a bar chart for a project which has six distinct jobs or activities (A, B, C, D, E, F). The time required for the completion of these activities are 5, 4, 5, 3, 4 and 2 weeks respectively. From the chart we conclude that :

- (1) Activities A and B can start simultaneously (at the same time). Both the activities are independent. They proceed in parallel, through they take different time for their completion.
- (2) Activity C starts only when activity B is complete.
- (3) However, activity D is independent of activity C. It starts 2 weeks later than C and
- (4) Activity E starts only after activity D is completed.
- (5) Activity F starts after all other activities are completed.



### [II] Gantt Chart

The Gantt charts were also developed by Henry L. Gantt. Their purpose is to provide an immediate comparison between schedule and reality (*i.e.*, between planned work and actual progress of the work). This is achieved simply by marking on the chart the planned work and the actual progress of the work.

The Gantt chart is actually a modified bar chart in which horizontal bars are drawn for each activity in proportion to the time required for completing it. A cursor attached to the Gantt chart can be moved across the chart to compare between the actual progress and planned work till any particular date.

There are basically two *types of Gantt charts* :

- (1) Order/Activity progress chart.
- (2) Machine Load chart.

In Gantt chart, time in weeks or days is marked along the horizontal axis and the activities or orders are represented along the vertical axis. The amount of work planned or scheduled is marked by the firm lines or blank areas and the actual progress of the work by dotted lines or shaded areas.

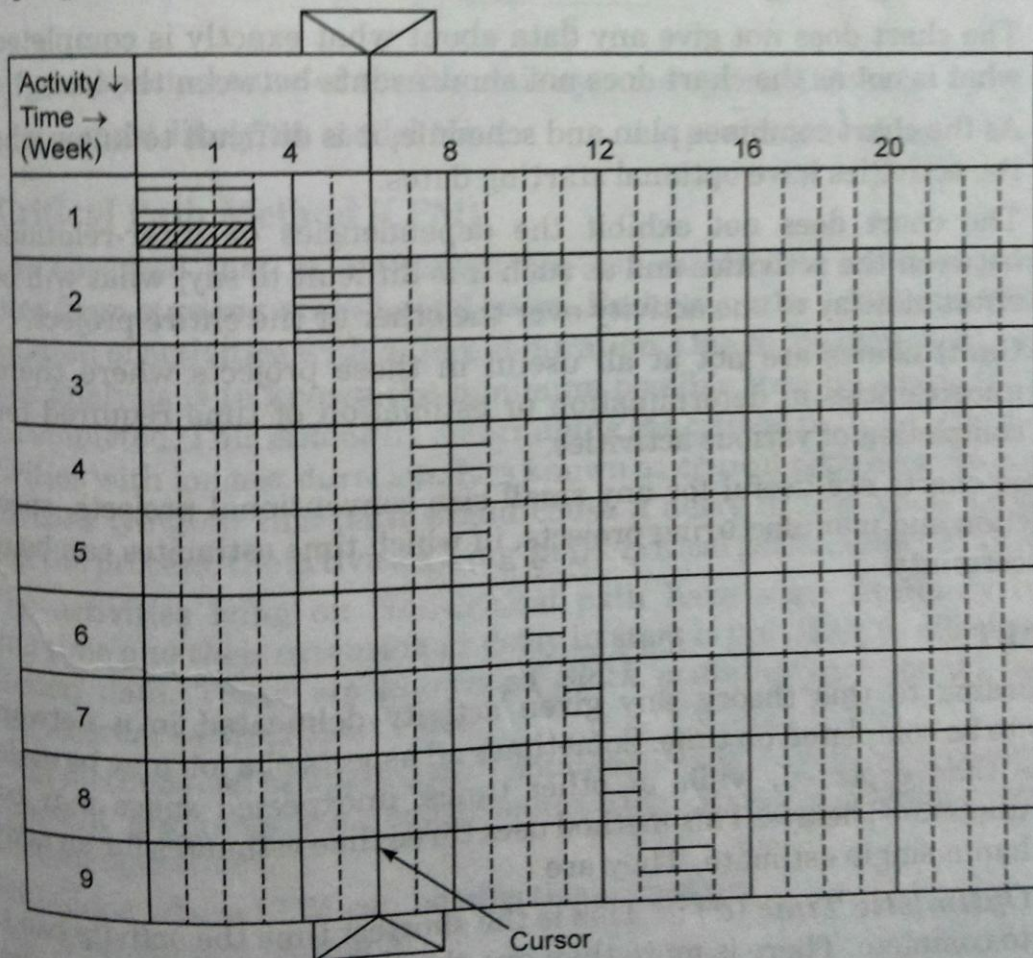


Fig. (3) Gantt Progress Chart

### 5. Dispatching

Dispatching is the part of production control that translates the paper – work into actual production. It is the group that coordinates and translates planning into actual production. Dispatching function proceeds in accordance with the details worked out under routing and scheduling functions. As such, dispatching sees to it that the material is moved to the correct work place, that tools are ready at the correct place for the particular operations, that the work is moving according to routing instructions. Dispatching carries out the physical work as

suggested by scheduling. Thus, dispatching implies the issuance of work orders. These work orders represent authority to produce. These orders contain the following information:

- The name of the product;
- The name of the part to be produced, sub-assembly or final assembly;
- The order number;
- The quantity to be produced;
- Descriptions and numbers of the operations required and their sequence,
- The departments involved in each operation
- The tools required for particular operation; and
- Machines involved in each operation and starting dates for the operations.

## **6. Expediting**

Expedition or follow-up is the last stage in the process of production control. This function is designed to keep track of the work effort. The aim is to ensure that what is intended and planned is being implemented. "Expediting consists in reporting production data and investigating variances from predetermined time schedules. The main idea behind expedition is to see that promise is backed up by performance". It includes the following functions:

1. Check-up to ensure that all materials, tools, component parts, and accessories are available at all work centers in specified quantities for starting and carrying out manufacturing operations.
2. Check-up on the status of work-in-progress and completed work at various work stations. This includes collecting information relating to the starting and completion time and date of work completed, status of work-in-progress relative to scheduled completion dates, position of movements of materials, component parts, and sub-assemblies within the plant, and inspection results.
3. Preparation of progress records and keeping the control boards up-to-date.
4. Reporting to manufacturing management on all significant deviations so that corrective action may be taken. It also includes reporting to production planning department so that future plans may be adjusted.

Thus production planning and control by completing the above discussed phases ensures the manufacturing of goods of right quality, quantity and at competitive market rates. One thing must be borne in mind that production planning and control is a never-ending process, and its various functions are inter-dependent.