

MANAGEMENT SCIENCE

UNIT-1

INTRODUCTION TO MANAGEMENT

Introduction to Management: When human being started group activities for the attainment of same common objectives whenever a group is formed and a group activity is organized to achieve certain common objectives management is needed to direct, co-ordinate and integrate the individual activities of a group and secure teams work to accomplish organizational objectives. The objectives of all business are attained by utilizing the scarce resources like men, materials, machines, moneyetc.

In process of management, a manager uses human skills, material resources and scientific methods to perform all the activities leading to the achievement of goods.

Definition: “Management is knowing exactly what you want men to do and then seeing that they do it the best and cheapest ways”.

F.W.Taylor

“Management is defined as the creation and maintenance of an internal environment in an enterprise where individuals working together in groups, can perform efficiently and effectively towards the attainment of group goals”.

Koontz and O’Donell

Nature of Management: The study and application of management techniques in managing the affairs of the organization have changed its nature over the period of time.

Multidisciplinary: Management is basically multidisciplinary. This implies that, although management has been developed as a separate discipline, it draws knowledge and concepts from various disciplines. It draws freely ideas and concepts from such disciplines as psychology, sociology, anthropology, economics, ecology, statistics, operations research, etc. Management integrates the ideas and concepts taken from these disciplines and present newer concepts which can be put into practice for managing the organization.

Dynamic nature of principle: Based on integration and supported by practical evidences, management has formed certain principles. However, these

principles are flexible in nature and change with the changes in the environment in which an organization exists.

Relative, not absolute principles: Management principles are relative, not absolute, and they should be applied according to the need of the organization. Each organization may be different from others. The difference may exist because of time, place, socio-cultural factors, etc.

Management Science or Art: There is a controversy whether management is science or art. However, management is both a science and art.

Management as profession: Management has been regarded as profession by many while many have suggested that it has not achieved the status of a profession.

Characteristics of Management:

Setting goals for organizations: Goals differ from organization to organization in business, the basic economic goal is to earn maximum profit, while in service organization like hospital and educational institution for the basic goal is to provide better service and better education.

Awareness of opportunities and resources: Management has awareness of opportunities and resources like men, materials, money which assembles and integrates by management.

Management is transformation process: Management is a transformation process consisting of planning, organizing, staffing, directing and controlling. Management

is universal: The principles and techniques of management are universally applicable to all group activities performed at any level of organization.

System of authority: System of authority means a hierarchy of command and control. Managers at different levels possess varying degrees of authority.

Co – Ordination: Various human beings organized in formal groups are endeavoring to achieve the common organizational objectives, so various departments in the organization must work in harmony with one another.

Management is Dynamic: The ever changing social environment directly and indirectly affects the group activity thus changing environments provide a

challenge to management. Efficient management can not remain static it must adopt it self to changing conditions.

Management is decision making: The managers are decision makers the marketing managers decides about how to market, when to market, where to market how to collect funds for organization.

Management is a profession: Management is not only a science but also an art. Art means managers has to handle the person and things tactfully. Science means achieving objectives through procedures

Importance of Management: “No ideology, no ism, or political theory can win greater output with less efforts from a given complex of human and materials resource only sound management And it is on such greater output that a higher standard of life, more leisure, more amenities for all must necessarily be found”.

Effective utilization of resources: Management tries to make effective utilization of various resources. The resources are scarce in nature and to meet the demand of the society, their contribution should be maximum for the general interests of the society. Management not only decides in which particular alternative a particular resource be used but also takes actions to utilize it in that particular alternative in the best way.

Development of resources: Management develops various resources. This is true with human as well as non-human factors. Most of the researches for resource development are carried on in an organization way and management is involved in those activities.

To incorporate innovations: Today changes are occurring at a very fast rate in both technology and social process and structure these changes need to be incorporated to keep the organizations alive and efficient. Therefore, they require high degree of specialization, high level of competence, and complex technology. All these require efficient management so that organizations work in the most efficient way.

Integrating various interest groups: In the organized efforts, there are various interest groups and they put pressure over other groups for maximum share in the combined output. For example, in the case of business organization, there are various pressure groups such as shareholders, employees, government etc. These interest groups have pressure on an organization.

Stability in the society: Management provides stability in the society by changing and modifying the resources in accordance with the changing environment of the society. In the modern age, more emphasis is on new inventions for the betterment of human beings. These inventions make old systems and factors mostly obsolete and inefficient. Management provides integration between

traditions and new inventions and safeguards, society from the unfavorable impact of these inventions so that continuity in social process is maintained.

Levels of Management:

1. TopManagement
2. Upper Middlemanagement
3. MiddleManagement
4. LowerManagement
5. Operating Force or Rank and fileworkmen

Top Management includes:

- a) Board ofdirectors
- b) Managingdirectors
- c) Chiefexecutives
- d) GeneralManager
- e) Owners
- f) Share holders

Functions:

- a) Setting basic goals andobjectives
- b) Expanding or contractingactivities
- c) Establishingpolicies
- d) Monitoringperformance
- e) Designing/Redesigning organizationsystem
- f) Shouldering financial responsibilitiesetc.

upper Middle Management includes:

- a) Salesexecutives
- b) Productionexecutives
- c) Financeexecutives
- d) Accountsexecutives
- e) R & D executives_

Functions:

- a) establishment of theorganization
- b) Selection of staff for lower levels of management

- c) Installing different departments
- d) Designing operating policies and routines
- e) Assigning duties to their subordinates

Middle Management includes:

- a) Superintendent
- b) Branch Managers
- c) General foremen etc.

Functions:

- a) To cooperate to run organizations smoothly
- b) To understand interlocking of department in major policies
- c) To achieve coordination between different parts of the organization
- d) To conduct training for employee development
- e) To build an efficient company team spirit

Lower Management includes:

- a) Foremen
- b) Supervisors or charge-hands
- c) Office Superintendent
- d) Inspectors etc.

Functions:

- a) Direct supervision of workers and their work
- b) Developing and improving work methods and operations
- c) Inspection function
- d) Imparting instruction to workers
- e) To give finishing touch to the plans and policies of top management
- f) To act as link between top management and operating force
- g) To communicate the feelings of workers to the top management.

Operating force includes:

- a) Workers
- b) Rank and file workman
- c) Skilled and Semi-skilled workers
- d) Unskilled

workers

Function:

- a) To do work on machines or manually, using toolsetc.
- b) To work independently (incase of skilled workers) or underthe guidance ofsupervisor.

Functions of Management:

Planning: Involves selecting the objectives and actions to achieve them. The planning stage involves decision making and choosing future courses of action from the various alternatives.

Organizing: Role of each person in any organization is fixed. The concept of role is who will be doing what should be known, to achieve organizational targets efficiently. It is intended that all the tasks necessary to achieve targets are assigned to people who can do the best.

Staffing: Staffing function includes keeping the various organizational positions fixed. This activity is done by identifying work force requirements, keeping the records of the performance of people working with the organization. So that suitable people can be promoted and at the same time people performing not up to the mark could be sent for training. If all the above activities are taking place in a nice way in any organization, it will give rise to a minimum work force turnover.

Directing: Directing means influencing people, so that they will contribute to the organization's targets. Directing involves motivation, leadership styles and proper communication.

Controlling: It is the process of comparing the plans with the results. If there is deviation, action is taken to bridge the gap between plan and actual results. **Coordinating:** The essence of management is the achievement of coordination among people. Coordination is a complex process following the principles by which organization activity can be accomplished. Coordination is possible only if all the personnel working in the organization accept the target of the organization. This target must be clearly defined and „sold“ to every one concerned.

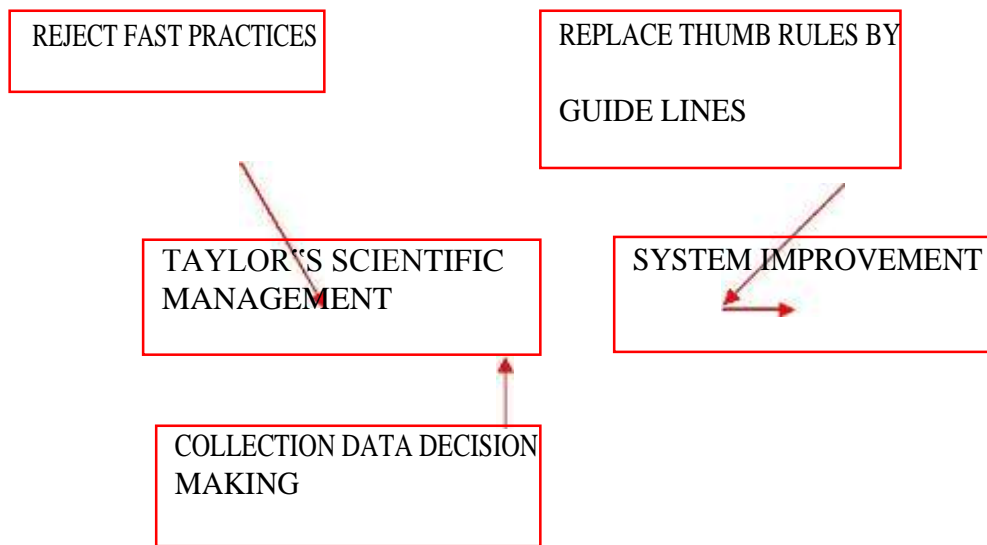
Evolution of Management Theory: Good management intends to achieve an objective with the least use of man, machine, money and material and at the same time maximum satisfaction of the participants.

Taylor's Scientific Management: The utility of scientific methods to problems of management was first introduced by F.W. Taylor.

Definition: Scientific management may be defined as the “Art of knowing exactly what is to be done and the best way of doing it”.

Scientific management is the result of applying scientific knowledge and scientific methods to the various aspects of management and the problems that arise from them.

Principles of Scientific Management: Taylor through his principles of scientific management initiated a system in which there would be an effective and fruitful coordination and cooperation between the management and the workers.



Development of Science for each element of work: Analyze the work scientifically, rather than using thumb rule. It means that an attempt is made to find out what is to be done by a particular worker, how he is to do it, what equipment will be necessary to do it. This information is provided to the worker, so as to reduce wastage of time, material etc. and improve the quality work Scientific selection, placement and training of workers: This principle states that select the workers best suited to perform the specific task, and then train them within the industry in order to attain the objectives of the enterprise workers should also be trained from time to time to keep them informed of latest development in the techniques of production.

Division of Labour: division of work in smaller tasks and separation of thinking element of job from doing element of the job, this is the principle of specialization. It is essential for efficiency in all sphere of activities as well as in supervision work

Standardization of methods, procedures, tools and equipment: Standardization helps in reducing time, labour and cost of production. The success of scientific management largely depends upon standardization of system, depends upon standardization of system, tools, equipments and techniques of production

Use of time and motion study: Taylor's introduced time and motion study to determine standard work. Taylor's undertook studies on fatigue, incurred by the workers and the time necessary to complete task.

Differential wage system: Taylor's differential piece rate scheme provides an incentive for a worker to achieve high level of optimum output. It distinguishes the more productive workers from less productive workers and motivates them to produce more.

Cooperation between labour and management: Mutual respect and cooperation between the workers and management helps in providing proper and effective leadership. The labour starts thinking that it is their work and they must put their heart in the work assigned to him.

Principle of Management by Exception: Taylor suggested that only major or significant deviations between the actual performance and standard performance should be brought to the notice of top management. Top management should pay more attention to those areas of work where standards and procedures could not be established and where there is a significant variation between standard performance and actual performance.

Administrative Management Theory (Henri Fayol and Others):

Henri Fayol is called as father of Modern Management

He established the pattern of management and the pyramidal form of organization. He pointed out that technical ability is more dominating on the lower level of management managerial ability is more important on the higher level of management.

Henri Fayol analyzed the process of management and divided the activities of an industrial undertaking into six groups

1. Technical activities
2. Commercial activities
3. Financial activities
4. Security activities
5. Accounting activities
6. Managerial activities

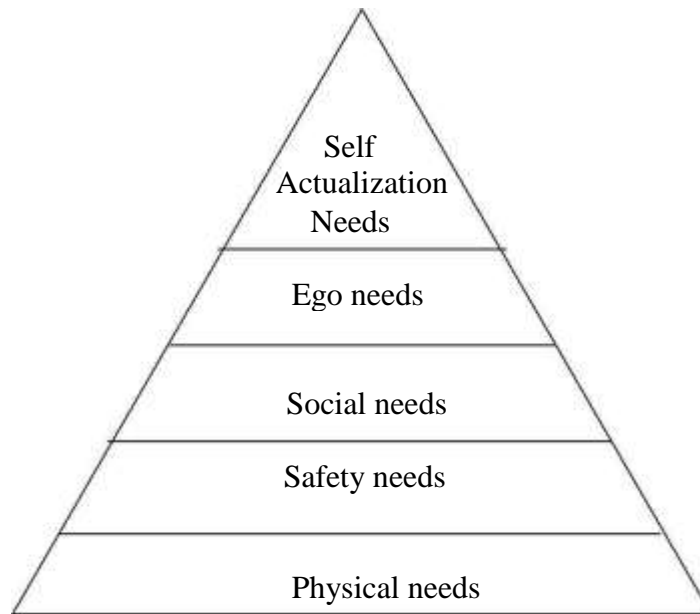
Elton Mayo: Elton Mayo generally recognized as father of human relations approach Mayo led the team which conducted the study psychological reaction of workers in on-the job situations Mayo concluded that work arrangements in addition to meeting the objective requirements of production must at the same time satisfy the employees subjective requirement of social satisfaction at his work place.

Maslow's Theory:

Maslow's level of hierarchy about human relations and behavioral science approach, his assumptions are based mainly on theory of „Human Needs“, he has defined five level of hierarchy of needs starting from the biological need and then coming to more intangible ones.

1. Physical needs like food, clothes and shelter
2. Safety needs freedom from fear of insecurity
3. Social needs include a sense of being accepted in the society or environment one finds himself in.
4. Ego needs include feeling of important and recognition

5. Self actualization needs include need or desire for personal fulfillment of individual potential and activity.



Douglas McGregor Theory: He divides leadership into two styles labeled theory “X” and theory “Y”. The traditional styles of leadership and controls stated in theory „X“ by McGregor, is exercised to managers on the basis of his assumptions about human beings. These assumptions as laid down or observed by McGregor for theory „X“ are Theory “X”:

1. An average human being does not like to work and he tries to avoid it as far as possible.
2. He avoids accepting responsible and challenging tasks, has no ambition but wants security above all.
3. Because of this, the employees are to be forced, concerned and threatened with punishments to make them put their best effort

These people would not work sincerely and honestly under democratic conditions.

However the above assumptions are not based on research findings. The autocratic style basically presumes that workers are generally lazy, avoid work and shirk responsibilities. It is believed that workers are more interested in money and security based on these assumptions the leadership styles developed, insist on tighter control and supervision.

Theory of "Y":

It focuses on a totally different set of assumptions about the employees

1. Some employees consider work as natural as play or rest.
2. These employees are capable of directing and controlling performance on their own
3. They are much committed to the objectives of the organization
4. Higher rewards make these employees more committed to the organization.
5. Given an opportunity they not only accept responsibility but also look for opportunities to outperform others.
6. Most of them are highly imaginative, creative and display ingenuity in handling organizational issues.

System Approach to Management:

Modern approaches to understand

management is the systems approach. Here the organization is viewed as a system. Every department is considered as a sub-system, it is also possible that every department can be viewed as a system and every section in the department can be viewed as a sub-system, system approach helps to study the basic feature and functions of the organization its minutest details.

The collection of interrelated parts called as sub-system which constitutes one whole unit. System approach facilitates the study of each of these parts in detail to have a close understanding of the whole system.

Ex: Every part of the study such as the eyes, brain, and heart can also be viewed as a sub-system, a study of each of the parts of the body is necessary to understand the whole body.

Herzberg's Two-factors Theory: Maslow's theory has been modified by Herzberg and he called in two-factors theory of motivation. According to him the first group of needs are such things as company policy and administration, supervision, working conditions, interpersonal relations, salary, status, job security and personal life.

“Herzberg called these factors as „dissatisfiers“ and not motivators, by this he means their presence or existence does not motivate in the sense of yielding satisfaction, but their absence would result in dissatisfaction. These are also referred to as „hygiene“ factors.

In the second group are the „satisfiers“ in the sense that they are motivators, which are related to „Job content“. He included the factors of achievement, recognition, challenge work, advancement and growth in the job. He says that their presence will yield feelings of satisfaction or no satisfaction, but not dissatisfaction.

Maintenance factors or dissatisfier

Motivational factor or satisfier

Job context

Job content

Company policy and Administration

Achievement

Quality of supervision

Recognition

Relations with supervision

Advancement

Relationswithsubordinates

Possibility ofgrowth

Pay

Responsibility

Leadership and Leadership Styles:

Leader:

One who leads a given group or team of people is called leader. If you can influence people to perform better in a given organizational setting, that means you are a leader.

Leadership is ability to influence people to achieve the given goals in an organization.

A true leader is one who shares success with followers and absorbs all failures.

A manager has to be a mini-leader (he has to inspire his subordinates and get work done) and leader to be a mega-leader (otherwise he does not understand the ground realities of functioning)

Leadership Styles: Leader has to ensure that people under his guidance are comfortable and their good work is recognized.

A good leader has to adopt such a style of working that takes care of people around him. There are also some leader who do not care for people and who care more for the taskcompletion.

Types:

Autocratic leadership: Here, leader command the followers and expects compliance from them for all the instructions given, leaders are more dogmatic and positive. They lead by his ability to withhold or give rewards or punishments. Here, no suggestions from the followers are entertained and almost to-down approach is seen. They direct others. They do not allow any participation.

Democratic leadership: Here leaders consult subordinates and involve them in decision making. They encourage discussion with the group leaders believes in two-way communication. They listen to followers; try to facilitate the decision making.

Free – Rein leadership: Free – Rein leaders exercises little authority and give maximum freedom to subordinates while making decisions. It is a bottom-up

approach. Suggestions from the followers are encourage and rewarded. They give high degree of independence subordinates in their operations.

Social Responsibility: Social responsibility refers to the process which includes several activities from providing safe products and services to giving apportion of the company's profits to welfare organizations.

Responsibility towards shareholders: The business enterprise has the responsibility to provide fair return on capital to the shareholders. The firm must provide them regular, accurate, and full information about the working of enterprise in order to fulfill and encourage their interest in the affairs of the company.

Responsibility towards consumers: The management has to provide quality products and services to the customers at reasonable prices. It should consider customer suggestions and also plan its services more effectively through consumer satisfaction survey.

Responsibility towards employees: Good working conditions motivate workers to contribute their best. It is the responsibility of the management to recognize their unions and respect their right to associate with a union of their choices.

Responsibility towards creditors: The business has to repay the loans it has taken from the financial institutions as per the repayment schedule. Also, it should inform the creditors about the developments in the company from time-to-time.

Responsibility towards Government: The business firm has to pay its taxes and be fair in its endeavours. It should also support the government in community development projects.

Responsibility towards competitors: The business firm should always maintain the highest ethical standards and maintain cordial relations with each of the competitors, which is a critical and sensitive segment.

Responsibility towards public: Business units have tremendous responsibility towards the general public to support the cause of community development. Most of the companies maintain public relations departments exclusively to maintain good relations with the community.

DESIGNING ORGANISATIONAL STRUCTURES

Organization:

Organization is form of organizing which is a part of management process

Organization defied as collectivity of people for achieving common

and also the establishment and the maintenance of authority relationships among these grouped activities it is the structural frame work with in which the various efforts are coordinated and related to each otherll.

Definitions:—Organizationarecollectivitiesofpeoplethathavebeenestablished for the pursuit of relatively specific objectives on a more or less continuous basisll.

William Scott

—Organizationistheformofeveryhumanassociationfortheattainmentof a commonpurposell.

__MooneyandReilly-Organization involves the grouping of activities necessary to accomplish goals and plans assignment and these activities toappropriate departments and

positions to appropriate departments and positions for authority delegation and coordinationll.

Koontz and O'Donnell

Organization is used in the following ways with or without prefix or suffix

- g) asentity
- h) as group ofpeople
- i) asstructure
- j) as process

Process of Organization:

Determination of objectives, strategies, plans and policies: Objectives should be clear and precise, because the entire organization is to be built around the objectives of the enterprises.

Determination of activities: Determine activities needed to execute these plans and policies and accomplish the objectives. The work load is broken into component activities that are to be performed by all the employees. The activities are so split to determine the job which can be performed by an individual.

Separation and grouping of activities: To attain the benefits of specialization and division of labour, every company, will separate its activities on the basis of primary functions like finance, engineering, purchasing, production, sales and industrial relations. All the similar or directly related activities are grouped together in the form of departments.

Delegation of authority: Authority is necessary for the performance of the job and therefore authority is delegated to the subordinates for enabling them to carry out their work smoothly and efficiently.

Delegation of responsibility: Responsibility may be described as the obligation and accountability for the performance of delegated duties. A superior is always accountable for the acts of his subordinate. Therefore, responsibility always flows from subordinates to superiors.

Establish inter-relationships: The grouped activities are placed in the overall organization structure at appropriate level. It is necessary to integrate or the these groups of activities through.

- a) Authority relationship horizontally, vertically and diagonally
- b) Organized information or communication system i.e., with the help of effective coordination and communication.

Providing physical facilities and proper environment: Physical facilities means provide machinery, tools equipments, infrastructure etc, environment means provide proper lighting, ventilation, heating, cooling arrangement at the work place, reasonable hours of work, safety devices, job security etc

Principles of Organization:

Principle of unity of objectives: An organization structure is effective if it enables individuals to contribute to entire objectives.

Principle of co-ordination: The aim of the objective can be achieved if proper co-ordination exists for different activities.

Principles of organizational efficiency: An organization is efficient if it is structured to aid the accomplishment of enterprise objective with a minimum of unwanted consequences or costs.

Span of management principle: In each managerial position, there is a limit to the number of persons an individual can effectively manage but the exact number will depend on the impact of underlying variables.

Scalar principle: The clearer the line of authority from the ultimate management position in an enterprise to every subordinate position, the clearer will be the responsibility for decision making the more effective will be organization communication.

Principle of delegation by results expected: Authority delegated to all individual managers should be adequate enough to ensure their ability to accomplish the results expected.

Principle of responsibility: The responsibility of subordinates to their superiors for performance is absolute, and superiors can not escape responsibility for the organization activity of their subordinates.

Principle of parity of authority and responsibility: The responsibility for actions can not be greater than that implied by the authority delegated, nor should it be less.

Principle of unity command: The more complete an individual's reporting relationships to a single superior, the smaller the problem of conflicting instructions and the greater the feeling of personal responsibility for results.

Authority level principle: Maintenance of intended delegation requires that decisions within the authority of individual managers should be made by them and not be referred upward in the organization structure.

Principle of balance: The application of principles or technique must be balanced to ensure the over all effectiveness of the structure in meeting enterprise objectives.

Principle of flexibility: the more that provisions are made for building flexibility in to an organization structure can fulfill its purpose.

Principle of leadership facilitation: The more an organization structure and its delegations of authority enable managers to design and maintain an environment for performance, the more they will help the leadership abilities of those managers.

Design of Organization structure: The main objective of an organization structure is to ensure that efforts of all the people working in various sections are co-ordinate and integrated for achieving the task in the most efficient effective way with minimum consumption of resources i.e. economical ways

1) Formal organization structure 2) Informal organization structure

Formal organization structure: According to classical theorists the formal organization is built on four pillars

- 1) Division of labour
- 2) Scalar functional processes
- 3) Structure
- 4) Span of control

Definition: An organization is formal when the activities of two or more persons are consciously coordinated towards common objectives.

Informal organization: Informal organization arises spontaneously based on friendship or some common interest and not based on rules, regulation and procedures. It is developed by the employees themselves and not by the formal authority.

Definition: Informal organization brings cohesiveness to a formal organization, it brings to the members of formal organization a feeling of belonging of status, of self-respect and of gregarious satisfaction.

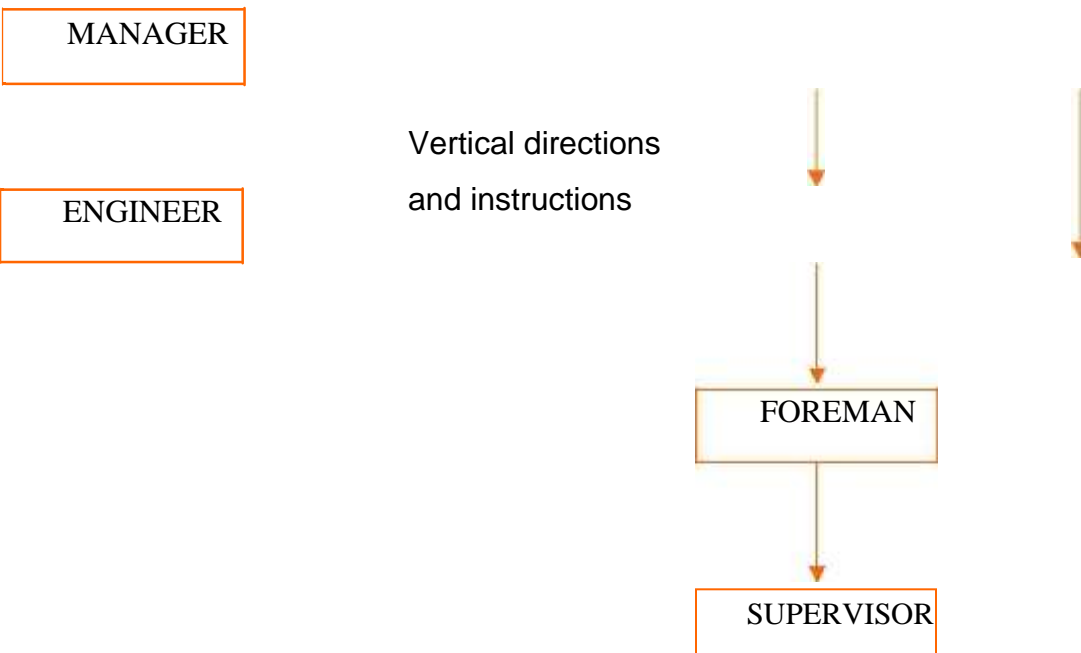
Comparison between formal and informal organization:

Basis of comparison	Formal	Informal
Formation	Planned & deliberated	Spontaneous
Purpose	Well-set goals	Social interaction
Structure	Well structured	Un structured
Focus	Positions	Persons
Nature	Official	Unofficial
Leadership	Superior	Any one
Source of power	Delegated	Given by group
Guidelines for behaviour	Rules procedures	Group norms
Source of control	Rewards/Punishment	Sanctions

Type of organization: On the basis of authority relationships organization classified as follows

1. Line organization or Military organization or Scalar organization
2. Functional organization
3. Line and Staff organization
4. Project organization
5. Committee organization
6. Matrix organization

Line organization:



Where efforts of large number of people have to be controlled and discipline is of prime importance line type organization structure will serve the purpose. This is also one of the oldest structures. However, in present conditions this type of structure has lost the applicability. In line structure ten lines of instruction, directing is vertical. This means in this type boss is always right and his orders are to be obeyed at any cost.

Merits:

Simplicity: Line organization is very simple to establish and can be easily understand by the employees

Discipline: Since each position is subject to control by its immediate superior position, often the maintenance of discipline is easy unity of command and unity of direction foster discipline among the people in the organization.

Co-ordination: The hierarchy in management helps in achieving effective coordination

Effective communication: There will be a direct link between superior and his subordinate; both can communicate properly among himself or herself.

Economical: Line organization is easy to operate and less expensive

Unity of command: In line organization every person is under the command of one boss only.

Prompt decision: Only one person is in charge of one division or department. This enables manager to take quickdecisions.

Over all development of the managers: The departmental head has to look after all the activities of his department; therefore, it encourages the development of all round managers at the higher level of authority.

Demerits:

Undue reliance: The success of the enterprise depends upon the caliber and ability of few departmental heads, loss of one or two capable men may put the organization in difficulties.

Personnel limitations: In this type of organization an individual executive is suppose to discharge different types of duties. He cannot do justice to all different activities because he cannot be specialized in all thetrades.

Overload of work: Departmental heads are overloaded with various routine jobs hence they can not spare time for important managerial functions like planning, development budgeting etc.

Dictatorial way: In line organization, too much authorities centre on line executive. Hence it encourages dictatorial way of working.

Duplication of work: Conflicting policies of different departments result in duplication of work.

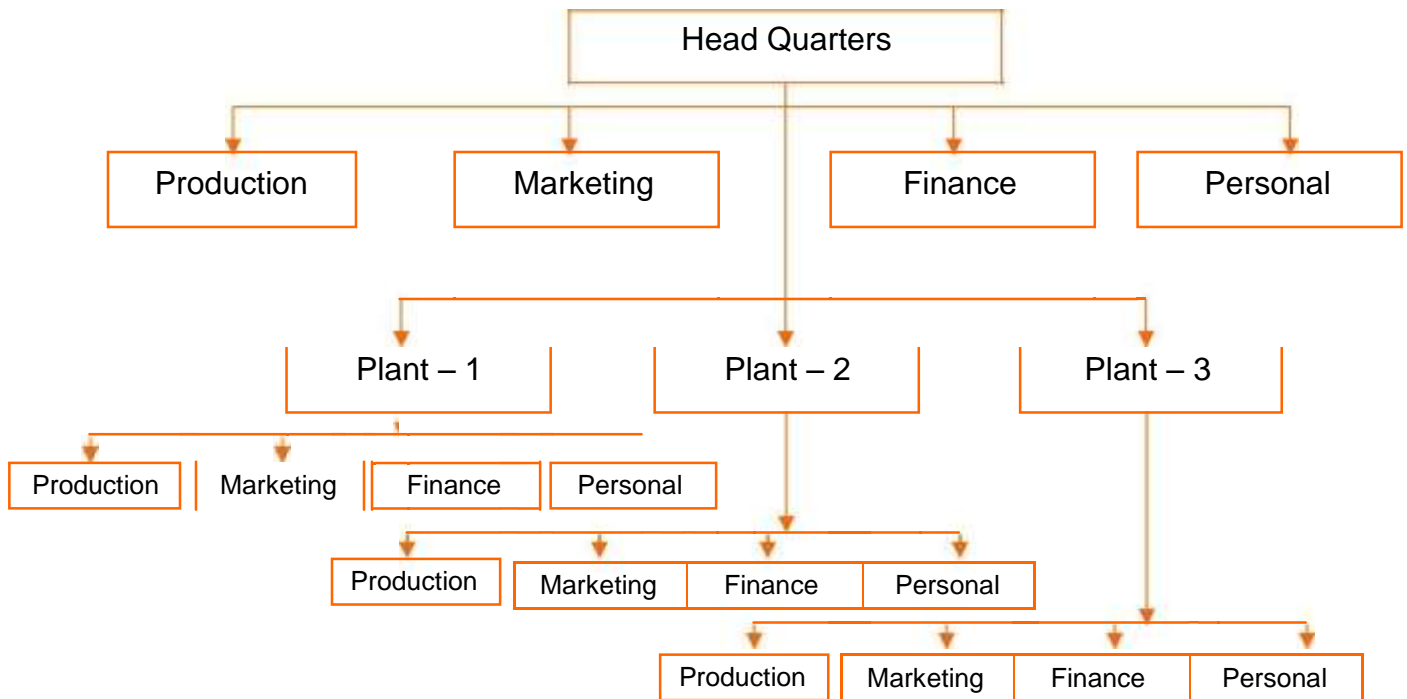
Unsuitable for large concerns: It is limited to small concerns

General interest of enterprise may be over looked: Departments may work for their self-interest and may sacrifice the general interest of the enterprise.

Scope of favourism: As the departmental heads has the supreme authority, there is chance of favourism.

Functional organization: This structure most widely used, in the medium and large organizations having limited number of products.

This was introduced by F.W.Taylor and is logical extension of the division of labour cover departments as well as men. In this authority is delegated to an individual or department to control specified processes, policies or other matter relating to activities under taken by persons in other departments.



In this system planning is separated from performance since the direction of work is divided by various function in the factory. It has been found that this type of structure becomes ineffective when the work of departments and individuals increases in variety and complexity.

Merits:

Separation of work: In functional organization, work has been separated from routine work. The specialist has been given the authority and responsibility for supervision and administration pertaining to their field of specialization unnecessary over loading of responsibilities is thus avoided.

Specialization: Specialization and skilled supervisory attention is given to workers the result is increase in rate of production and improved quality of work.

Narrowrange with high depth: The narrow range of activities enable the functional expert to developing in depth understanding in his particular area of activity

Ease in selection and training: Functional organization is based upon expert knowledge. The availability of guidance through experts makes it possible to train the workers properly in comparatively short span of time.

Reduction in prime cost: Since for every operation expert guidance is there, wastage of material is reduced and thus helps to reduce prime cost.

Scope of growth and development of business: This type of organization presents ample scope for the growth and development of business.

Demerits:

Indispline: Since the workers receive instructions from number of specialist it leads to confusion to whom they should follow. Therefore, it is difficult to maintain discipline

Shifting of responsibility: It is difficult for the top management to locate responsibility for the unsatisfactory work every body tries to shift responsibility on others for the faults and failure.

Kills the initiative of workers: As the specialized guidance is available to the workers the workers will not be using their talents and skills therefore their initiative cannot be utilized.

Overlapping of authority: The sphere of authority tends to overlap and gives rise to friction between the persons of equal rank.

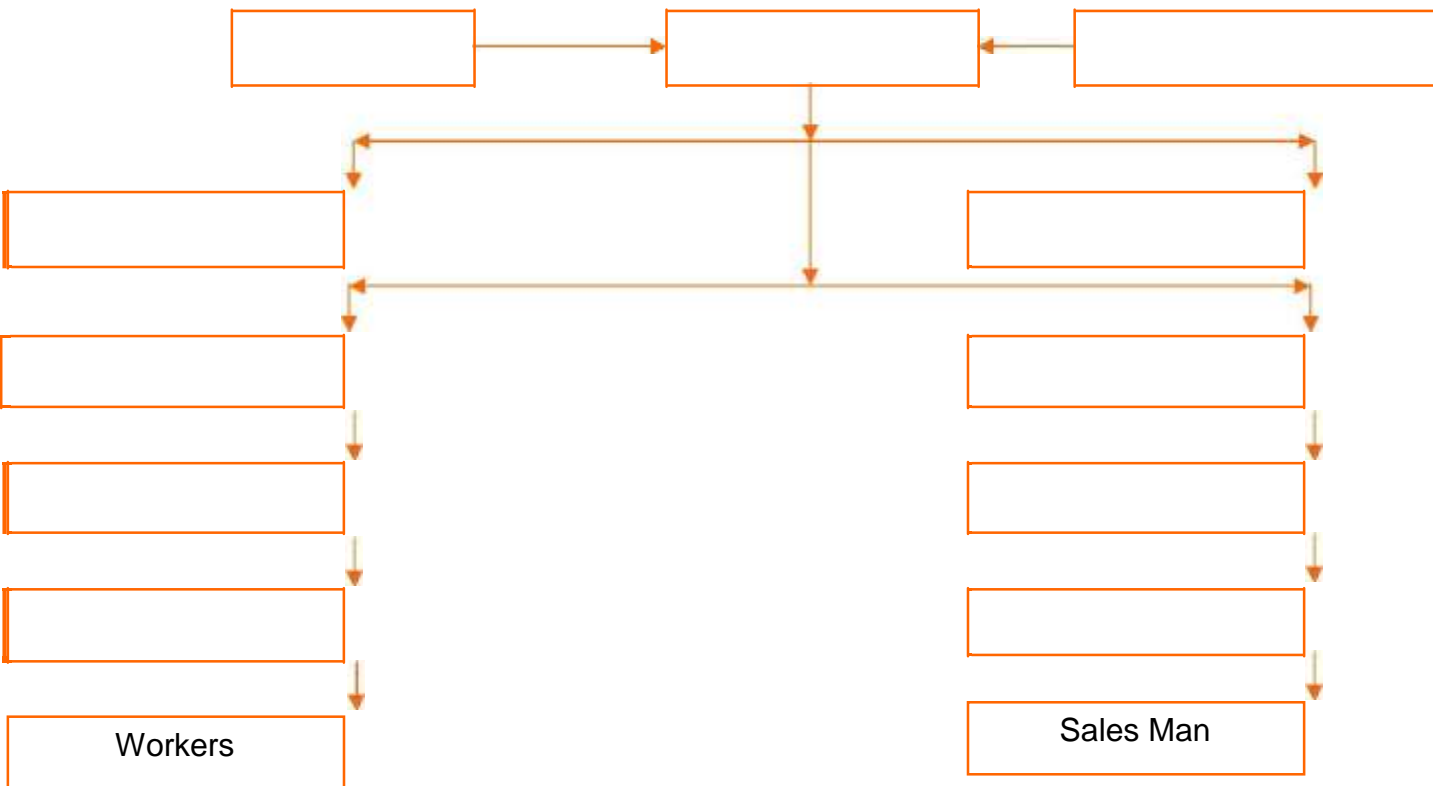
Lack of co-ordination between functions: except the function in which he is specialized he is absolutely indifferent to other functions. Therefore, there is a lack of coordination of function and efforts.

Line and Staff Organization: Line and Staff organization is the in which the line heads are assisted by specialist staff.

If the firm is of large size, manager cannot give careful attention to every aspect of management. They are busy with ordinary task of production and selling. Hence staff is deputed to do the work of investigation, research, recording, and advising to managers. Thus the staff brings advising to managers. Thus the staff brings specialization by assisting the line officers.

—Line means - Operating

—Staff means - Service



Merits:

Planned specialization: The line and staff structure is based upon the principle of specialization. The line managers are responsible for operations contributing directly to the achievement of organizational objectives where as staff people are there to provide expert advice on the matters of their concerns.

Quality decisions: Decisions come after careful consideration and thought each expert gives his advise in the area of his specialization which is reflected in the decisions.

Prospect for personal growth: Prospect for efficient personal to grow in the organization not only that, it also offers opportunity for concentrating in a particular area, there by increasing personal efficiency

Less wastage: There will be less wastage of material.

Training ground for personnel: It provides training ground to the personnel in two ways. First, since everybody is expected to concentrate on one field, one's training needs can easily be identified. Second, the staff with expert knowledge provides opportunities to the line managers for adopting rational multi-dimensional approach towards a problem.

Demerits:

Chances of Misinterpretation: Although the expert advice is available, yet it reaches the workers through line supervisors. The line officers may fail to understand the meaning of advice and there is always a risk of misunderstanding and misinterpretation.

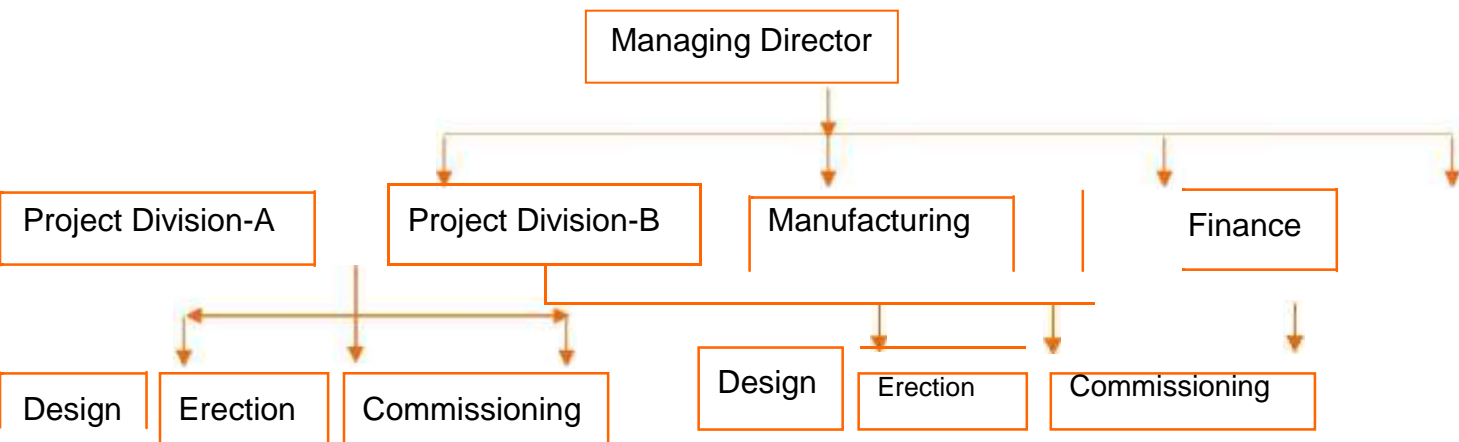
Chances of friction: There are bound to be occasions when the line and staff may differ in opinion may resent in conflict of interests and prevents harmonious relations between the two.

Ineffective Staff in the absence of authority: The staff has no authority to execute their own advice. Their advice is not a binding on the line officers. Therefore the advice given by specialist may be ignored by line heads.

Expensive: The overhead cost of the product increases because of high salaried specialized staff.

Loss of initiative by line executives: If is they start depending too much on staff may loose their initiative drive and ingenuity.

Project Organization: A project organization is a special case where common service like finance, purchase etc. are organized at the functional level. But project resources are allocated to the project manager. Since the business responsibility rests with the project manager, necessary authority is given to him with the requisite resources. This type of organization structure helps in making decisions for project control in terms of cost, resource and time. In a project organization some of the functions are corporate responsibility and some of them are project manager's responsibility.



Merits:

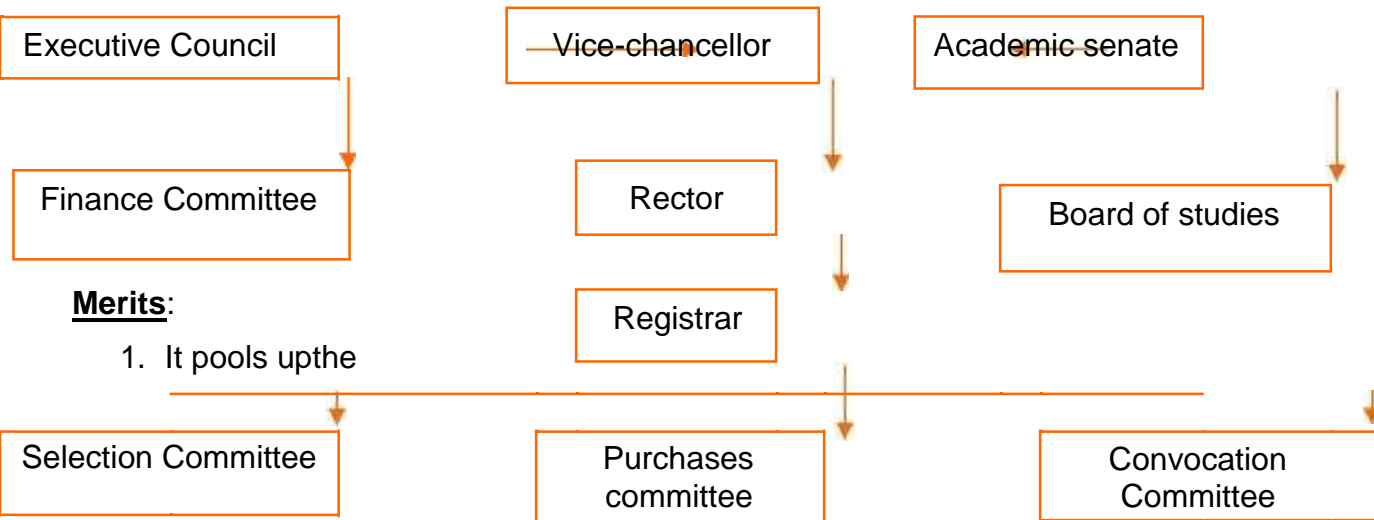
- c) This calls for quick divisions
- d) Organizing all functional
- e) Proper coordination of work of different departments

Demerits:

1. It tends to increase the problems of control for top management
2. It is special case of product organization
3. The organization may get disintegrated with increasing focus on departments

Committee Organization: A committee is formed when two or more persons are appointed to work as a team to arrive at a decision on the matters referred to it. It is intended to utilize the knowledge, skills, and experiences of all the

concerned parties. Particularly, in large organizations, problems are too big to be handled by one single expert.



Merits:

1. It pools up the

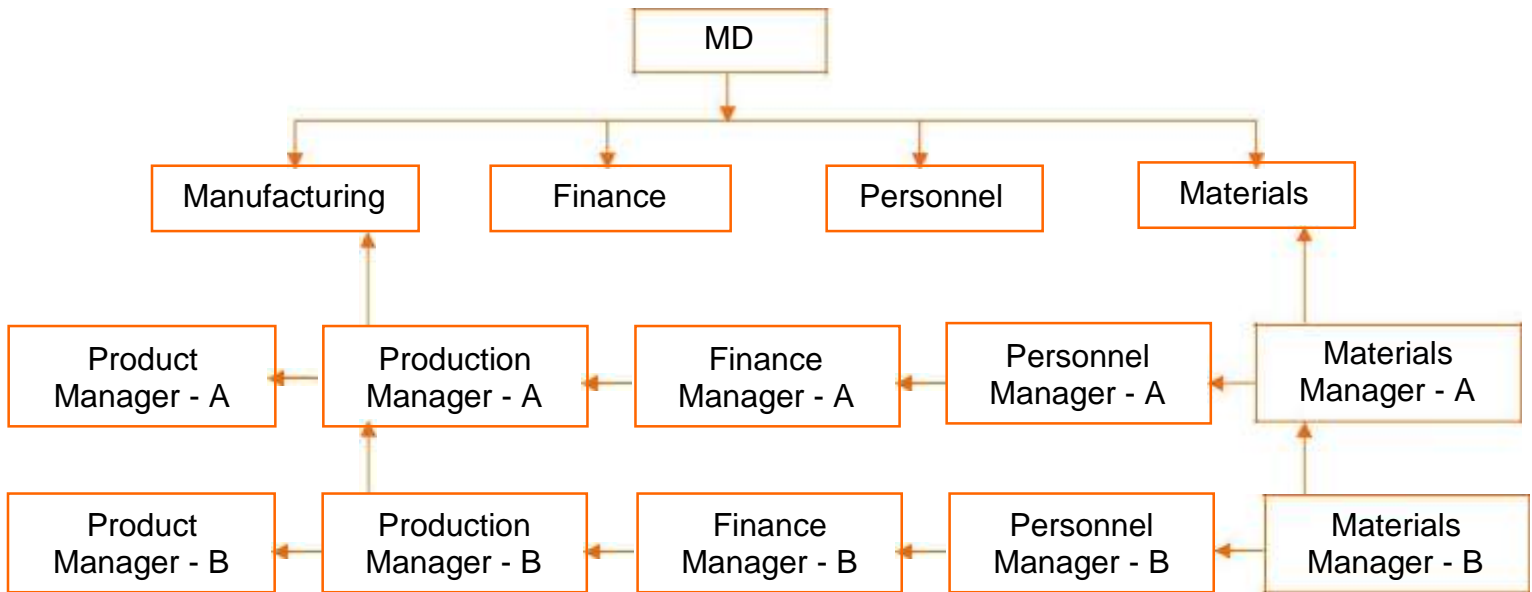
organizational resources in terms of knowledge skills and experiences.

2. It represents all interested groups and thus, facilitates group decision.
3. It yields good results if the committee are headed by taskmaster like chairman and time bound in terms of decision-making.
4. It minimizes the fear of too much authority vested in one person
5. It motivates all the concerned or effected groups to participate.

Demerits:

1. Responsibility of decisions cannot be fixed on a particular person.
2. It calls for high degree of coordination.
3. It involved high cost in terms of time and money.

Matrix Organization: This is also called as project organisation it is a combination of all relationships in the organization in vertical, horizontal and diagonal. It is mostly used in complex projects. It provides a high degree of operational freedom, flexibility and adoptability for both the line and staff managers in performing their respective roles. The main objective of matrix organization is to secure a higher degree of coordination than what is possible from the conventional organizational structure as the line and staff



Merits:

1. It offers operational freedom and flexibility
2. It seeks to optimize the utilization of resources
3. It focuses on results
4. It maintains professional identity
5. It holds employees responsible for management of resources

Demerits:

- c) It calls for greater degree of coordination
- d) It violates unity of command principle
- e) It may be difficult to define authority and responsibility precisely
- f) Employees may find it frustrating to work with two bosses

MODERN TRENDS IN ORGANISATIONAL STRUCTURE DESIGNS:

Organizations in the recent times have been gearing themselves to suit to the growing demands from their stakeholders in terms of responsiveness, flexibility, agility, adaptability etc. In this process, they are following organic structure, which are more agile, flexible and adaptable to the changing circumstances. Virtual organizations, cellular organizations, team structure, boundaryless organization and inverted pyramid and different forms of organic structure that are widely seen among most of the sun-rise sectors such as financial services, Information Technology (IT) and IT enabled services. These structures have been contributing to the organic growth of the organization.

The focus of organic structures is to do away with those activities which do not directly contribute to the growth of the organization and focus only on those activities which directly lead the organization for the achievement of the given goals.

These are discussed below:

Virtual Organisation:

Virtual organizations facilitate competitiveness particularly when these organizations are part of the global economy. Here, there can be alliances and partnerships with other organizations almost all over world. It is a flexible organization structure that removes the traditional boundaries. It allows easy reassignment and reallocation of resources to take quick advantage of shifting opportunities in global markets. To avoid disintegration and to attain the effective needed focus, the lead virtual organizations must have a shared vision,, strong brand and high trust culture.

The virtual organization is a temporary network of companies that come together quickly to exploit fast changing opportunities. Virtual organizations appear to be bigger than traditional organizations. As virtual organizing required a strong information technology

(IT) platform, The boundaries that traditionally separate a firm from its suppliers, customers and even competitors are largely eliminated, temporarily and in respect to a given transaction or business purpose. Virtual organizations

come into being as needed when alliances are called into action to meet specific operating needs and objectives. When the task is complete, the alliances rest until next called into action. Each partner in the alliance contributes to the virtual organization what it is best at—its core competence.

Cellular Organization:

Organizations structured around the units/cells that complete the entire assembly process are called cellular organizations. In the modern organizations, cellular organizations have been replacing the continuous line or linear production process system. In cellular organizations, workers manufacture total product or sub-assemblies in teams (cells). Every team (cell) of workers has the responsibility to improve or maintain the quality and quantity of its products. Each team is free to recognize itself to improve performance and product quality. These cells comprise self-managed teams. They monitor themselves and also correct where necessary on their own. Cellular organizations are characterized by much smaller staff all over the organization with middle management positions reduced and lean management members at the top. It is both a lean and flat structure.

Team Structure:

A structure in which the entire organization is made up of work groups or teams is known as team structure. Team structures are both permanent and temporary in nature as situation demands. Traditional organizations are characterized by vertical structures and modern organizations are identified by the horizontal i.e., team structures. 'We report to each other' is the main feature of team structure. It leads to boundary less organization in a borderless world. In team structures, we find cross-functional teams meant for improving lateral relations, solving problem, completing special projects and accomplishing routine tasks. A cross-functional team comprises members from different functional departments such as marketing, finance, HR, production etc. Project teams are convened for a particular task or project and these get dissolved once task is completed. The intention here is to quickly bring together the people with the needed talents and focus their efforts intensely to solve a problem or take advantage of a special

opportunity. Here employees are more involved and empowered because of reduced barriers among functional areas. Sometimes, when there is pressure on teams to perform and there is no clear chain of command, team structure fails to deliver results.

Boundaryless Organization:

As the name indicates, a boundary less organization eliminates internal boundaries among subsystems and external boundaries with external environment. It is a combination of team and network structures with the addition of temporariness. Such type of organization structure is characterized by spontaneous teamwork and communication. This replaces formal chain of command. It is a dynamic organization structure wherein organizational needs are met through a judicious mix of outsourcing contracts and alliances as and when needed. The key features of boundary less organization include knowledge-sharing, absence of hierarchy and bureaucracy, empowerment voluntary participation of expert members, technology utilization and temporariness. The focus is on mustering necessary talent and competencies required for the achievement of a task without any bureaucratic restrictions. Creativity, quality, timeliness, increase in speed and flexibility are the benefits the boundary less organization yields. It also reduces inefficiencies. The boundary less organization is highly flexible and responsive. These draw on talent wherever it is found. Sometimes, they are ineffective due to problems in communication.

Inverted Pyramid:

This is an alternative to the traditional chain of command. This is a structure, which is narrow at the top and wide at the base. It includes a few levels of management. For instance, sales people and sales support staff sit on the top as the key decision makers for all the issues related to sales and dealing with the customers. Since the sales staffs are in touch with the customer and aware of the requirements of the customers, they are given all the freedom to follow their own best judgment at all levels.

Departmentation: On the basis activity or departmentation

Industrialisation has created problems, which are complex in nature. It created a necessity of large-scale industries to meet the increased demand. In large scale, industries there are large number of employees. For the sake of efficient supervision and control, the factory/enterprise is divided into different

departments. Each department is entrusted with a particular function for carrying out particular activity each departmental head is expected to control and supervise the work in his department.

Definition: The process of dividing the work and then grouping them into units and submits or departments for the purpose of administration.

Method of Departmentation:

By function: It is divided into primary function to be performed such as, finance, marketing, production, personnel etc. each function separate departments

By product: All activities related to a particular product line may be grouped together. This basis of departmentation has become increasingly important, especially for complex organizations producing different types of products.

By process: In this method, the manufacturing activity are sub divided on the basis of their process of production, similar machines such as all laths, milling machines, grinding machines, milling machine etc. are grouped into separate section, such as lathe department, milling department, drilling department.

By geographical region: This method may be adopted when the enterprise produces and sells in the wide market, often in international markets.

UNIT - 2

OPERATIONS MANAGEMENT and MARKETING MANAGEMENT

Plant location: Plant location is a strategic decision several factors influence this decision. The main objective of any business is to optimize its cost and revenue that is, minimize its costs and maximize its returns.

The degree of significance for the selection of location for any enterprise mainly depends on its size and nature large scale industries requiring huge amount of investment there are many considerations other than the local demand in the selection proper plant location these plants cannot be easily shifted to other place and an error of judgment in the selection of site can be vary expensive to the organization. However, small-scale industry mainly selects the site where in accordance with its capacity; the local market is available for its products. It can easily shift to other place when there is any change in the market.

Factors affecting plant location:

Nearness to Market: If the plant is located close to the market the cost of transportation can be minimized. This also helps the producers to have direct knowledge of the requirements of the customers.

Nearness to supply of raw materials: As far as possible the site selected should be near the source of raw materials, so that the cost of transportation can be minimized and storing cost can be reduced due to shorter lead time.

Availability of labour: Availability of right kind of labour force in required number at reasonable rates is also a deciding factor in selection of site

Transport and communication facilities: Generally, industries have a tendency to locate the industrial units near the railway station, highway or port areas.

Availability of power and fuel: Coal, electricity, oil and natural gas are the important sources of power in the industries.

Ex: Tata iron and steel industry is established near the coalmines of Bihar.

Climatic conditions: Climatic conditions largely affect certain production processes and also the efficiency of the employees.

Ex: Textile mills require moist climate that why these plant located at Mumbai and Ahmedabad.

Availability of water: Water is used in industries for processing as in paper in chemical industries, for generation of power in hydroelectric power, plants and also required for drinking sanitary purpose also.

Ancillary industries: Many industries such as processing and assembly industries are not producing all the parts of their product but purchase some of the parts from ancillary industries producing it.

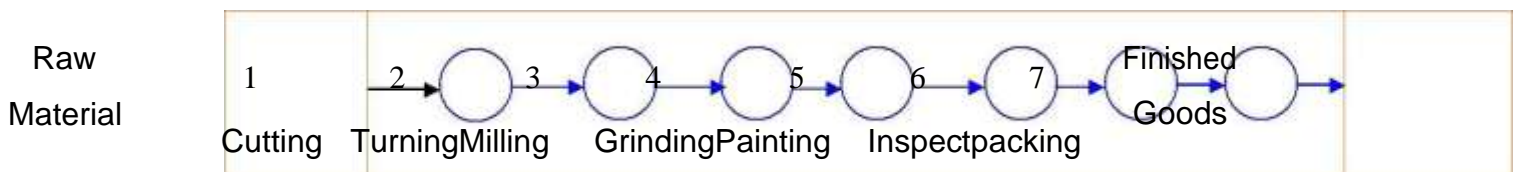
Financial and other aids: For the development of backward regions central as well as state government provide certain incentives and facilities such as cash-subsides, concession financial assistance, land, power and other facilities at cheaper rates, tax concession etc.

Plant Layout: A technique of locating machines, processes and plant services within the factory in order to secure the greatest possible output of high quality at the lowest possible total cost of production

Type of plant layout:

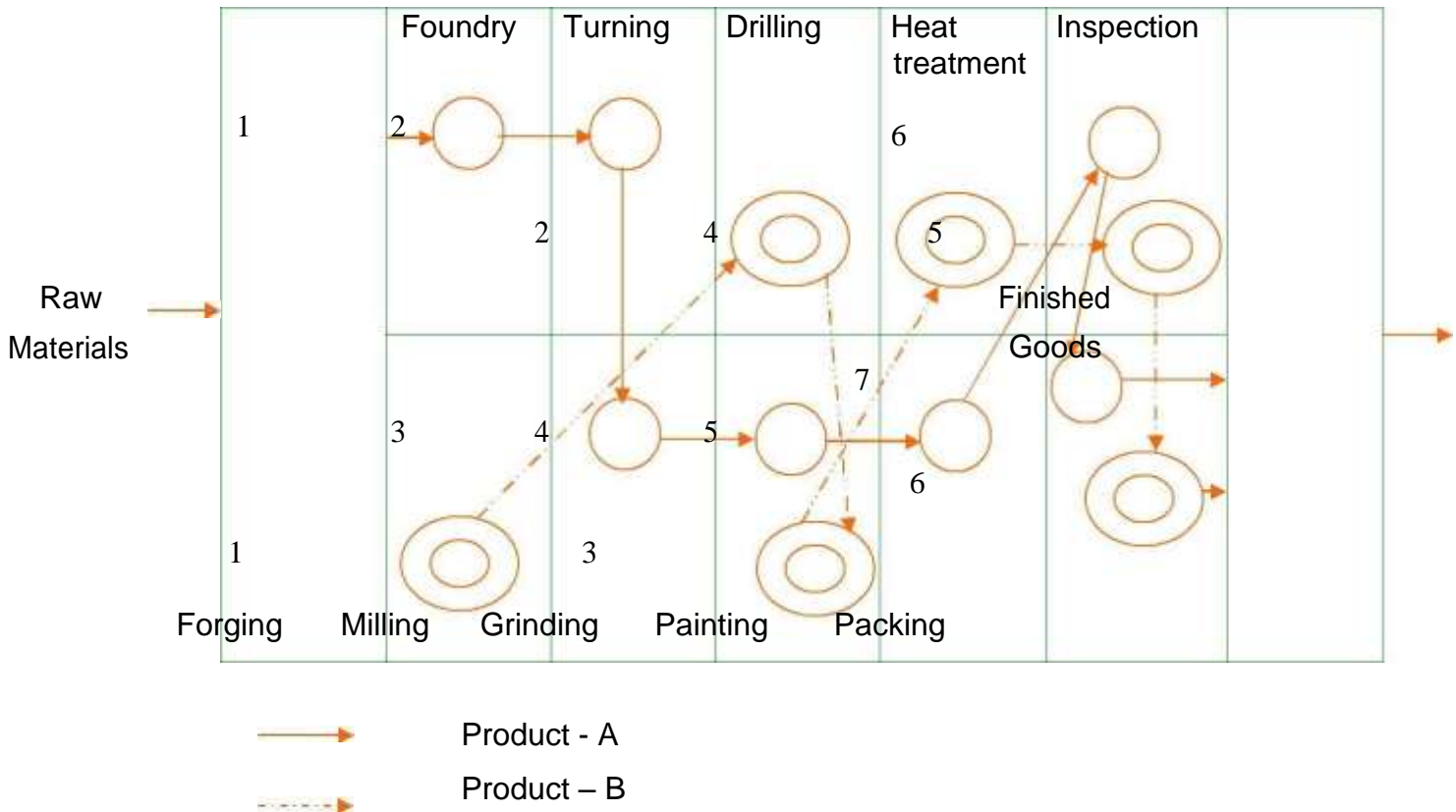
Product or line layout: This type of layout is developed for product-focused systems. In this type of layout only one product, or one type of product, is produced in a given area. In case of product being assembled, this type of layout is popularly known as an assembly line layout.

The work centers are organized in the sequence of appearance. The raw material centre at one end of the line and goes from one operation to another rapidly with minimum of work-in-process storage and material handling

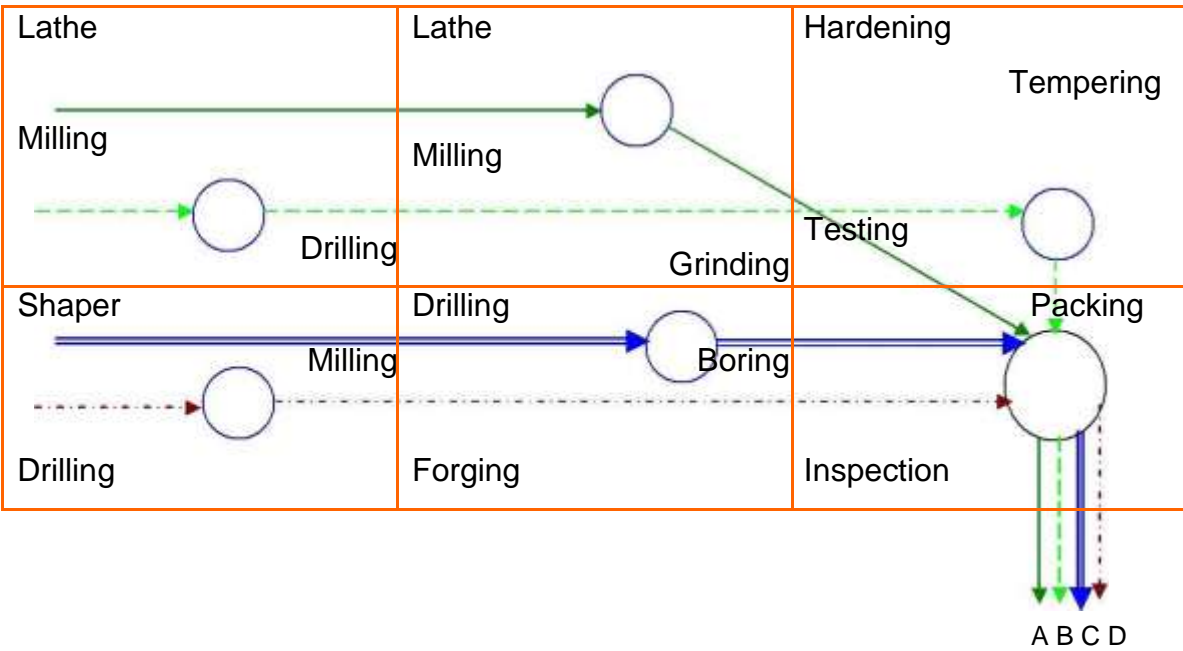


Process or Functional layout: This type of layout is developed for process focused systems. The processing units are organized by functions into departments on the assumption that certain skills and facilities are available in each department similar equipments and operations are grouped together, e.g., milling, foundry, drilling, plating, heat treatment etc.

The use of process-focused systems is very wide in both manufacture and other service facilities such as hospitals, large offices, municipal services, etc.

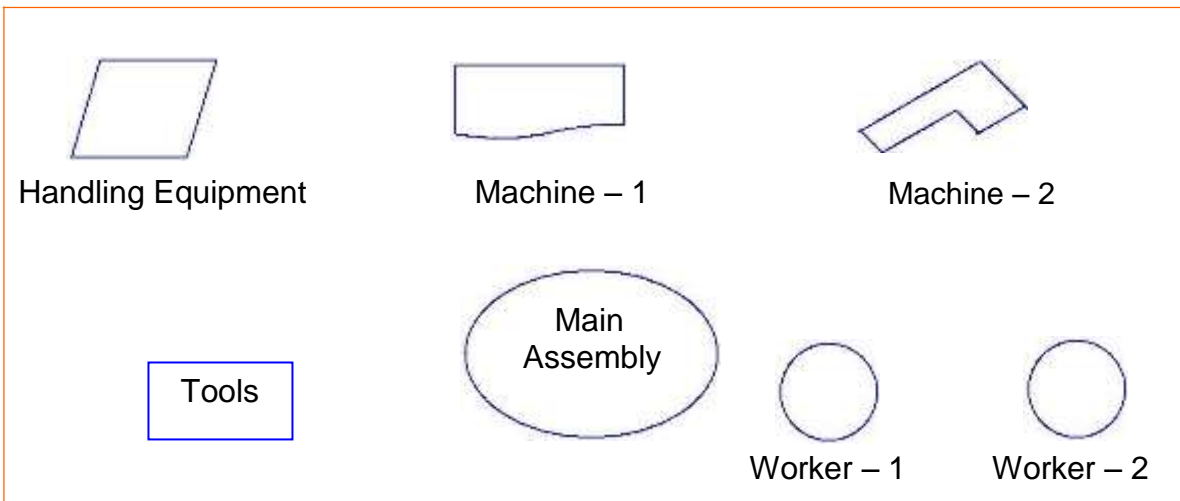


Cellular or group layout: It is special type of functional layout in which the facilities are clubbed together into cells. This is suitable for systems designed to use the concepts, principles and approaches of 'group technology'. Such a layout offers the advantages of mass production with high degree of automation even if the numbers of products are more with flexible requirement. In such a system the facilities are group in to cells which are able to perform similar type of functions for a group of products.



Job Shop Layout: It is a layout for a very general flexible system that is processing job production, The preparation of such a layout is dependent on the analysis of the possible populations of orders and is a relatively, complex affair.

Project or Fixed position Layout: This is the layout for project type systems in which the major component is kept at a fixed position and all other materials, components, tools machines, work etc. are brought and assembly or fabrication is carried out. This type of layout is now not used very commonly as the machines required for manufacturing work are big and complicated. The fixed position layout is used only when it is difficult to move the major component and fabrication is to be carried out. Ex: production of ships.



Factors influencing plant layout:

Management policy: Management has to decide on many matters e.g. nature and quality of products, size of the plant, integration of production process, plans for expansion, amount of inventory in stock, employee facilities

Manufacturing process: The type of manufacturing process e.g. synthetic/analytical, continuous/intermittent and repetitive/non-repetitive, will govern the type of plant layout.

Nature of product: Small and light products can be moved easily to the machines, whereas for heavy and bulky products the machines may have to be moved.

Type of equipment: The use of single purpose and multi-purpose machine substantially affects the plant layout. Similarly, noisy and vibrating machines require special attention in the plant layout decision.

Types of buildings: The plant layout in a single storey building will be different from that in a multi storey building. The covered areas, the number of storeys, elevators and stairs, parking and storage area all affect the layout.

Availability of total floor area: The allocation of space for machines, workbenches, sub-store aisles etc., is made on the basis of the available floor area use of overhead space is made in case of shortage of space.

Arrangement of materials handling equipment: Provide sufficient aisles for free movement of material handling equipment such as hand truck, fork truck etc.

Service facilities: The layout of factory must include proper service facilities required for the comfort and welfare of workers. These include canteen, lockers, drinking water, first aid etc.

Possibility of future expansion: Plant layout is made in the light of future requirement and installations of additional activities.

Principles of plant layout:

Principle of integration: The best layout is one which integrates the men, materials, machinery, supporting activities and any other such a factors that results in the best compromise.

Principle of minimum movement: The number of movement of workers and materials and the distance moved should be minimized. The materials should be transported in bulk rather than in small amounts.

Principle of smooth and continue flow: It states that bottlenecks, congestion points and bulk tracking should be removed by proper line balancing techniques.

Principle of cubic space: Space of a room, if the ceiling height is also utilized, more materials can be accommodated in the same space.

Principle of satisfaction of safety: Working places-safe, well-ventilated and free from dust, noise fumes, odors and other hazardous conditions, help to increase the efficiency of the workers and improve their morale.

Principle of flexibility: It means the best layout in one which can be adopted and re-arranged at a minimum cost with least inconvenience.

Productivity:

Definition: Productivity is defined as the rate at which the goods and services are produced.

It refers to the relationship between the inputs and the output. It is calculated as a ratio between the amount produced and the amount of resources (land, labour, capital, technology etc.) used in the course of production in other words

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

And also defined productivity as human efforts to produce more and more with less and less inputs of resources as a result of which the benefits of production are distributed among maximum number of people.

Method of Production:

Job production: In this system, goods are produced according to the orders with this method, individual requirements of the consumers can be met. Each job order stands alone and is not likely to be repeated. This type of production has a lot of flexibility of operation and hence general purpose machines are required. Factories adopting this type of production, are generally small in size.

Advantages:

6. It is the only method, which can meet the individual requirement.
7. There is no managerial problem, because of very less number of workers, and small size of concern.
8. Such type of production requires less money and is easy to start.

Disadvantages:

- k) There is no scope for continuous production and demand
- l) As the purchase of raw materials is less, hence cost of raw materials per unit will be slightly more.
- m) For handling different type of jobs, only skilled and intelligent workers are needed, thus labour cost increases.

Batch production: This type of production is generally adopted in medium size enterprise. Batch production is in between job production and mass production. Batch production is bigger in scale than the job production. While it is smaller than that of mass production, batch production requires more machines than job production and fewer machines than that of mass production.

Advantages:

- c) While comparing with mass production it requires less capital
- d) Comparing with job production, it is more advantageous commercially.
- e) If demand for one product decrease then production, for another product may be increased, thus the risk of loss is very less.

Disadvantages:

- 5) Comparing with mass production cost of scales and advertisement per unit is more

7. Raw materials to be purchased are in less quantity than that in mass production; therefore it is slightly costlier than that of mass production because less quantity discount is available.

Mass production: This method of production is used by concerns where manufacturing is carried on continuously in anticipation of demand though demand of the product may not be uniform through the year.

In mass production, simplification and standardization of products are made with the help of specialized (one purpose) machine, articles of standardized nature can easily and economically be produced on a largescale.

There is a small difference between mass production and continuous production. This is mainly in the kind of product and its relation to the plant. In mass production plant and equipment are flexible enough to deal with other products, involving same production process. Where as in continuous or process production only standardized product in a sequence produced. In this method layout and requirement of additional tools and equipment

Advantages:

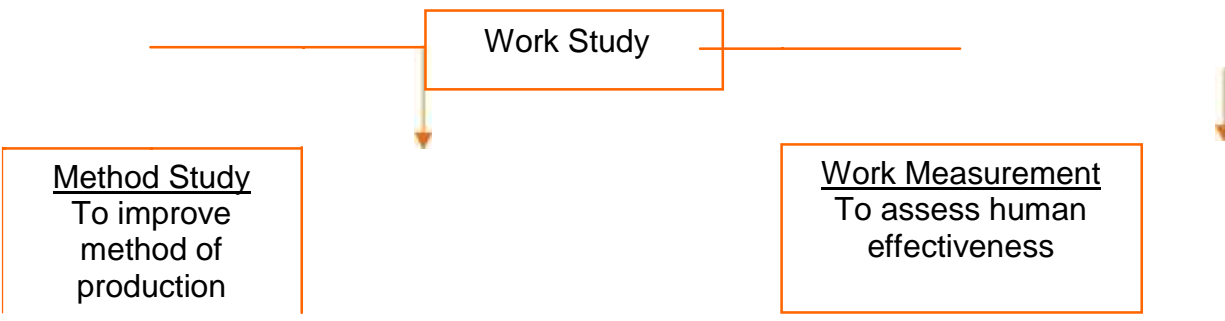
- f) A smooth flow of materials from one work station to the next in logical order.
- g) Since the work from one process is fed directly into the next, small in process inventories result
- h) Total production time per unit short
- i) Simple production planning control system are possible
- j) Little skill is usually required by operations at the production line, hence training is simple, short and inexpensive.

Disadvantages:

4. A breakdown of one machine may lead to a complete stoppage of the line that follows the machine. Hence maintenance and repair is challenging job.
5. Since the product dictates the layout, changes in product design may require major changes in the layout.
6. Generally high investment are required owing to the specialized nature of the machines and their possible duplication in the line

Work Study: Work study is one of the most important management techniques which is employed to improve the activities in the production. The main objective of work study is to assist the management in the optimum use of the human and material resources.

Definition: Work study refers to the method study and work measurement, which are used to examine human work in all its contexts by systematically investigating into all factors affecting its efficiency and economy to bring forth the desired improvement.



Method Study:

Definition: The systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective methods and reducing cost it is also called motion study.

Work Measurement:

Definition: Work measurement is the application of techniques designed to establish time for a qualified worker to carry out a specified job at a defined level of performance.

Work study has two parts, Method Study and Work Measurement. Method study deals with the techniques of analyzing the way to do a given job better, Work Measurement seeks to measure the time required to perform the job.

Basic procedure for Method Study:

Select: The work to be studied

Record: All the relevant facts of the present or proposed method study by observation

Examine: The recorded facts critically every thing that is done, considering in turn, the purpose of the activity, the place where it is performed, the sequence in which it is done, the person who is doing it and the means by which it is done.

Develop: The most practical, economical and effective method considering all the circumstances.








Define: The new method so that it can always be identified.

Install: The method as standard practice

Maintain: That standard practice by regular routine checks.

Recording: The current process of doing the job has to be recorded, while doing so every detail however small it may be, has to be identified.

Where the process is too long, involving many stages of production, inspection or transportation, the present process of doing the job is recorded sufficiently together with all the relevant information, using the process chart symbols.

Symbol	Meanings
	<p><u>Operation</u>: Operation involving changes in the condition of a product Ex: Assembly of spare parts</p>
	<p><u>Transport</u>: Something from the location to another Ex: Assemble PC is moved to inspection section</p>
	<p><u>Storage</u>: (permanent) To store the materials, goods etc. Ex: When PC is put into the store after inspection</p>
	<p><u>Delay</u>: (Temporary storage) Arises when the product waits for next stage in the process Ex: Machinery breakdown etc.</p>
	<p><u>Inspection</u>: To check whether the quality and quantity of the product is satisfactory or not</p>
	<p><u>Operation – cum – Inspection</u>: Inspection is taken place during the production process</p>
	<p><u>Operation – cum – Transportation</u>: Assemble is taking place while the belt conveyer transports the spares.</p>

Recording Techniques: The recording techniques are of three types

- a) Process chart
- b) Diagrams
- c) Motion and film analysis
- d) Models

A) Process Charts:

1) Out line process chart: This chart outlines the main events sequencewise considering only operations and inspections in the given job

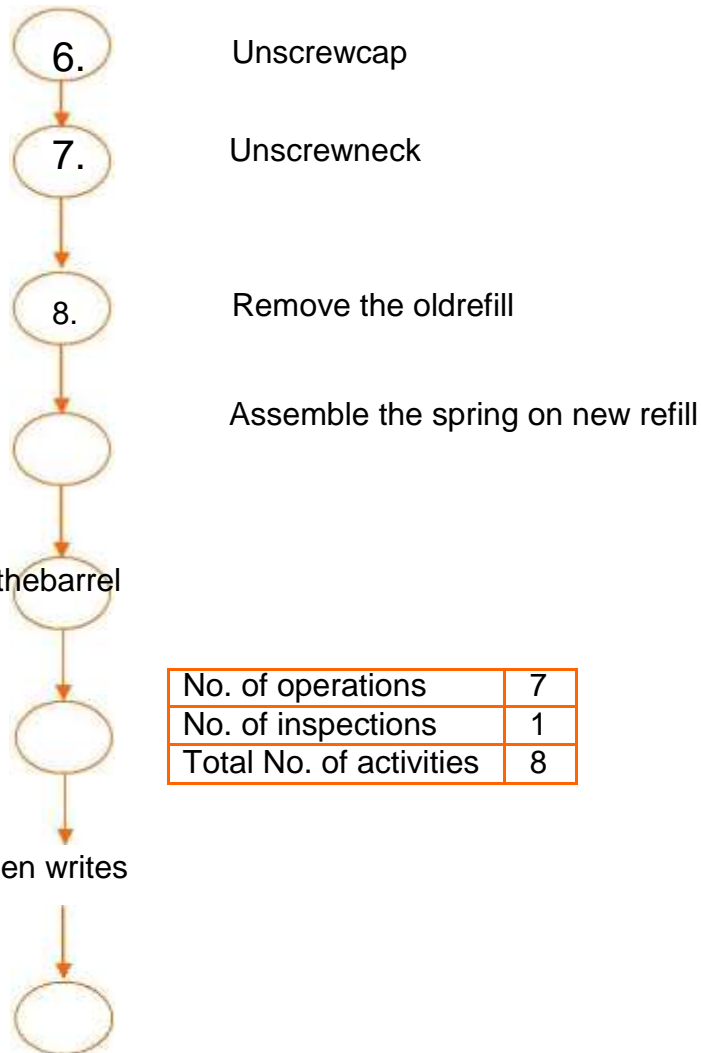
Ex: TASK : Changing refill of a Ball Pointpen

Chart begins : Unscrew thecap

Chart ends : Screw the cap

Chart by :-----

Chart Ends : -----



4

5

6

1

7

No. of operations	7
No. of inspections	1
Total No. of activities	8

2) Flow process chart: These are scale drawings of the work place, which indicate where each activity takes place. This chart is capable of reflecting undue delays in transferring work between workstations duplication of work, and unfair work assignment, which may delay the completion process. Itclassified into three types

ManType : It records what the worker does

MaterialsType : It records what happens to thematerials

EquipmentType : It records how the equipment used._

a) ManType

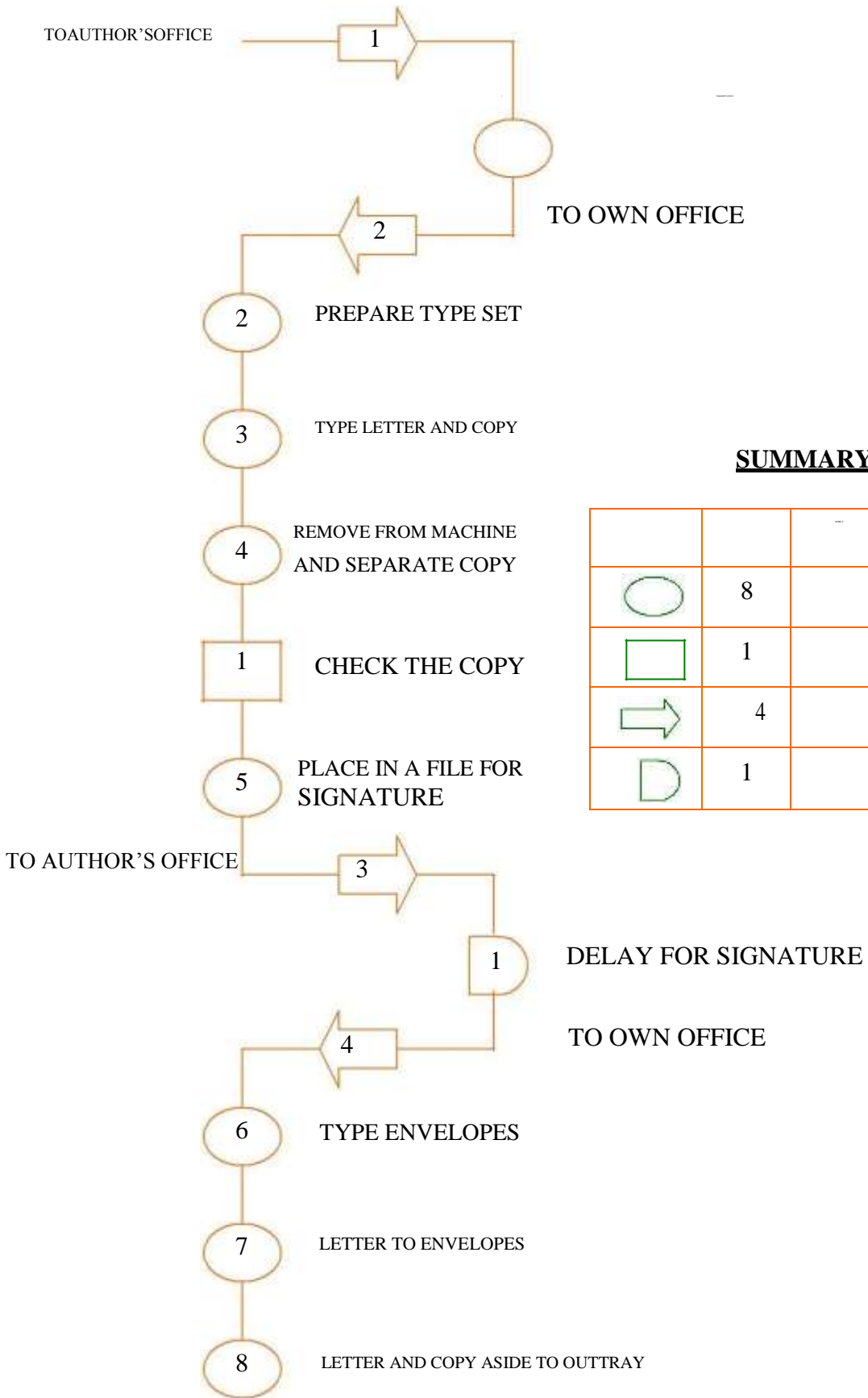
Ex:

Job : Writing a letter using short handtypist

Chartbegins : Typist in own office-awaitingdictation

Chartends : Typist puts letter and copy in outtray

Typistoffice : 6 meters manager'soffice

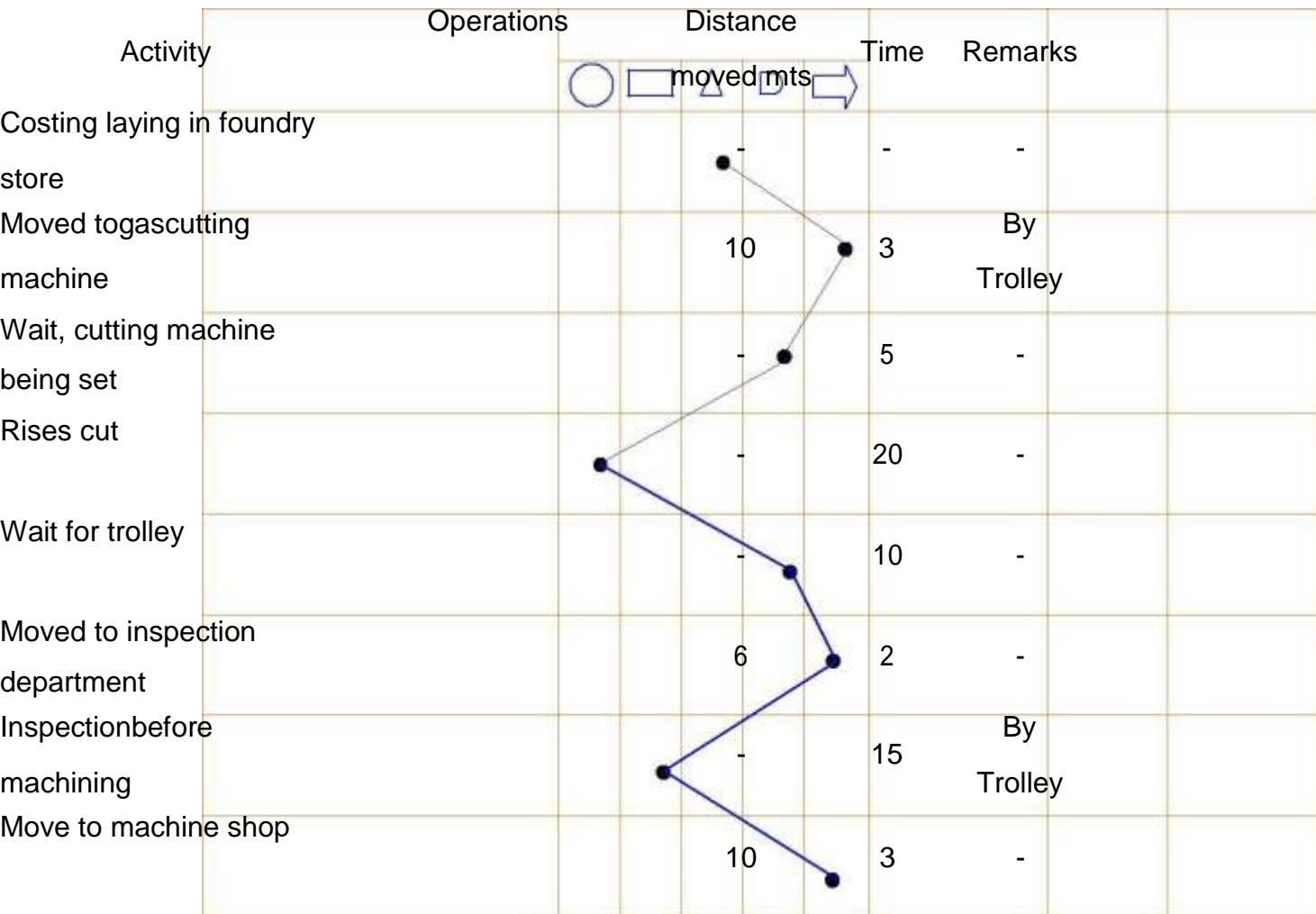


b) MaterialType:

Ex: Job : Making the casting ready for machining

Chart begins : Casting lying in foundry

Chart ends : Casting ready for machining

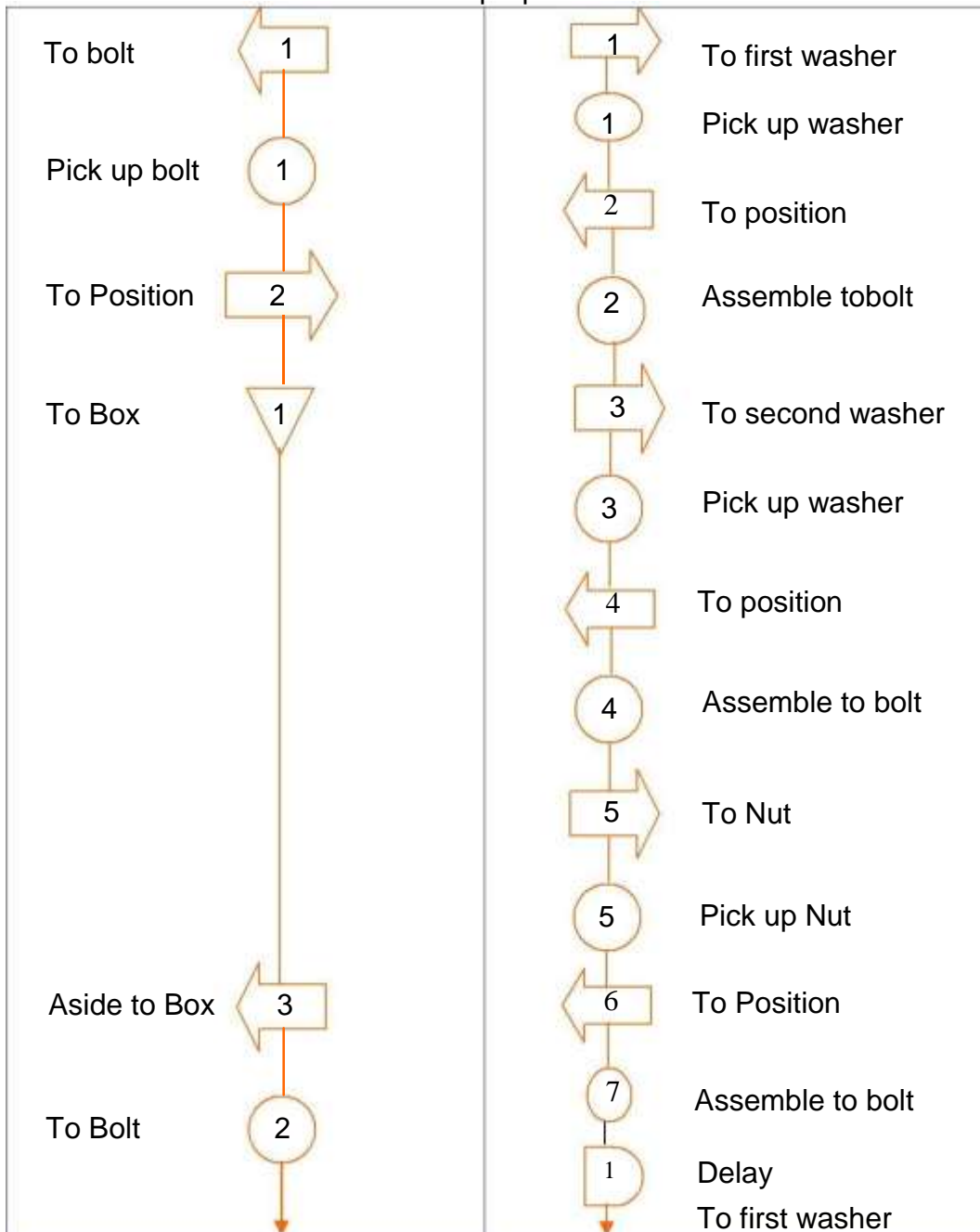


Summary

Event	No.	Time	Distance
	○ 1	20	-
	□ 1	15	-
	△ 1	-	-
	◻ 2	15 (5+10)	-
	➔ 3	8	26

1) Two handed process chart: The two hand process chart is a chart in which the activities of a worker's hands are recorded, in their relationship to one another. It is commonly used for repetitive and short operations.

Ex: Job : Assemble to washers and nut to bolt
 Chart begins : Hand empty material inboxes
 PartNo. :-----
 Chart ends : Completed assembly aside to box
 OperationNo. :-----
 Method :Present/proposed



2) Multiple activity chart: A multiple activity chart is a chart in which the activities of more than one item (worker, machine or equipment) are recorded on a common time scale to show their interrelationship.

By using separate vertical columns to represent the activities of different operators or machines on a common time scale, the chart shows very clearly the period of idleness on the part of any items during the process.

Ex:

ChartNo.----- SheetNo.----- Department-----
 Material :B201casting Job : Making a slot on thecasing
 Machine :Slotted Operation :XYZ
 Chartedby :----- Date : -----

Time (min.)	Man			Machine	Time (min.)
0.2	Removes finished casting cleans with compressed air			Idle	0.2
0.4	Gauges depth of slot on surface plate			Idle	0.4
0.6	Breaks sharp edges with file cleans with compressed air			Idle	0.6
0.8	Place in a box obtains new casting			Idle	0.8
1.0	Cleans machine with compressed air			Idle	1.0
1.2	Locates casting in fixture, starts machine and automatic fee			Idle	1.2
1.4	Idle			Cutting slot	1.4
1.6	Idle			Cutting slot	1.6
1.8	Idle			Cutting slot	1.8
2.0	Idle			Cutting slot	2.0

Summary:

Cycletime : 2 min.

WorkingTime:

a)Man : 1.2min.

b)Machine : 0.8 min.

Idle time:

a) Man : 0.8 min.

b) Machine : 1.2 min.

Utilization:

a) Man : 60%

b) Machine : 40%

B) Diagrams:

4. Flow diagrams: Flow process chart only shows the sequence of various activities necessary for performing the specified work. It does not show clearly the path of movement of men and materials from one location to another.

Definition: It is a diagrams, drawn to scale, intended to show the relative position of the production machinery and marks the route followed by the machines, materials and men.

5. String diagrams: The workers are moving at irregular intervals between a number of points in a working area with or without materials in many industrial activities.

Definition: The string diagram is a scale plan or model on which a tread its used to trace and measure the path of workers, materials or equipment during a specified sequence of events.

6. Cycle graph: In this method a small electric bulb is attached to each part of the body, which makes the movement for carrying out an operation. The path of movement is photographed by high-speedcamera.

7. Chronocycle graph: This is a photographic record, which traces the path of movement onto a photographic plate. In principle, it is similar to the string diagram, and is most effective when recording short, rapidmovements.

C) Micro motion Study and film analysis: Micro motion study is a set of techniques intended to divide human activity into groups of movements or micro motions (therbiligs) and the study of such movements help to find for an operator one best pattern of movements that consumes less time and requires less effort to accomplish the task.

Film analysis: Once the activity has been filmed and the film processed, a projector runs the film very slowly and the film can be stopped or reversed whenever required.

1) SIMO Chart (simultaneous motion cycle chart): A SIMO chart is based on film analysis, it is a graphic representation of the coordinated activities of an operators body embers. The activities are described in terms of basic or fundamental motions. The time required for completion of these motions is also recorded on thechart.

D) Models: Sometimes the picture of the existing conditions is not clear by the use of flow process chart or flow diagram. In such cases instead of the scales plans of the shop facilities models are used to provide visual representation of the proposed layout before proceeding with actual rearrangement of the work place.

Work Measurement: Work measurement is the application of technique to establish the time for a qualified worker to carry out a specified job at a defined level of performance.

Procedure for Work Measurement:

6. **Sect:** The work to be studied and determine the objectives of the study
7. **Record:** All the relevant data relating to circumstances in which the work is being done, the methods to be used breakdown the job into its elements
8. **Examine:** The recorded data and the detailed breakdown critically to ensure the most effective method and motions are being used and that unproductive elements are separated from productive elements.
9. **Measure:** The time required to complete each element using the appropriate work measurement techniques and calculate the time required to complete the work cycle which is known as basic time.
10. **Compile:** The standard time for the operation or work place, in case of stop watch time study the various allowances to cover relation, personal needs etc. are added to the basic time to estimate the standard time.

Techniques of work measurement:

- g) Time study
- h) Synthesis from standard data
- i) Predetermined Motion Time System (PMTS)
- j) Analytical estimating
- k) Work Sampling

1) Time study: It is defined as the art of observing and recording the time required to do each detailed element of all industrial operation.

Time study equipment: Time study equipment can be broadly grouped into two categories

- A) Time measuring device
- B) Time study boards and time study chart

A) Time measuring devices:

- e) Stop Watch
- b) Motion picture camera
- c) Time recording machine
- h) Electronic timer.

e) Stop Watch:

c) Decimal minute stop watch: In this type of watch the movements is started and stopped by moving the slide —All, forward and backward respectively are complete revolution of large hand represents 1 minute and since the dial is divided into 100 parts reading to with in 0.01 minutes can be obtained. Every time the large hand make one revolution the small hand will register 1 minute and is able to register up to 30minutes.

7. Decimal hour stop watch: The dial in this watch is divided into 100 parts. The needle completes 10 revolutions in one hour. The least count in this watch is 0.001 hours. The small dial of this watch is divided into 30 equal spaces (representing 0.01 hour) and the small needle makes $3\frac{1}{3}$ revolutions in one hour.

5. Motion picture camera: Every element of the operation involving motion of the workers is made into film through motion picture camera when this film is run at a slow speed through a projector; the time of each element is recorded using a stopwatch.

6. Time recording machine: A moving tape is run in this machine at a uniform velocity of 10 inches/minutes with the help of electric motor. The machine has two keys: one key, when pressed, indicates starting of an operation, and the other key used to take a print on the scaled tape at the end of elements.

7. Electronic timer: The timing of starting and ending of an operation of an element is automatically recorded through electronic timers.

B) Time study boards and time study charts:

Time study board: These are simple and handy hard wood boards equipped with stopwatch holders and clamps for holding the observation sheets and time study forms. These boards help to see and record the observation and time at the same instant.

Observations forms: Printed or cyclostyled forms are used for recording the observation during that time study. It ensures that time study are made

standard manner and that no essential data are omitted. These forms are attached to the study board by means of clip provided

6. Synthesis from standard data: This one technique of work measurement to obtain synthetic times that are synthesis from element times previously obtained from direct time studies. The analysis and measurement stage are thus conducted prior to the actual study.

7. Predetermine motion time system (PMTS): Every element of work is composed of some combination of basic human motions. Apart from mental activity all works can be broken down into elements that usually a fundamental movement of the body or body members. After this analysis stage the basic motions that have been isolated have a time allotted to them on the basis of predetermine motion times.

8. Analytical estimation: Analytical estimating serves as best for measuring work. In the analysis stage we find the usually these basic elements or much larger as compared to the elements in PMTS or time study. For measuring stages the time, which will be occupied by the element at a specific speed of working is estimated.

9. Work Sampling: It is work measurement technique which large number of instantaneous observations are made random interval over a specified period of time of a group of workers, machine and processes. Each observation records what is happening at that instant and the present observations recorded for a particular activity or delay is a measure of the percentage of time during which that activity or delay occurs.

It can also be defined as a method of finding the percentage occurrence of a certain activity by statistical sampling and random observations.

Procedure for conducting time study: For conducting time study average workers and average machines are selected. This study is conducted by the time study expert, who should be familiar with all the information related to the job and the conditions in which it is being done.

Time study is performed in the following stages.

A) Analysis of work B) Standardization of methods C)

Making time study

4. Analysis of work: It includes all the tasks performed by the workers, not just the effective work. In the end, time required for job preparation, cleaning of machine, etc. should also be included.
5. Standardization of methods: Related to materials, equipment, tools, working conditions to ensure an acceptable method which is easy, safe and the fastest.
6. Making time study: Time study is done on a printed time study record sheet, which is fixed on a board known as time study board. On one corner, a stopwatch is placed.

Different time readings of element are recorded in the corresponding column of the record sheet. Several sets of reading are taken to arrive at an accurate result after noting all these readings, average time is calculated, neglecting abnormal values, if any.

Standard time: it is the time, which is taken by a normal worker for a specific task or job, working under moderate conditions and including other allowances. Such as fatigue setting of tool and job, repairing of tool and checking of job etc

Standard time is the basis for the calculation of wages and incentives.

Standard time = Average time * Rating factor + other allowances

Rating factor: the study engineer multiplies actual time with a factor known as Rating factor or leveling factor to set the average time which a normal worker would take. This is expressed as a percentage of the efficiency of representative operator, which is in comparison to some of his average fellow workers.

Performance rating: performance rating is that process, during which the time study engineer compares the performance of the operator of normal performance.

OBSERVED PERFORMANCE 100

Performance rating = $\frac{\text{OBSERVED PERFORMANCE}}{\text{NORMAL PERFORMANCE}} \cdot 100$

The rating can be

7. Standard rating: A qualified worker will naturally work if he is motivated to apply himself to his work at the average rate of pace.
8. Normal rating: It is the average rate or pace at which a qualified worker will naturally work even if he has no specific motivation to apply himself to this work

Rating techniques:

1) Speed rating : Speed rating consists of determining the speed of the operator's movements in relation to a normal pace as a factor and applying it to each element so as to get the normal time for the element.

$$\text{Normal or basic time} = \frac{\text{OBSERVED TIME} \cdot \text{RATING}}{\text{STANDARD RATING}}$$

$$\text{Rating} = \text{Worker's speed}$$

$$\text{Standard rating} = \text{Speed expected from the worker}$$

Westing-house system of rating: It is based upon four factors- system comprising skill, effort, conditions and consistency and arrives at cumulative rating.

Synthetic rating: It is the ratio of the standard time for the element to that of observed time.

Objective rating: It is determined in two stages- first the speed rating and second the adjustment for job difficulties.

Psychological evaluation of performance level: In this rating we consider the amount of oxygen consumed, change of heart rate etc to determine rating factor.

Types of allowances in time study:

1) Process allowances: Process allowances to compensate for enforced idleness due to no work power failure, faulty material or tools and equipment.

2) Personal allowances: It comprises personal needs and fatigue. Fatigue allowance contains, in turn, a constant portion and a variable portion.

3) Interference allowances: When a worker is attending more than one machine

4) Contingency allowances: These allowances are to meet legitimate but irregular or infrequent items of work or delays.

5) Special allowances: Special allowances decided as a policy matter, covering activities that are essential for satisfactory performance of work but may not be part of the job, like start up, shut down, change over, cleaning, set up, tool changing etc.

STATISTICAL QUALITY CONTROL

Introduction: Quality is the determining factor the success of any product or service large resource are committed in every organization to ensure quality

Definition: It is defined as customer satisfaction in general and fitness for use in particular. Both the external consumer who buy the product and services and the internal consumers that is, all divisions or departments of the business organization are equally interested in the quality.

Statistical quality control: The process of applying statistical principles to solve the problem of controlling the quality control of a product or service is called statistical quality control.

Quality elements: a) Quality design b) Quality conformance

a) Quality design: Quality of design refers to product feature such as performance, reliability durability, ease of use, serviceability

b) Quality conformance: Quality conformance means whether the product meets the given quality specification or not

Inspection: The process of measuring the out put and comparing it to check whether it meets the given specified requirements or not, is called inspection.

Inspection Methods: The following are the methods of inspection based on merits

1) Incoming inspection: In this method, the quality of the goods and services arriving into the organization is inspected. This ensures that the material suppliers adhere to the given specifications with this defective material cannot enter into the production process. This focuses on the vendor's quality and ability to supply acceptable raw materials.

2) Critical point inspection: Inspecting at the critical points of a product manufacture gives valuable insight into the completely functional process. At the points of manufacture that involve high costs or which offer no possibility for repair or rework, inspection is crucial further operation depend on these results critical point inspection helps to drop the defective production, and thereby, facilitate avoiding unnecessary further expenditure on them.

3) Process inspection: This is also called patrolling inspection or floor inspection or roving inspection. Here the inspector goes around the manufacturing points in the shop floor to inspect the goods produced on random sample basis from time to time.

4) Fixed inspection: It provides for a centralized and independent where work is brought for inspection from time to time. This method is followed where the inspection equipment cannot be moved to the points of productions.

5) Final inspection: This is centralized inspection making use of special equipment. This certifies the quality of the goods before they are shipped.

Elements of statistical Quality Control: The technique under SQC can be divided in to two parts a) Process control b) Acceptance sampling

a) **Process control**: Process control is a technique of ensuring the quality of the products during the manufacturing process itself. If a process consistently produces items with acceptable or tolerable range of specification. It is said to be statically under control. Process control is achieved through control charts. Process control aims to control and maintain the quality of the products in the manufacturing process.

Statistical control charts: A control chart compares graphically the process performance data to computed statistical control limits. These control limits act as limit lines on the chart control charts are the tools to determine whether the process is under control or not.

The quality of the production process may be affected by chance cause or assignable cause.

Chance cause: such causes, which may or may not affect the manufacturing process are called chance cause, chance cause cannot even be identified. It is not possible to always maintain the given specification.

Assignable Cause: Assignable causes affect the quality of the production process. These causes can be identified and specified. Causes such as change in the labour shift, power fluctuations, or excessive tool wear are said to be assignable causes as they affect the quality of manufacturing process in different ways.

Process capability: Process capability refers to the ability to achieve measurable results from a combination of machines, tools, methods, materials and people engaged in production.

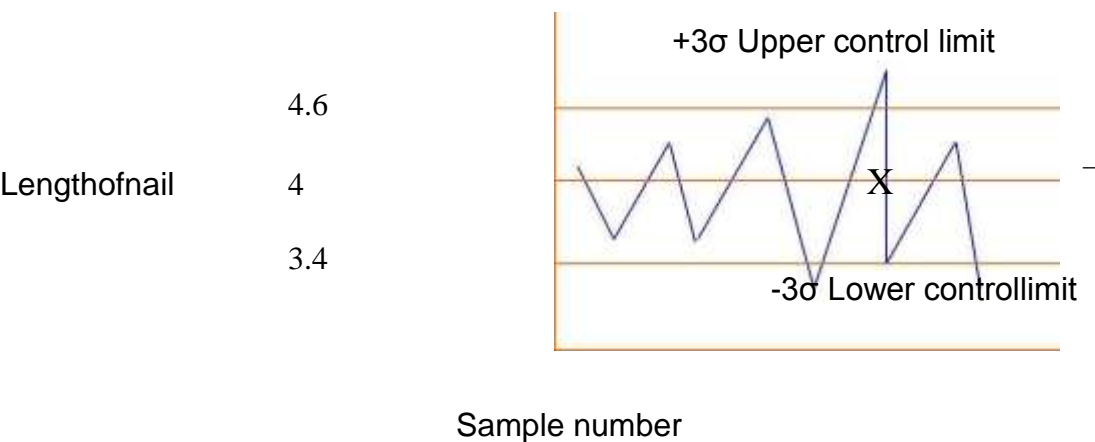
Confidence limits and control limit:

Confidence limit: It indicates the range of confidence level. A confidence level refers to the probability that the value of measurement or parameter, such as length of screw, is correct.

Ex: If a component is required with measurement of 50 mm. across, then the buyer accepts all components measuring between 48 mm and 52 mm across, considering a five percent confidence level.

Control limit: Control limits are found in the control charts. There are two control limits 1) Upper control limit (UCL) and 2) Lower control limit (LCL). These are determined based on the principles of normal distribution.

Ex: In a pilot investigation of the length of the nails produced in the shop floor, it is found that the mean length \bar{X} is cm, the S.D 3σ , the measure of variability of the nails produced 0.2 cm. How do you construct the control chart for this data.



Control charts for variables: A variable is one whose quality measurement changes from unit to unit. The quality of these variables is measured in terms of hardness, thickness, length, and so on. The control charts for variables are drawn using the principles of normal distribution. There are two types of control charts for variables \bar{X} and R chart.

\bar{X} and R Chart: The \bar{X} chart is used to show the process variations based on the average measurement of samples collected. It shows more light on diagnosing quality problem when read along with R chart. It shows the erratic or cyclic shifts in the manufacturing process. It can also focus on when to take a remedial measure to set

right the quality problems. However, collecting data about all the variables involves a large amount of time and resources.

The R chart is based on the range of the items in the given sample. It highlights the changes in the process variability. It is a good measure of spread or range. It shows better results when read along with the \bar{X} chart.

For \bar{X} charts:
$$UCL = \bar{\bar{X}} + A_2 \bar{R}$$

$$LCL = \bar{\bar{X}} - A_2 \bar{R}$$
 When $\bar{\bar{X}}$ = Mean of Means
 \bar{R} = Mean of sample range
 A_2 = Constant

For R chart:
$$UCL = D_4 \bar{R}$$

$$LCL = D_3 \bar{R}$$
 D_4, D_3 are constants

\bar{R} is the average of sample ranges (Range is the difference between the maximum variable and minimum variable)

EX: Construct \bar{X} and R charts from the following information and state whether the process is in control for each of the following \bar{X} has been computed from a sample of 5 units drawn at an interval of half an hour from an ongoing manufacturing process.

Samples	1	2	3	4	5	6	7	8	9	10
\bar{x}	24	34	35	39	26	29	13	34	37	29
R	23	39	14	5	20	17	21	11	40	10

Solution: The mean of means
$$\bar{\bar{x}} = \frac{\sum \bar{x}}{N} = \frac{300}{10} = 30$$

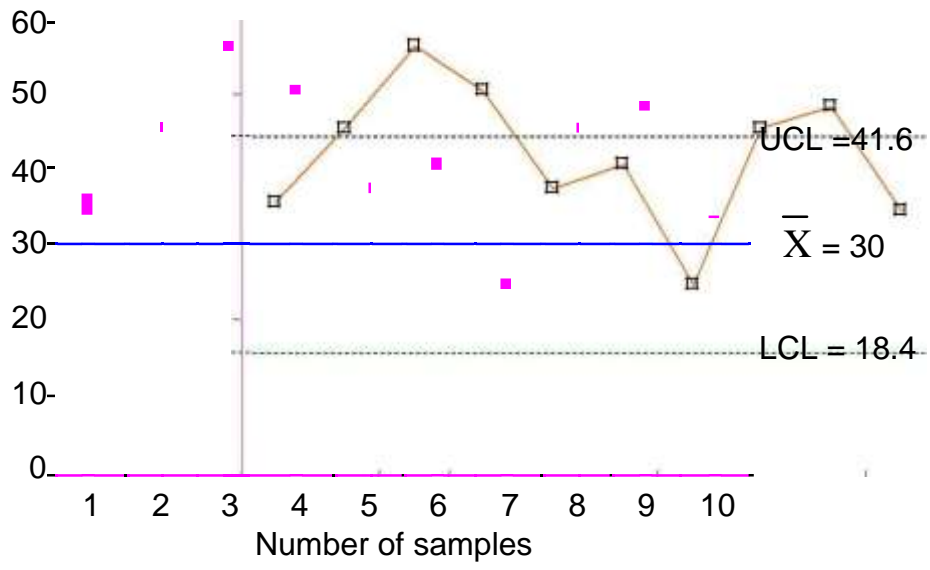
\bar{R} is calculated as
$$\bar{R} = \frac{\sum R}{N} = \frac{200}{10} = 20$$

\bar{x} Chart: \bar{x} chart UCL and LCL compute at sample size 5 A_2 table value is 0.58

$$UCL = \bar{\bar{X}} + A_2 \bar{R} = 30 + (0.58 \times 20) = 41.6$$

$$LCL = D_3 \bar{R} = 30 - (0.58 \times 20) = 18.4$$

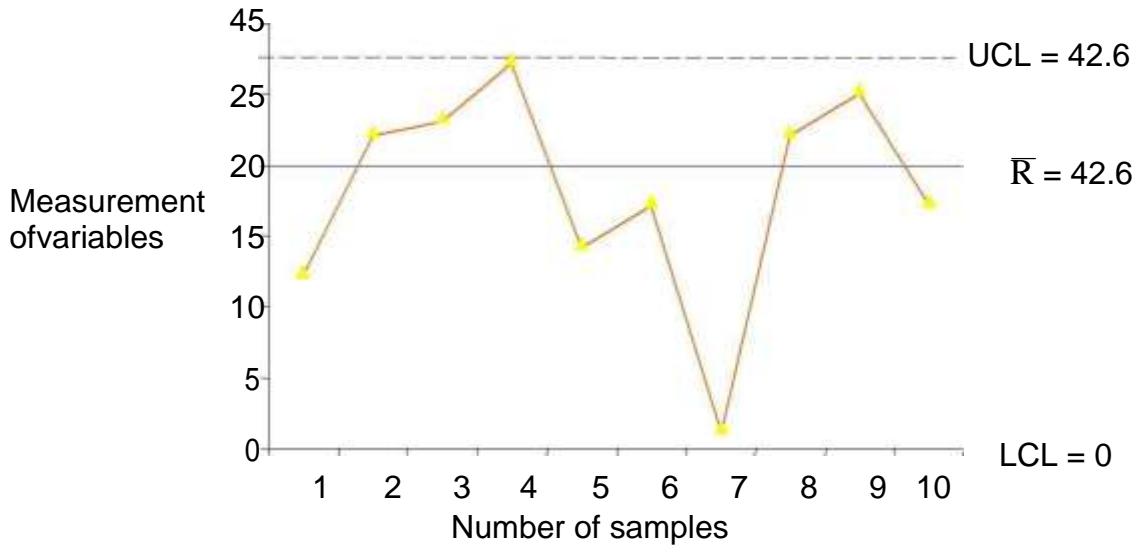
Measurement of variables



R Chart: R chart UCL and LCL compute at sample size 5, D4 table value is 2.11 and D3 table value is 0

$$UCL = D_4 \bar{R} = 2.11 \times 20 = 42.2$$

$$LCL = D_3 \bar{R} = 0 \times 20 = 0$$



Therefore 3, 7 points the process is out of control.

Control charts for attributes: The quality of attributes can be determined on the basis of ‘Yes’ or ‘No’, ‘Go’ or ‘No go’. In other words, in case of a mirror glass, even if there is one scratch it is not considered to be a quality mirror, in such a case quality is decided base on whether the mirror has any scratch or not.

The control charts for attributes are ‘C’ chart and ‘P’ charts

C’ Chart: ‘C’ chart is use where there a number defects per unit. This control charts controls the number of defects per unit. Here the sample size should be constant. This calculate as below.

$$UCL = \bar{c} + 3 \sqrt{\bar{c}} \text{ and } LCL = \bar{c} - 3 \sqrt{\bar{c}}$$

Where the $\bar{c} = \frac{\text{Total number of defects in all the samples}}{\text{Total number of samples inspected}}$

Ex:

Sample Number	No. of defects	Sample Number	No. of defects
1	5	11	4
2	4	12	6
3	9	13	7
4	7	14	3
5	8	15	5
6	9	16	3
7	4	17	3
8	5	18	1
9	2	19	7
10	6	20	2

Total number of defects

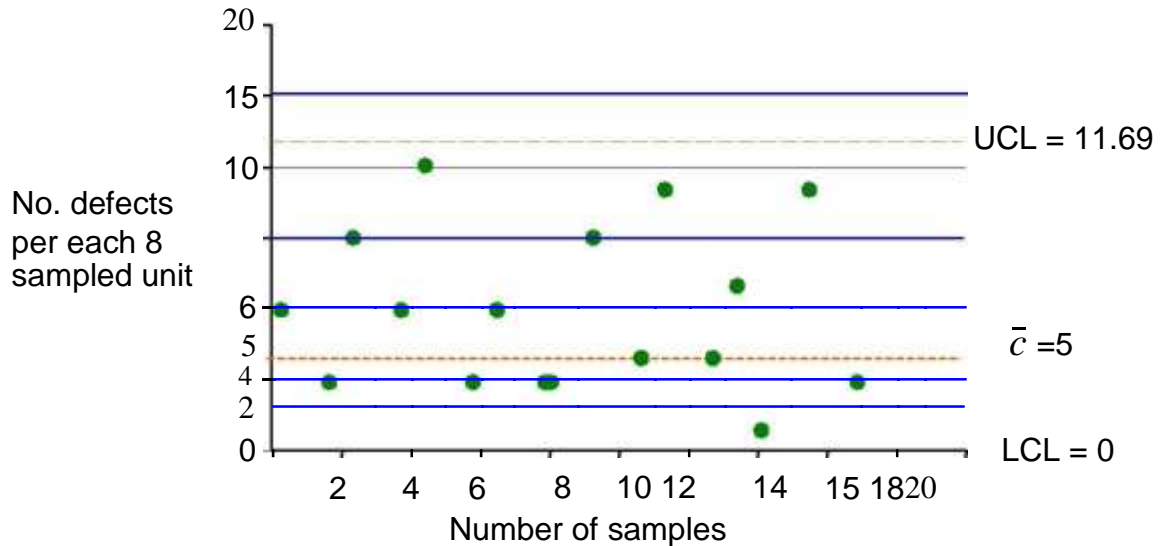
=100

$$c = \frac{100}{20} = 5$$

$$UCL = \bar{c} + 3\sqrt{\bar{c}} = 5 + 3\sqrt{5} = 11.69$$

$$LCL = \bar{c} - 3\sqrt{\bar{c}} = 5 - 3\sqrt{5} = 0$$

LCL = 0 means, LCL got negative value, take it as equal to zero



P' Chart: P' Chart is used where there is data about the number of defectives per sample. It is also called fraction defective chart or percentage defectives chart. Here each item is classified on 'go or no go' basis that is good or bad. Hence if the sample size is larger, the results could be better.

UCL =

LCL =

Where average defective (\bar{p}) =
$$\frac{\text{Total no. of defective found}}{\text{Total no. of pieces inspected}}$$

\bar{n} = Number of pieces inspected per day

Ex: For each of the 14 days a number of magnets used in electric relays are inspected and the number of defectives is recorded. The total number of magnets tested is 14,000. The following are the particular of the number of defectives found everyday.

Day number	Number of defective	Day number	Number of defective
1	100	8	120
2	50	9	60
3	150	10	140
4	200	11	50
5	150	12	70
6	50	13	40
7	80	14	40

Solution:

Total number of defectives = 14000

The average sample size(\bar{n}) per day= 14000/14 days = 1000

Percentage of defective per day =
$$\frac{\text{Total no. of defective found per day}}{\text{Total no. of pieces inspected per day}}$$

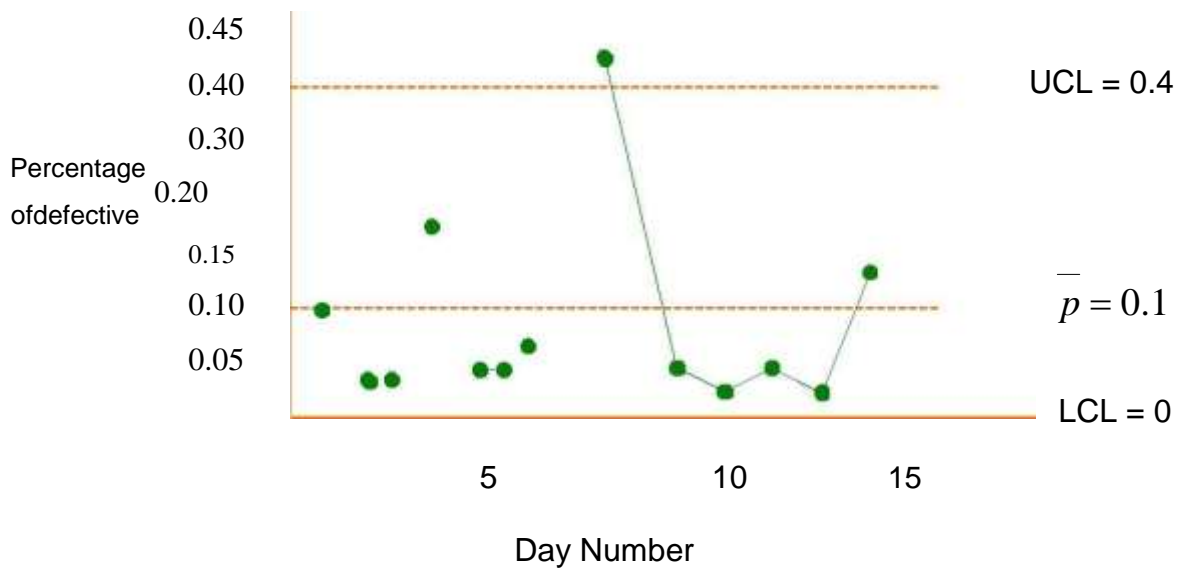
Day number	Percentage of defectives	Number of defective	Percentage of defectives	Day number	Number of defective
1	100/1000=0.10	100	120/1000=0.12	8	120
2	50/1000 =0.05	50	60/1000 =0.06	9	60
3	150/1000=0.15	150	140/1000=0.14	10	140
4	200/1000=0.20	200	50/1000 =0.05	11	50
5	150/1000=0.15	150	70/1000 =0.07	12	70
6	50/1000 =0.05	50	40/1000 =0.04	13	40
7	80/1000 =0.08	80	140/1000=0.14	14	40

$$\bar{p} = \frac{\text{Total no. of defective found}}{\text{Total no. of pieces inspected}}$$

$$1400/14000 = 0.1$$

$$UCL = 0.1 + 3 \frac{0.1(1-0.1)}{1000} = 0.4$$

$$LCL = 0.1 - 3 \frac{0.1(1-0.1)}{1000} = 0$$

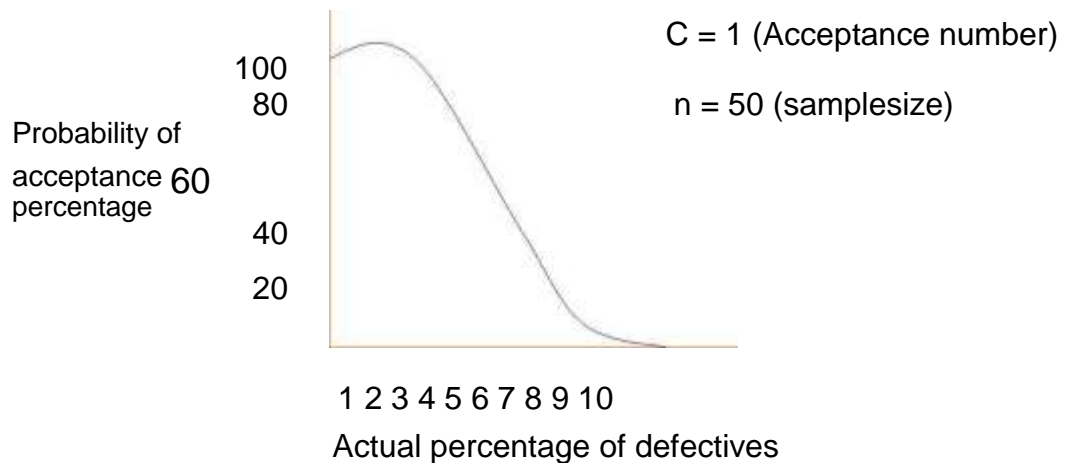


Acceptance Sampling: Acceptance sampling is a technique of deciding whether to accept the whole lot or not based on the number of defectives from a random drawn sample.

It is widely use in buying food products, such as rice, wheat etc. Before buying the random samples drawn from the bags of say rice are tested. If the quality of sample drawn looks good or free from defects then according to the requirement the entire bag or part of it can be brought

The process of acceptance sampling through operating characteristic curve (OCC)

Operating characteristic curve (OCC):The graphical relationship between percentage defective in the lots being submitted for inspection and the probability acceptance is termed as —operating characteristic of a particular sampling plan

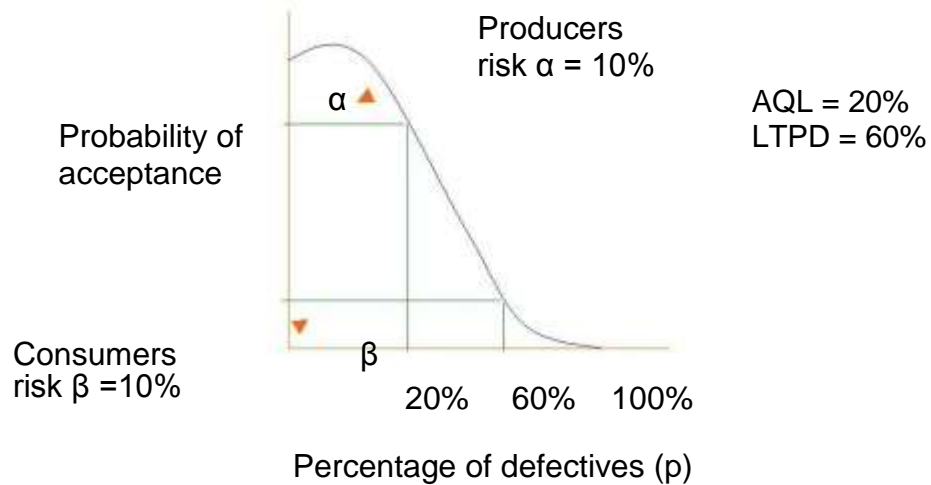


It gives a clear picture about the probability of acceptance of lot for various values of percent defectives in the lot. The probability of acceptance of a lot is high for low values of actual percentage decrease and it is low for high values of actual percentage defectives.

Construction of OC curve: To develop a sampling plan for acceptance sampling, an appropriate O.C curve must be selected to construct an OC curve an agreement has to be reached between the producer and the consumer on the following four point.

- 1) Acceptable quality level (AQL): This is the maximum proportion of defectives that will make the lot definitely acceptable.
- 2) Lot tolerance percentage defective (LTPD): This is the maximum proportion of defectives that will make the lot definitely unacceptable.
- 3) Producers risk (α): This is the risk, the producer is willing to take that lots of the quality level AQL will be rejected, even though, they are acceptable usually $\alpha = 5\%$

4) Consumer risk (β): This is the risk, the consumer is willing to take that lots of the quality level LTPD will be accepted, even though, they are actually unacceptable usually $\beta = 10\%$.



Sampling plans: Based on the number of samples drawn for taking accept/ reject decisions, the sampling methods are used. There are four methods of acceptance samplings.

- 1) Single sampling plan: A lot is accepted or rejected on the basis of a single sample drawn from that cost
- 2) Double sampling plan: If it is not possible to decide the fate of the lot on the basis of first sample, a second sample is drawn and the decision is taken on the basis of the combined results of first and second sample.
- 3) Multiple sampling plan: A lot is accepted or rejected based upon the result obtained from several samples (of parts) drawn from the lot.
- 4) Sequential sampling plan: (Item by item analysis)

Sequential sampling involves increasing the sample size by one part at a time till the sample becomes large enough and contains sufficient number of defectives to decide intelligently whether to accept or reject the lot.

MATERIALS MANAGEMENT

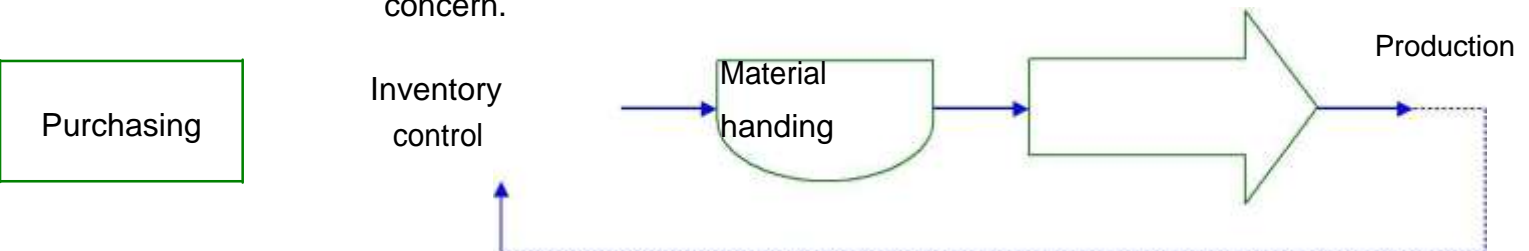
Definition of Materials: Materials refer to inputs into the production process, most of which are embodied in the finished goods being manufactured. It may, (finished goods, raw materials, work in progress) are parts and

components, operating supplies such as lubricating oil, cleaning materials, and others, required for maintenance and repairs.

Definition on Material Management: Material management deals with controlling and regulating the flow of materials in relation to changes in variables like demand, prices, availability, quality, delivery schedules etc.

Objects of materials management:

9. Minimization of materials costs
10. To reduce inventory for use in production process and to develop high inventory turnover ratios.
11. To procure materials of desired quality when required, at lowest possible overall cost of the country.
12. To reduce paper work procedure in order to minimize delays in procuring materials.
13. To note changes in market conditions and other factors affecting the concern.



- n) The purchase, receive, transport, store materials efficiently
- o) To reduce cost, through simplification, standardization, value analysis etc.
- p) To conduct studies in new areas e.g., equality consumption and cost of materials so as to minimize cost of production.

Function of Materials Management:

- f) Materials planning and programming
- g) Purchasing materials inspection of materials
- h) Inspection of Materials
- i) Classification, codification and standardization in stores
- j) Storage of materials
- k) Issuing of materials
- l) Maintenance of proper inventory records
- m) Materials receiving

Inventory: It is defined as a comprehensive list of movable items which are required for manufacturing the products and to maintain the plant facilities in working conditions.

Inventory Control: The systematic location, storage and recording of goods in such a way that the desired degree of service can be made to the operating shops at minimum ultimate cost.

Objectives of Inventory Control:

- 6) To support the production departments with materials of the right quality in the right quantity, at the right time and the right price, and from the right supplier
- 7) To minimize investments in the materials by ensuring economies of storage and ordering costs
- 8) To avoid accumulation of work in process
- 9) To ensure economy of costs by processing economic order quantities
- 10) To maintain adequate inventories at the required sales outlets to meet the market needs promptly, thus avoiding both excessive stocks or shortages at any given time
- 11) To contribute directly to the overall profitability of the enterprise

Functions of inventory control:

To develop policies, plans and standards essential to achieve the objectives

To build up a logical and workable plan of organization for doing the job satisfactory

To develop procedure and methods that will produce the desired resultseconomically

To provide the necessary physical facilities

To maintain overall control by checking results and taking corrective actions.

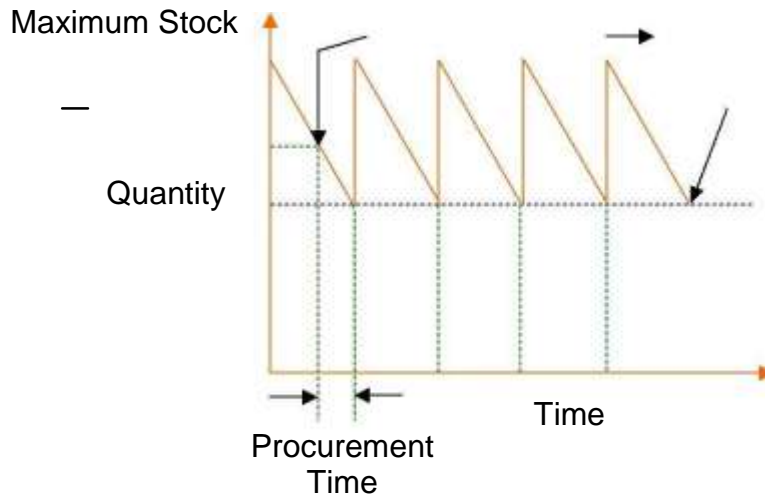
Inventory Management System or Level:

The objects of inventory control is to establish level of inventory which will serve to minimize the company's costs and maximize its revenue.

It is determined by five basic variables

a) Minimum inventory b) Reorder point c) Recorder quantity d) Procurement lead time e) Maximum inventory.

ReorderPoint



7. Minimum inventory: Minimum inventory or buffer stock is needed to take care of any temporary unpredictable increase in the part usage or in the procurement leadtime.

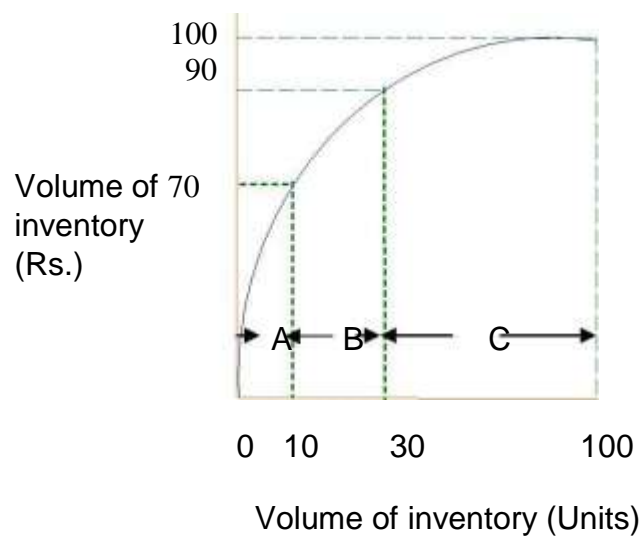
8. Reorder point: It is sufficiently above the minimum inventory to allow for issuing the purchase order and for delivery by a vendor. Reorder point stock level is equal to the minimum stock plus the expected consumption during the procurement leadtime.

9. Reorder Quantity: This is the fixed quantity of item for which order is placed every time the stock drops to the reorder point. This quantity is fixed either on the basis of experience or calculated.

10. Procurement lead time: This comprises the time required for preparing the purchase order, the time gap between placing an order and receiving supplies and time required for inspection etc.

e) Maximum inventory: It is approximately the sum of the order quantity and minimum inventory. It will exactly equal the sum of these two quantities if the ordered material is received just when the minimum stock is reached.

ABC Analysis: ABC analysis is a technique of controlling inventories based on their value and quantities. It is more remembered as an analysis for 'Always Better Control' of inventory. Here all items of the inventory are listed in the order of descending values, showing quantity held and their corresponding value. Then, the inventory is divided into three categories A, B and C based on their respective values.



A – Refers to high value item

B – Refers to medium value item

C – Refers to low value item

A category comprises of inventory, which is very costly and valuable. Normally 70% of the funds are tied up in such costly stocks, which would be around 10% of the total volume of stocks. Because the stocks in this category are very costly, these require strict monitoring on a day-to-day basis.

B category comprises of inventory, which is less costly. Twenty percent of the funds are tied up in such stocks and these accounts for over 20% of the volume of stocks. These items require monitoring on a weekly or fortnightly basis.

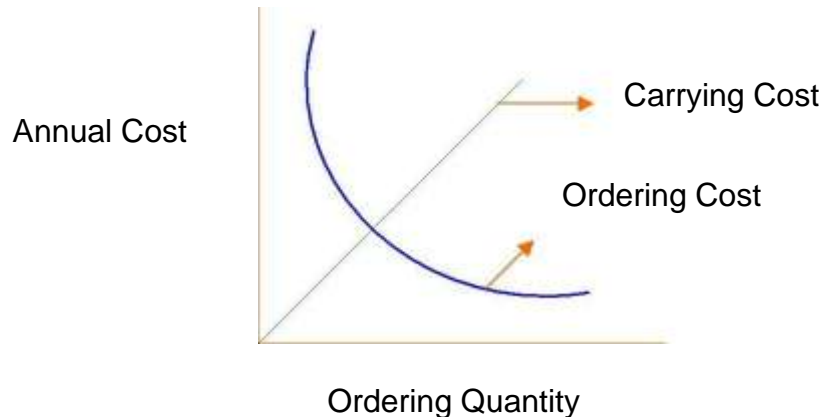
C category consists of such stocks, which are of least cost. Volume-wise, they form 70% of the total stocks but value-wise, they do not cost more than 10% of the investment in the stocks. This category of stocks can be monitored on a monthly or bi-monthly basis.

The following table summarizes the concept of ABC analysis;

Category	Value (%)	Volume (%)	Desired Degree of Control
A	70	10	STRICT
B	20	20	MODERATE
C	10	70	LOW

Economic Order Quantity (EOQ): Economic order quantity is defined that quantity of materials, which can be ordered at one time to minimize the cost of ordering and carrying the stocks. In other words, it refers to size of each order that keeps the total cost low.

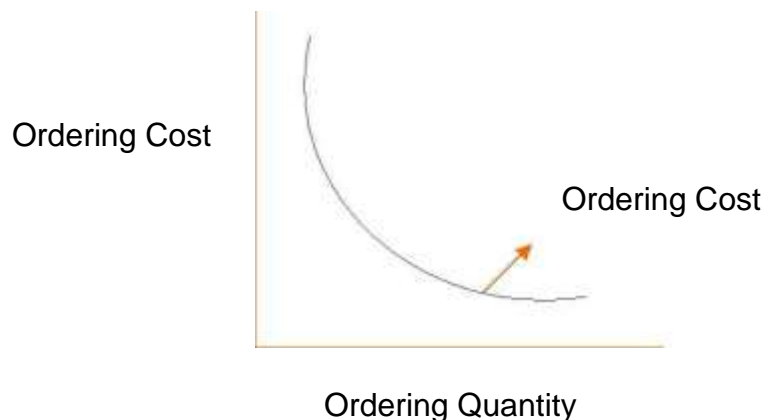
Inventory costs: The inventory costs can be classified into two categories, 1) Inventory ordering cost 2) Inventory carrying cost.



Inventory Ordering Costs (C_o): The cost refer to the cost incurred to procure the materials particularly in large organizations, these cost are significant. This is also called as procurement cost.

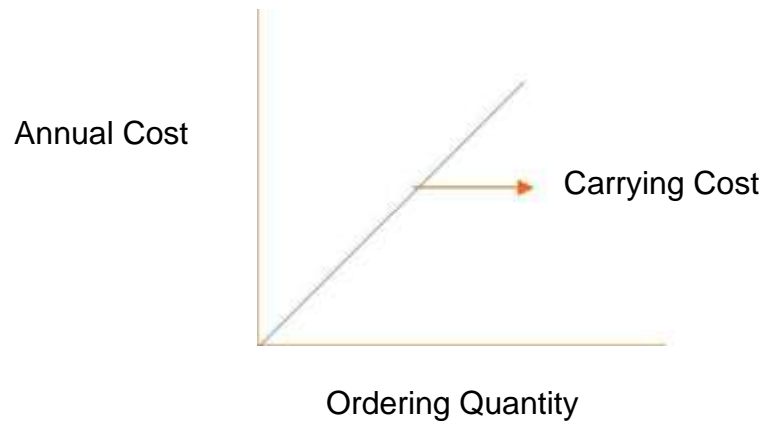
Definition: It is the cost of placing an order from a vendor. This includes all costs incurred from calling for quotation to the point at which the item is taken into stock.

Ex: Receiving quotations, Processing purchase requisition, Receiving materials and then inspecting it , Follow up and expediting purchase order, Processing sellers invoice.



Inventory Carrying cost: Carrying cost which are also known as holding costs are the costs incurred in maintaining the stores in the firm. They are based on average inventory and consist of:

Ex: Storage cost includes: Rent for storage facilities, Salary of person and related storage expenses, Cost of insurance, Cost of capital.



Determine EOQ:

Step1:

Total Ordering cost per year = No. of orders placed per year x ordering cost per

Order

$$= (A/S) \times O$$

A = Annual demand

S = Size of each order (units per order)

O = Ordering cost per order

Step2:

Total Carrying cost per year = Average inventory level x Carrying cost per year

$$= (S/2) \times C$$

A = Annual demand

S = Size of each order (units per order)

C = Carrying cost per unit

Step3:

EOQ is one where the total ordering is equal to total carrying cost

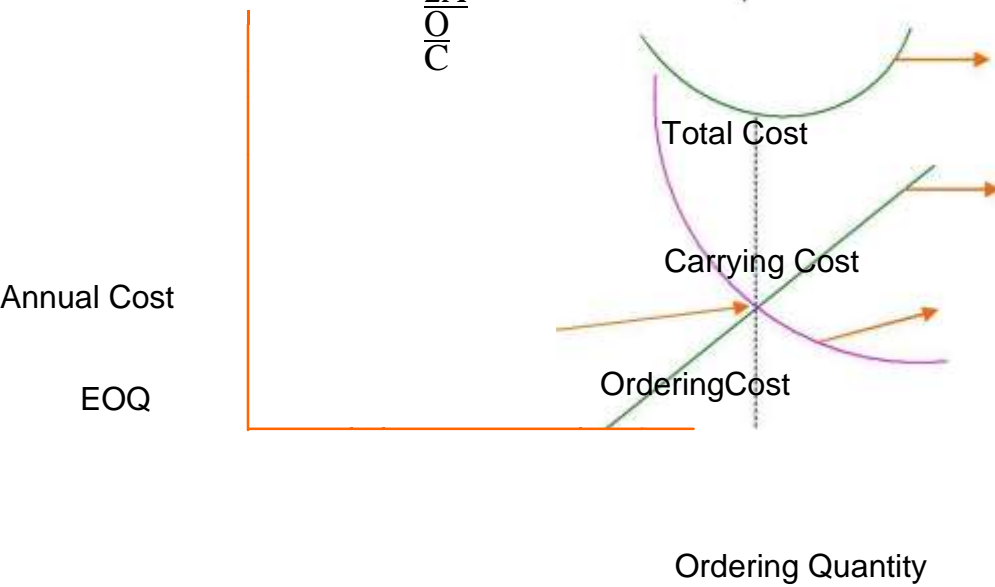
$$\frac{A}{S} \cdot O = \frac{S}{2} \cdot C$$

$$2AO = S^2 \cdot C$$

$$\frac{2AO}{S^2} = C$$

$$\frac{S^2}{S} = \frac{2AO}{C}$$

$$\frac{2AO}{C}$$



Where S is the Economic order quantity, A is the annual demand in units, O is the ordering cost per order and C is the carrying cost per unit

Ex: A biscuit manufacturing company buys a lot bags of 10,000 bags wheat per annum. The cost per bag is Rs.500 and ordering cost is Rs.400. The inventory carrying cost is estimated at 10% of the price of the wheat determine EOQ and number of orders required per year.

Solution:

Annual demand (A) = 10,000 bags

Ordering cost per order (O) = Rs.400

Carrying cost per unit (C) = 10% of Cost price

= 0.10 x 500 = Rs.50/-

$$EOQ = \sqrt{\frac{2AO}{C}}$$

$$= \sqrt{\frac{2 \cdot 10,000 \cdot 400}{50}}$$

$$= \sqrt{1,60,000}$$

EOQ = 400 bags

The number of orders to be placed during the year = $\frac{\text{ANNUAL DEMAND (UNITS)}}{\text{EOQ}}$

$$\frac{10,000}{400} = 25 \text{ ORDERS}$$

In the above case, the company has to place 25 orders to optimize its ordering and carrying costs.

Method of pricing the materials issued:

It is necessary to value the stocks at the end of the accounting period. These are different methods followed in different industries at different points of time for this purpose. .

The Methods are:

- 9. First in First out(FIFO)
- 10. Last in First out(LIFO)
- 11. Simple average price method
- 12. Weighted average price method

First in First Out (FIFO) : In this system, the materials first received are issued first materials from the second lot are issued only, when first lot is exhausted and so on. The prices of the materials are charged at the cost at which that lot was purchased.

Last in First out (LIFO): In this system, the materials first received are issued first materials from the second lot are issued only when first lot is exhausted and so on. The prices of the materials are charged at the cost at which that lot was purchased.

Simple average price method: In this method, the stock are issued at an average price. The average price is determined by dividing the sum of the prices (at which the goods are received) by the number of price available.

Weighted average price method: This method is an improvement over simple average price. While calculating the average price, the quantities of each of the receipts are considered. The weighted average price is calculated as given below:

$$\text{Weighted average price} = \frac{(W_1 \cdot P_1) + (W_2 \cdot P_2) + (W_3 \cdot P_3)}{W_1 + W_2 + W_3}$$

Where W_1 , W_2 , and W_3 refer to the quantities of each of the three receipts and P_1 , P_2 , and P_3 are the prices of each of the receipts. Under this method, the quantity of each of the receipts is called the weight. Hence, the average price so computed is called the weighted average price. Weighted average is calculated after each time a purchase is made.

Purchasing: It deals with investment, overheads dealing with other and also result in server losses mass production industries that requires large purchasing for a continues flow of materials, demand for an efficient purchase decision. It implies procurement of raw materials machinery, service etc. needed for production and maintenance of the concern.

It has several benefits in terms of reduced costs, higher inventory turnover, buying the materials at the best prices, turnover, buying the materials at the best prices, continues supplies, reduced lead time and so on.

Objectives:

8. To procure right material
9. To procure materials in desired quantities
10. To procure material of desired quality
11. Purchasing from reliable source
12. To pay less for materials purchased
13. To receive and deliver materials at right place and time.

Purchasing process:

The following are the logical steps in the purchasing process:

11. Requisitioning purchases
12. Exploring sources of supply
13. Issuing of tenders and obtaining quotations
14. Opening of tenders and quotations and preparation of comparative statement
15. Negotiating over the purchase price and terms of supply
16. Placing purchase order
17. Receiving of materials along with the invoice
18. Checking inward invoice
19. Inspecting and testing materials
20. Forwarding the materials to stores
21. Checking invoice and passing of bills for payments

Stores Management: It deals with planning, coordination and control of various activities pertaining or effective efficient and economic storage and store keeping.

Store: Generally, un worked material is known as store

Storage: The store room is the place where stores are housed

Storage: Storage is meant holding in custody all kinds of stores and materials semi-processed and fully processed products.

Store Keeping: It may be defined as that aspect of materials control concerned with physical storage of goods.

Functions of stores:

- l) To receive raw materials, semi-finished or purchased items from vendors and to check them for identification.
- m) To receive parts and components which has been processed in the factory?
- n) To make a record of material receipt and current status of material in the store
- o) To maintain positioning of materials in the store.
- p) To maintain stock safety and in good condition to ensure that they do not suffer from damage
- q) Issuing the items/materials to operational personnel
- r) Making a record of receipt and issue slips
- s) To avoid illegal attics in store areas.
- t) To plan for optimum utilization of space.
- u) Cooperating to full extent with purchasing, manufacturing and production planning and control departments.

Stores Records:

Material requisition note: Whenever the materials are required by a department/section, this form has to be filled in. This note provides information about the job number, description of the items required in terms of number. The head of the department/section should authorize it. Whenever the materials are issued, the receiving person should sign the note.

This is to be entered in the materials issued record, which is to be signed by the storekeeper.

Purchase order: The purchasing officer will release the purchase order. The following is the format of a purchase order. Here, we find Vivek enterprises placing a purchase order on Business Solutions Ltd., for the following materials. The terms and conditions of the purchase order such as delivery, payment, and other have to be mentioned clearly.

Invoice: Invoice is a statement sent by the seller to the buyer mentioning the particulars of the goods supplied, net amount payable for the goods, and the

terms and conditions governing the sale. It is very important document because it shows the net amount payable by the buyer after all the discounts and the taxes, if any.

Goods received note: The goods received note furnishes the particulars of the suppliers, purchase order number, purchase requisition number, and the job for which the goods are received. These details are to be certified by a competent authority. On this basis, the accounts department initiates the process of payment for the goods received.

Goods returned note: Sometimes, a part or whole of the goods received may not be of acceptable quality, and hence, these have to be returned to the supplier. In this context, the goods received note is prepared. This is also called the 'debit note' because the suppliers or creditors' account has to be debited by the amount mentioned in this debit note for the goods returned.

Stores ledger account: This is maintained to provide the details of the quantity, price and amount of the receipts, issues, and balance of stocks on a day-to-day basis. At any given time, the physical quantity of stocks should match with the balance as per the stores ledger account. A separate account is maintained for each type of the material in the stores. It should necessarily mention the method such as FIFO or LIFO, followed to value the issues of stocks. It is a valuable tool for the costing department in exercising stores control. It facilitates the valuation of stock from time to time.

Bin card: Bin card is the slip or tag attached to the bin where the goods are stocked. Whenever the materials are received or issued, an entry is made on the bin card. The purpose of bin card is to reveal the particulars of the quantities received, issued, and available as on a given date at a glance. Where separate bins are maintained for each item of the store, each bin will have a tag hung to it.

Marketing Management

Marketing: Marketing as a social process by which individuals and groups obtain what they need and want through creating, offering exchanging products and services of value with others.

Selling versus Marketing:

Selling refers to the act of transferring the ownership of the goods and services from the seller to the buyer.

Marketing refers to the whole process encompassing the entire range of activities starting from identifying the customers requirements to satisfying these in a mutually beneficial manner.

Selling	Marketing
1. Product enjoys the supreme importance	1. Customer enjoys unique importance
2. Emphasis on company (sellers) needs	2. Emphasis on market customers needs
3. Company oriented selling effects	3. Market oriented selling effects
4. Goods are already produced and then sold as profit	4. customers demand determines production supply is adjusted to demand
5. Selling aims at short-term objectives	5. Marketing aims at long-term objectives
6. Top priority is given to sales volume rather than profits increasing sales	6. To priority is given to profitable volume of sales and market share at fair prices and reasonable risk
7. Production oriented	7. Customer oriented.

Marketing Function:

Buying: Buying involves both the marketing and the customers. The marketing manager must know about the type of customers, their consuming habits demands and buying pattern.

Selling: It creates a demand for a product selling function involves.

1. Product planning and development

- f) Finding out or locating buyers
- g) Demand creation through salesmanship, advertising and sales promotion
- h) Negotiation of terms of sales such as price, quantity and quality etc.

Transporting: It involves the creation of place utility. In order to have value goods must first be transported from the place they are produced to the place where they are needed.

Storage: It is concerned with storing finished products properly without any damage, until they are dispatched to the customers. It is also concerned with maintaining stock of raw materials with customers. It is also concerned with maintaining stock of raw materials, components etc. to meet production schedules.

Standardization and grouping: These two functions are supplementary and complementary to each other. A standard is a measure of fixed value. The standard could be based on colour, weight, quality, and number of items, price, or any other parameter. Both domestic and export markets rely extensively on this function. Grading is the process of sorting the goods. The price varies with the grade of the goods. This function enables the marketer to fix a uniform price for a given grade of the goods. It further promotes good understanding between the buyer and the seller.

Finance: Finance is the life blood of business. The value of goods is expressed in money and it is donated by price to be paid by buyer to seller. Credit is necessary in marketing. It plays an important role in retail trade particularly in the sales of costly consumer goods.

Marketing research: The marketing personnel must study the trends in market demand, supply prices and related market information. The knowledge about the latest market information may help the firm to reduce risk loss in purchasing, in pricing, in forecasting market demand and in facing competition in the market.

Marketing Mix: It refers to the combination of four basic elements, viz., product, price, promotion and the place, known as the four P's of marketing.

Product Mix: It is used to describe the assortment of different product types (product lines) and their varieties (product depth). In addition, different tangible and intangible features of the product also form the product mix.

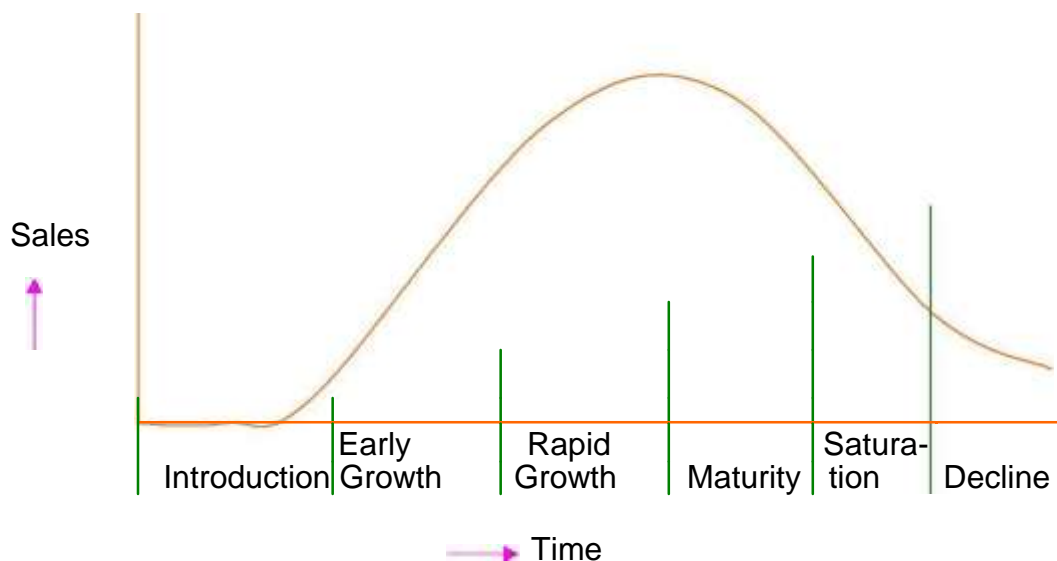
Price Mix: Price mix refers to the decisions relating to the price charged for the product, service or idea.

Promotion Mix: Refers to the activities relating to promotion of the product, service or idea.

Place Mix: Place or physical distribution mix refers to the activities that are involved in transferring ownership to consumers at the right time and price.

Product life cycle:

- i) Products have limited life.
- j) Products sales pass through distinct stages, each passing different challenges, opportunities and problems to seller.
- k) Profits rise and fall at different stages of product lifecycle.



Early growth: when the results of usage of product start flowing into the market and the results are encouraging, more and more buyers come forward to try. The sales revenue remains very low till this point of time. This is also a very critical stage, as the manufacturer cannot avail scale economies.

Rapid growth: A new product enters the stage of rapid growth when it satisfies the needs of the customers. The sales start picking up with repeat purchases and by word of mouth publicity, coupled with continued promotion outlay from the manufacturer's side. As new customers get attracted to the product for the first time, sales soar, sales revenues increase faster than costs, and profits start accruing. This trend attracts the attention of the competitors who release a similar product copying the best features of the new product.

Maturity: when the product's sales growth slows down, it is called maturity. Due to this slow down, the industry as a whole suffers from overcapacity. At this stage, firms tend to attract the customers away from their competitors through cheaper prices and larger promotional efforts and outlay. Those who cannot afford such large promotional outlay and woo customers of the competitors.

Saturation: When the sales growth slows down to zero, such a stage is called saturation. This size of the market does not increase beyond this stage. In other words, old customers who have stopped buying the product replace any new customer entering the market. All sales are simply replacement sales or repeat purchases by the same customers.

Decline: When sales of a product tend to fall, such a stage is called decline. When a product ceases to satisfy the customer's needs in relation to those available in the market, it is no more preferred. As a result, its competing products offering superior benefits take over the market. This leads to weakened profitability.

Type of Channels of Distribution: Channels of distribution refer to the ways and means of reaching the customer through the intermediaries such as wholesalers, retailers, and other agencies, if any.

Manufacturer – consumer: This is a direct marketing channel where the manufacturer contacts the customer directly without involving middlemen or intermediaries. The manufacturers of industrial goods such as aeroplanes,

turbo-engines, ships, and other high-value capital goods mostly follow this route.

However, consumer product manufacturers also through Internet, mail order operations, and door-to-door selling are following this method. It is common sight to find the representatives of the manufacturers going from house to house to sell their products, which are normally used in the households.

Manufacturer – wholesaler – consumer: This channel is primarily used in the case of industrial goods and high-value consumer durable products. The wholesaler, who may also be called as distributor in this channel, carries out the functions of retailing to large customers who may in themselves be the manufacturers also. The wholesalers in this channel buy goods from many manufacturers, stock, and subsequently, sell them through internet or directly to the customers in a wider geographical area. An example of the use of this method can be observed in the computer hardware industry.

Manufacturer – retailer – consumer: Here, the large retailing chains, including supermarkets, use this channel to buy products in large quantities from manufacturers at a very competitive price and sell the same to the ultimate consumers. As the retailers enjoy large discounts in this process, they share this benefit with their customers by keeping their products competitively priced. The consumers patronage this channel because they can buy in small quantities from a wide variety at lower prices.

Manufacturer – wholesaler – retailer – consumer: This is a chain widely followed for fast moving consumer goods, which are likely to have mass markets. When the consumers are large in number, widely dispersed geographically, and products are of low value, this channel is favoured. Manufacturers would find it prohibitively expensive to set up their own outlets in such circumstances. For manufacturers of consumer goods such as hosiery, food items, confectionery, clothes, and readymade garments, cosmetics, and so on, intermediaries are indispensable in the distribution chain.

UNIT - III

HUMAN RESOURCE MANGEMENT

Human Resource Management: Human resource management is the process of managing the human resources of an organization in tune with the vision of the top management.

Personnel Management: Defines personnel management as the planning, organizing, and controlling of the procurement, development, compensation, integration and maintenance of people for the purpose of contributing to the organizational goals.

Personal management versus Human resource management:

14. Personnel management function is often viewed as a function of the specialized staff.

Human resource management function is the responsibility of all the line managers in the organization.

15. Personnel management goal is employee orientation

Human resource management goal is organization orientation

16. Personnel management managerial function

Human resource management operative function

17. Personnel management cooperative level manager

concern Human resource management top level manager concern.

Personnel Management and Industrial Relations:

The word personnel management is popular with different names, such as staff management, labour management, manpower management, industrial relations and modern times as human resources management. Industrial relations refer to the relation between the employees and management.

Features in Personnel Management:

q) Personnel management is concerned with managing people at all level in the organization

r) It is concerned with employees both as individuals and as a group

- n) It is a method of helping the employees to identify and develop their potential.
- o) It is a method of channelising this potential for the attainment of organizational goals.

It is required in every organization, in the form of the services of the personnel manager.

Characteristics of personnel management:

Maximum individual development: This principle stresses on the development of every person working in an organization. Workers are able to fulfill the objectives of an organization with the minimum cost. Hence, the employees in the organization should be properly developed. By this, employees will be able to develop themselves to the maximum extent of their capabilities. Their ability, productivity and efficiency can be used for achieving the objectives of the organization.

Scientific selection: For the proper co-ordination between work and workers, it is necessary to select the right person for the right job. Workers should be selected after a careful weighing of the requirements of the jobs on the other hand, and assessment and evaluation of the abilities and attitudes of man on the other.

High morale: It is necessary to have high morale among the workers in an organization. For this purpose, ideal wage policy should be offered in the organization. Workers should be motivated by monetary and non-monetary incentives.

Dignity of labour: Human resource management specially act, so that the workers feel proud of their work or labour. Sometimes, like 'work is worship' notion should be developed in workers. This principle requires treating every job and every jobholder with dignity and respect.

Team spirit: Team spirit must be developed in the workers. They should work collectively and they should feel collective responsibility for the attainment of the objectives of the organization. For this purpose, workers must have the sense of cooperation, unity and mutual trust.

Effective communication: There must be effective channel of communication between the management and the workers. The orders of higher authorities should reach the workers, while worker's request and grievances should reach the higher authorities in a proper way. If communication system is not effective, then there will arise complex problem like mistrust, hatred and ill-will, and this in turn affects the production of the organization.

Fair remuneration: Labour should be given fair and proper compensation for the work they rendered. They should also be given fair incentives or rewards to recognize good performance. This develops industrial peace.

Effective utilization of human resources: The skills and abilities of human resources should be effectively utilized. Proper training facilities should be provided to workers. Human resource management is an art to get the work done by the people, to get the desired result. For this employees should be given humanly treatment in the organization.

Participation: This principle emphasizes the idea of labour participation in the management of the enterprise. Workers participation in management aims at increasing productivity of labour by improving co-operation between employer and employees.

Contribution to national prosperity: This principle stresses to provide a higher purpose of work to all employees and to contribute to national prosperity. For this purpose, human resource management should develop the sense of participation in labour to make them realize that their efforts alone can contribute to the prosperity of the organization and of the country

Functions of Personnel Management:

Managerial Function

Planning
Organizing
Staffing
Motivating
Controlling

Operative Functions

Procurement of personnel
Development of personnel
Compensation of personnel
Employees benefit schemes
Maintaining good industrial relations
Recordkeeping
Personnel planning and evaluation
Personnel research and audit

Managerial Function:

Planning: It is concerned with manpower planning

- 12) To forecast future vacancies
- 13) To anticipate retirements promotions and transfer
- 14) Preparing job analysis, job description and job specifications
- 15) Analyzing resources of potential employees

Organizing: It is concerned with organizing manpower

8. To analysis organization structure
9. Recommending organizational changes
10. To analyze applications and determine suitability of candidates
11. Interviewing conducting test
12. Investigating references
13. Arranging medical examination

Staffing: Staffing comprises these are functions induction, transfer/promotion, Manpower development and training.

Induction: To ensure new recruits are provided with appropriate training,

- k) Orienting new employees into their jobs
- l) Reviewing their performances
- m) Ascertaining training requirements

Transfer/Promotion: To utilize employees enhanced capabilities

11. Continuously analyzing jobdescription
12. Evaluating employeequalification/performance
13. Determining further training requirement_

Manpower development: To provide individual employeesdevelopment

13. Developing performancestandards
14. Appraisingperformance
15. Planning individual development

program Training: It includes thefollowings

14. Conducting trainingprogram
15. Evaluating trainingresults

Motivating: Motivating comprises these are the functions payment recreation, communication, health and safety.

Payment: To set pay scales for different job positions and considering pay scales in other organization

22. Analyzing jobs as per jobdescription
23. Evaluating suchjobs
24. Develop scales

Recreation: To provide facilities for enjoyment

- v) Conducting socialactivities
- w) Sports andgames
- x) Recreationalactivities

Communication: To provide needed exchange of information throughout the organization.

- i) Developing channels and media of informationsystem
- j) Introducing suggestionscheme
- k) Conducting opinionsurveys

Health and safety: Prevent diseases and provide security measures

- l) Providing medicalfacilities
- m) Providing safetymeasures

Controlling: Controlling comprises these are the functions performances appraisal, security, employees' attitude and coordination.

Performance appraisal: To appraise performance as per their duties and responsibilities

- f) Developing performance evaluating system
- g) Conducting performance evaluating interviews
- h) Analyzing evaluation results

Security: To provide precautionary measure to prevent theft, fire etc.

- d) To develop and implement security measures
- e) To provide watchman
- f) To organize fire fighting training

Employee attitude and coordination: To improve employees attitude and coordination of work.

- 8. Analyzing personal problems arrange consulting
- 9. Implement improved practices

Operative Functions:

Procurement of personnel: It deal with determination of man power requirement, their recruitment, selection, placement and orientation

Development of personnel: After personnel have been obtained, they must to some degree be developed before going to work. Development has to do with the increase of skill, through training that is necessary for proper job performance.

Compensation of personnel: Compensation means, determination of adequate and equitable remuneration of personnel for their contribution to organization objectives.

Record keeping: In this system personnel manager collects and maintain information which is concerned with the staff of the organization

Personnel planning and evaluation: Under this system different types of activities are evaluated such as evaluation of performances personnel policy of an organization and its practices, personnel audit, moral survey and performance appraisal etc.

Personnel research and audit: This function is concerned with the research in motivational techniques and auditing.

Job Analysis: Job analysis can be defined as the process of identifying the tasks comprising a particular job to assess whether they could be organized in a productive manner. This will identify the main features of the job, the major tasks undertaken, the results to be achieved, and how one job is related to the other jobs in the organizational hierarchy. The product of job analysis is job description.

Job Description: Job description is an accurate and concise description of (a) the overall purposes of the job (b) the principal duties of the person doing this job. The job description emphasizes the job requirements. Clear job description constitutes the basis for advertising the vacancy positions and for drawing up job specifications. Once individuals are selected to the posts, job description allows them to know exactly what their roles are and what is expected of them.

Job Specification

Job specification identifies the requirements on the part of the person to perform the given job. It provides the interviewer an understanding of the job and helps him to assess the qualities necessary for its performance to an acceptable standard, at the time of interview. This helps him to compare the performance of candidates objectively and to eliminate unsuitable candidates.

Manpower Planning: It is the scientific process of evolving the right quantity of right men to be required in future at right time on the right job.

Definition: Manpower planning may be defined as a rational method of assessing the requirements of human resources at different levels in the organization. It ends with proposals for recruitment, retention, or even dismissal, where necessary.

Objectives of Manpower Planning:

8. Making correct estimate of manpower requirement
9. Managing the manpower according to the need of enterprises
10. Helps in recruitment and selection
11. Maintaining production level
12. Making employees development programme effecting
13. Establishing industrial peace
14. Reduction in labour costs
15. Minimization of labour costs.

Recruitment: Applications are invited at this stage for further scrutiny and short listing. Before advertising for the position, it common to check up of the position could be filled in internally.

Selection: The process of identifying the most suitable persons for the organization is called selection. Selection is also called a negative function because at a stage the applications are screened and short-listed based on the selection criteria. The main purpose of selection is to choose the right person for the right job. The job analysis, job description, and job specifications are carried out before the position is advertised. These provide adequate insight about nature of the job, its description, and its specifications,

and further focus on what type of person is to be selected for a given position. These simplify the process of selection.

Selection process involves the following stages:

10. Initial screening/Shortlisting
11. Comprehensive application/bio datascreening
12. Aptitude or written tests
13. Group discussion
14. Personal interviews
15. Group discussion
16. Personal interviews
17. Medical examination
18. Employment offer letter

Training and development

Training: Training is short-term process of utilizing systematic and organized procedure by which the staff acquires specific technical knowledge and functional skills for a definite purpose. The focus of training is the job or task.

Training Needs:

7. High turnover among the newrecruits
8. Increase in wastage ofmaterials
9. Increase in the number of rejected units ofproduction
10. Increase in the number of customercomplaints
11. Increase in the accidentrate
12. Reduced productivitylevels
13. Increase in machinebreakdowns

Methods of Training: There are two methods of training

On-the job training

Off-the job training

A) On-the job training: It is designed to make the employees immediately productive. It is learning by physically doing the work. The focus here is to provide specific skills in a real situation. These methodsinclude:

1) **Job instruction training**: This is a method used for such jobs which can be performed with relatively low skill. Here, the trainees systematically acquire skills by following routine instructions in key processes from a qualified instructor.

2) **Experiential learning**: This is a modern approach to the learning process. This method is more . used for training the senior executives. It is a technique, which empowers the manager-trainee with the freedom of choice to act upon and the capacity to initiate, rather than simply respond, to circumstances.

3) **Demonstration**: Here, the work procedures are demonstrated to the trainees. Each of the trainees is asked to carry out the work, on a sample basis, based on his/her observation and understanding of thedemonstration.

4) Apprentice training: Those who are selected to work in the shop floor are trained as apprentices in the factory for a brief period ranging from three months to one year, depending upon the complexity of the training. Those who show good progress in this training are likely to be absorbed in the same organization. Those who complete apprentice training are likely to get good jobs outside also.

B) Off-the-job training methods: provide a relatively broad idea relating to a given job or task. These are meant for developing an understanding of general principles, providing background knowledge, or generating an awareness of comparative ideas and practice. These methods include:

1) Lectures/talks and class room instructions: These techniques are designed to communicate specific interpersonal, technical, or problem-solving skills. Here, the trainer can maintain a tight control over learning. However, this method restricts the trainee's freedom to develop his/her own approaches to learning.

2) Conferences: Conferences refer to get-together of the experts from different areas of a given topic. These experts present their views based on their work experience and research results. When employees participate in such events they get a feel of the real world. They may also get motivated to perform better.

3) Seminars: Seminars are held periodically by the professional organisations for the benefit of all the practicing managers by taking into consideration the recent advances in a specialized area. Participation in such seminars enables the executives to get exposed to the recent developments in the area of their interest.

4) Team discussions: This technique develops team spirit among the executives from different departments. It also enables them to understand and appreciate each other's problems. It reinforces a feeling of unity among those who work towards common goals.

5) Case study: This is a predominant technique followed even in premier management institutes. This technique helps to provide an understanding of

what has gone wrong in a particular case, such as Delhi Cloth Mills (DCM). Similarly, what are the factors responsible for the success of organizations such as Reliance or Hindustan Lever. Case study technique is a very good method of learning the principles and concepts. However, this method has one weakness. The circumstances you are likely to face in your life may be very different from the cases you have analyzed earlier! Case studies help to enhance the analytical & decision making skills.

6) Role-playing: The participants are assigned roles and are asked to react to one another, as they would do in their managerial jobs. These roles are eventually exchanged. In other words, each participant will get a turn to play all the roles. For instance, the role-playing in a grievance-handling situation involves two players: In the first step, the worker presents his grievance to the personnel manager. In the second step, the worker plays the role of the personnel manager while the personnel manager plays the role of the worker. Role-playing allows participants to understand problems of each other. It enhances the interpersonal-handling skills.

7) Programmed instruction: It is a system of instruction within which pre-established subject matter is broken into small, discrete steps and carefully organized into logical sequence in which, it can be learned by the trainee. Each step is built upon the previous one. The programmed instruction techniques can be in the form of programmed tests and manuals, or video displays. For instance, withdrawal of money through automatic teller machines (ATMs) involves responding to programmed instructions; working on a personal computer or internet involves responding to a series of programmed instructions.

8) Simulation exercises: These include interactive exercises in which trainees practice their skills on working models or in mock situations based on real-life situations.

9) Group decision-making: Group decision-making refers to the process of making decisions based on the opinions expressed by all the concerned — may be subordinates, peers, or outside consultants. The manager thus

ensures that more people are involved in taking decisions. Each member of the group will accept the responsibility for the decisions made as he is a party to it. This method facilitates to generate more alternative solutions to a given problem because more people are involved in the thinking exercise. This facilitates coordination among the groups also.

Development: Development is an activity aimed at career growth rather than immediate performance. Employee development is the process, which helps him or her to understand and interpret knowledge rather than teaching a specific set of functional skills. Development, therefore, focuses more on employee's personal growth in the near future.

Placement: After training, the employee is placed in his/her position under the charge of a manager. The new recruit is allowed to exercise full authority and is held responsible for the results.

a) **Promotion:** Promotion refers to the advancement of an employee to a job with a higher authority and responsibility. It may also carry a better compensation package. Promotion can also be viewed as a means of filling up vacancies in the organization occurring from time to time.

b) **Demotion:** Where an employee is not in a position to perform a given job, he may be demoted or transferred to a position with a lower authority and salary. In other words, demotion is a punishment.

c) **Transfer:** It is a lateral shift that moves an individual employee from one position to another. It may be in the same department, or to a different department or location. This does not involve any changes in the duties, responsibilities, or skills needed. The salary benefits also may remain the same.

d) **Separation:** Separation refers to termination of employment. In other words, the employee is separated from his job. In case of misconduct or misbehavior, where the employee is not in a position to improve his performance despite notice, his/her employment is terminated. This is also called dismissal.

e) **Absenteeism:** Absenteeism refers to the practice of an employee who does not report to work for any particular reason. Absenteeism affects the productivity adversely. It becomes difficult for the departments to cope up with the work pressures, if any particular employee is absent. As a measure of control, the employees are not allowed to be absent without prior permission from the management.

Wages and Salary Administration: Wages and salary administration is the process of fixing wages/salary for different jobs in the organization through job evaluation, negotiations with the unions, and soon.

Grievance Handling: A complaint from employees, when ignored, takes the form of a grievance. Grievance is a complaint genuine or otherwise, about any issue relating to the job such as about supervisor, wages, working conditions and so on. It is necessary to create an in-built mechanism to redress the grievances, at the earliest, at the departmental level. If the individual grievances are ignored, they may take the form of industrial disputes.

Performance Appraisal: Performance appraisal is the process of measuring and evaluating the performance or accomplishments, including behaviour, of an employee on the job front for a given period. The purpose is to assess the worth and value of a person to the organization. It is also meant for assessing his/her potential for future development in an objective manner.

Why appraise the performance:

1. To assess the employee's present level of performance
2. To identify the strengths or weaknesses of individual employee
3. To provide feedback to the employee so that he can improve his/her performance
4. To provide an objective basis for rewarding the employees for their performance
5. To motivate those employees who perform
6. To check and punish those employees who fail to perform
7. To identify the gaps in performance, and thus, assess training and development needs
8. To identify the employee's potential to perform
9. To provide a database for evolving succession strategies
10. To provide a basis for many other decisions such as fixation of incentives or increment, regularization or confirmation of the services of the employee, promotion, transfer or demotion.

Steps in performance Appraisal:

1. Create set up performance standards
2. Mutually set identifiable and measurable
3. Measure present level of performance
4. Compare and appraise present level of performance with standard
5. Discuss the appraisal with employee
6. Identify and initiate the corrective action

Job Evaluation: An attempt to determine and compare the demands which the normal performance of particular job makes on normal workers without taking account of the individual abilities or performance of workers concerned. It rates the job not the rank.

Objectives:

1. To establish correct wage differentials for all jobs within the factory
2. To bring new jobs into their proper relative with jobs previously established
3. To help clarify lines of authority, responsibility and promotion
4. To accomplish the foregoing by means of the facts and principles, which can be readily explained to and accepted by all concerned
5. To establish a general wage level for a given factory which will have parity with those of neighboring factories

Advantages:

1. It is simple, inexpensive and expeditious
2. It is easily understood and easily administered
3. It helps setting better rates than the arbitrary rates based purely on judgment and experience
4. Some unions prefer it, because it leaves more room for bargaining.

Disadvantages:

1. Job may be ranked on the basis of incomplete information and without the benefits of well defined standards
2. The rank position of different jobs is likely to be influenced by the prevailing wage ranks
3. No one committee member is likely to be familiar with all the jobs

Method of Job Evaluation: It is broadly classified as

- 1) Qualitative Method
- 2) Quantitative Method

1) Qualitative Method: It can broadly be classified as ranking or classifying the job from lowest to highest.

a) Ranking technique: In this method, the jobs in the organization are arranged in either in the ascending or descending order and numbered serially. The basis of such arrangement could be the job description in terms of duties, responsibilities, qualifications needed, relative difficulty involved in don the job, or value to the company.

Points considered:

1. Amount of work involved
2. Supervision needed
3. Extent of responsibility required
4. Difficulties involved in the work
5. Work conditions required

b) Classification Method: This is also called job-grading method. Here, the number of grades and the salary particulars for each grade are worked out first. The grades are clearly described in terms of knowledge, skill and so on.

Major steps for job evaluation:

1. Deciding the number of grades
2. Writing grade descriptions
3. Identifying/listing of the jobs to be evaluated
4. Preparing job descriptions

2) **Quantitative Method**: Where point values are assigned to the various demands of a job and relative value is obtained by summing all such point values.

a) Factor comparison method: Every job requires certain capabilities on the part of the person who does the job. These capabilities are considered as critical factors, which can be grouped as follows:

- Mean effort
- Skill
- Physical
- Responsibility
- Working conditions

Step involved in the factor comparison method:

Identify the key jobs

Rank the key job, factor by factor

Apportion the salary among each factor and rank the key jobs

Compare factor ranking of each job with its monetary ranking

Develop a monetary comparison scale

Evaluate non-key jobs based on the monetary comparison scale

b) Point-rating method: There are four widely accepted factors used in the point-rating method, skill, effort, responsibility and job conditions each of these factors is divided into sub-factors.

Skills	- 1. Education and training 2. Experience 3. Judgment and initiative
Efforts	- 1. Physical 2. Mental
Responsibility towards	- 1. Materials or product 2. Equipment or process 3. Safety of others 4. Work of others

Merit Rating: Merit rating is the process of evaluating the relative merit of the person on a given job. It is an essential task of the personnel manager to distinguish the meritorious employees from the other. The data collected from this task is used for strategic decisions such as releasing an increment in pay, promotion, transfer, and transfer on promotion to a critical assignment or even discharge.

Objectives of Merit Rating:

To determine salary increments

To decide who has to be transferred, promoted, or demoted

To discover the workers needs for retaining and advanced training

To unfold the exceptional skills among the employees based on their innate potentials

To guide and monitor the performance of those who are lagging behind.

Method of Merit Rating:

Ranking method: In this method, all the staff of a particular cadre or a department are arranged either in the ascending or the descending order in order of merit or value to the firm. Though this is a simple method, it cannot be followed where the employees in the department are many in number.

Paired comparison method: Here, every employee is compared with all others in a particular cadre in the department. By comparing each pair of employees, the rater can decide which of the employees is more valuable to the organization.

Rating scale: Here, the factors dealing with the quantity and quality of work are listed and rated. A numeric value may be assigned to each factor and the factors could be weighed in the order of their relative importance. All the variables are measured against a three or five point scale.

Forced distribution method: Here, employees are given a set of alternatives and they have to choose one, which reflects their understanding of the true nature of the job. Their thinking is conditioned by the given set of answers.

Narrative or essay method: Here, the candidate is required to narrate in an essay format his/her strengths, weaknesses, and potential to perform. Here, the candidate is not restricted by any given set of alternatives. The candidate is free to decide what to furnish or what not to furnish.

Management by objectives (MPO): The short-term objectives mutually agreed upon by the management and the employees are used as performance standards. This method considers the actual performance as the basis for evaluation. It is a systematic method of goal setting. In addition, it provides for reviewing performance based on results rather than personality traits or characteristics. However, this is not practical at all levels and for all kinds of work in the organizations.

UNIT - IV

PROJET MANAGEMENT (PERT/CPM)

Net work analysis: It is refers to a number of techniques for the planning and control of complex projects. The basis of network planning is the representation of sequential relationships between activities by means of a network of lines and circles. The idea is to link the various activities in such a way that the overall time spent on the project is kept to a minimum.

Features of Network Analysis:

Logical base of planning: Network analysis is highly applicable at several stages of project management right from early planning stage of selecting right option from various alternative to scheduling stage and operational stage.

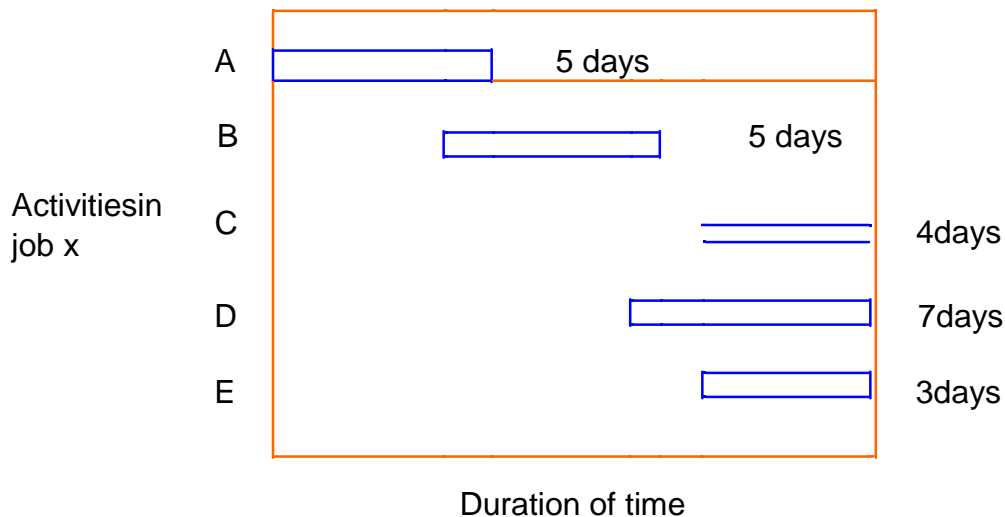
Simple in nature: Net work analysis is straightforward in concept and can be easily explained to any laymen. Data calculations are simple and for large projects computers can be used.

Improves coordination and communication: The graphs generated out of network analysis display simply and direct way the complex nature of various sub-divisions of project may, quickly perceive from the graph

Wider application: The network analysis is applied to many types of projects. Moreover, they may be applied at several levels within a given project from a single department working on a sub-system to multi-plant operations within corporation.

Gantt's bar chart: Before PERT and CPM were developed, Gantt charts and mile stone charts were used tools to monitor the project progress in complex projects. Gantt chart is a bar chart, which was developed by Henry Gantt around 1900.

It consists of two coordinate axes, one represents the time and the other jobs or activities performed.

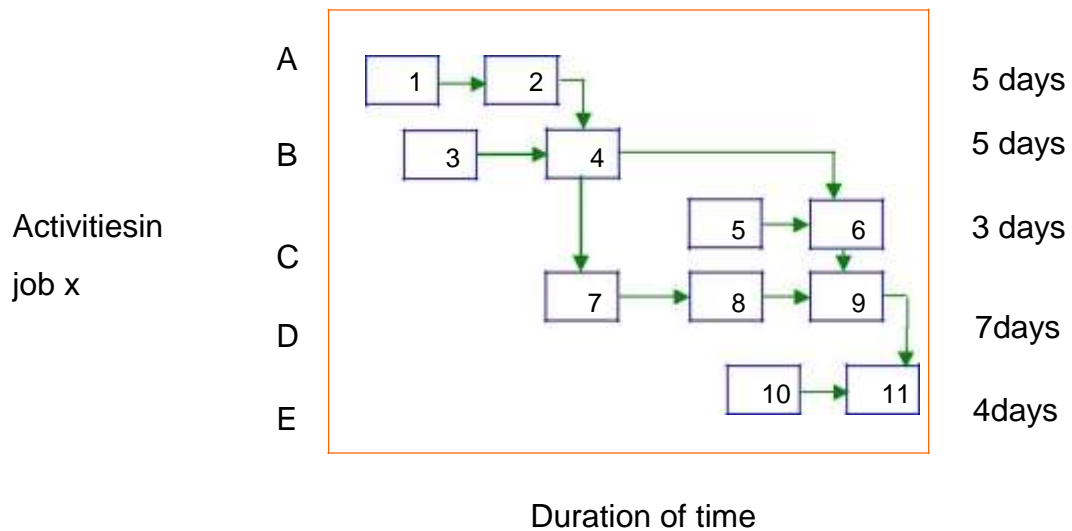


The above figure shows job x which contains five activities ABCDE the different time durations activity A is an independent activity followed by activities B, activity B is followed by activity C, activities D, E have no such sequence. Activities C,D and E reach completion together. However the total number of days taken for completing the job is 14 days.

Limitation of Gantt Chart:

- 18. This Gantt bar charts not useful for big projects, consisting of large number of complexactivities
- 19. It does not show the relationship between various operations. It is very difficult to find the sequence of various operations on the Gantt chart or the most probable date ofcompletion.
- 20. Does to indicate the progress ofwork
- 21. It cannot reflect uncertainty or tolerance in the duration time estimated for variousactivities
- 22. It simply a scheduling technique, but not effective planningtool.

Milestone chart: Milestone chart is an improvement over Gantt chart. It has becomes a good line between Gantt chart and PERT and CPM network. Every task represented by a bar in Gantt's bar chart, is subdivided in terms event or point in time.



In the Gantt's bar charts bar representing an activity is divided into certain milestones. They are identified with a major event, and consecutively numbered such a breakdown enhances the awareness about the inter dependencies among all milestones.

Network analysis undergone several changes and many variants exist, which evaluate the randomness due to imperfection in all human and physical systems. PERT and CPM continue to be very popular, in handling the basic factors like time, cost, resources, probabilities and combinations of all these factors.

PERT AND CPM:

PERT: Programme evaluation and review technique (PERT) is a tool to evaluate a given programme and review the progress made in it from time to time. A programme is also called a project. A project is defined as a set of activities with a specific goal occupying a specific period. It may be a small or big project, such as construction of a college building, roads, marriage, picnic etc.

It is concerned with estimating the time for different stages in such a programme or a project and find out what the critical path is, which consumes a maximum resources.

CPM: Critical path method assumes that the time required to complete an activity can be predicted fairly accurately, and thus, the costs involved can be quantified once the critical path has been identified. Since time is an important factor, CPM involves a trade-off between costs and time. It involves determining an optimum duration for the project, that is, a minimum duration that involves the lowest overall costs.

Application of PERT and CPM:

Construction of projects such as building, highways, houses or bridges

Preparation of bids and proposals for large projects such as multipurpose projects

Maintenance and planning of oil refineries, ship repairs and other such as large operations

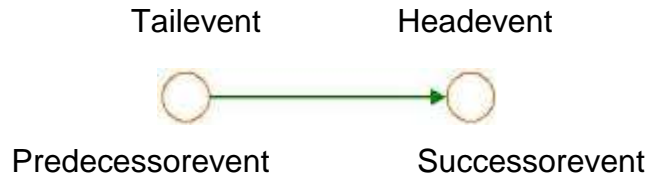
Development of new weapon systems and new products and services

Manufacture and assembly of large items such as aeroplanes or ships repairs and other such as large operations

Simple projects such as home remodeling house keeping or painting and so on.

PERT Basic Terminology:

Event: An event is a specific instant of time which indicates the beginning or end of the activity. An event is also known as a junction or node. It is represented by a circle and the event number is written within the circle.



Activity: Every project consists of number of job operations or tasks which are called activity.



- | | | |
|---------------------------------------|----|-------------|
| Ex: Start machine installation | p) | An event |
| Machine installation | q) | An activity |
| Completion of machine | r) | An event |

Classification of activities:

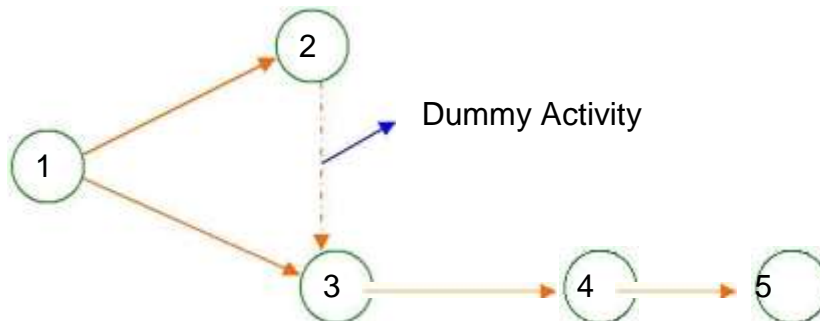
- 16) Critical activity
- 17) Non-Critical activity
- 18) Dummy activity

Critical activity: In a network diagram critical activities are those which if consume more than their estimated time, the project will be delayed. It shown with thick arrow.



Non-critical activity: Such activities have a provision of float or slack so that, even if they consume a specified time over and above the estimated time.

Dummy activity: When two activities start at the same instant of time like A and B the head event are jointed by dotted arrows and this is known as dummy activity.



CPM Basic terminology:

Critical Path: Critical path is that path which consumes the maximum amount of time or resources. It is that path which has zero slack value.

Slack: Slack means the time taken to delay a particular event without affecting the project completion time. If a path has zero slack that means it is the critical path.

$$\text{Slack} = \text{LFT} - \text{EFT}$$

Earliest Start Time (EST): It is the earliest possible time at which an activity can start, and is calculated by moving from first to last event in the network diagram.

Earliest Finish Time (EFT): It is the earliest possible time at which an activity can finish

$$\text{EFT} = \text{EST} + \text{Duration of activity}$$

Latest Start Time (LST): It is the latest possible time by which an activity can start without delaying the date of completion of the project.

$$\text{LST} = \text{LFT} - \text{Duration of the activity}$$

Latest Finish Time (LFT): It is the latest time by which the activity must be completed. So that the scheduled date for the completion of the project may not be delayed. It is calculated by moving backwards.

Float: Floats in the network analysis represent the difference between the maximum time available to finish the activity and the time required to complete it.

The basic difference between slack and float times is a slack is used with reference to event, float is used with reference to activity.

Floats are three types:

1) Total float 2) Free float 3) Independent float

1) Total float: It is the additional time which a non critical activity can consume without increasing the project duration. However total float may affect the floats in previous and subsequent activities.

$$\text{Total float} = \text{LST} - \text{EST} \quad \text{or} \quad \text{LFT} - \text{EFT}$$

2) Free float: Free float refers to the time by which an activity can expand without affecting succeeding activities.

$$\text{Free float} = \text{EST of Head Event} - \text{EST of Trail Event} - \text{Activity duration}$$

3) Independent float: This is the time by which activity may be delayed or extended without affecting the preceding or succeeding activities in anyway.

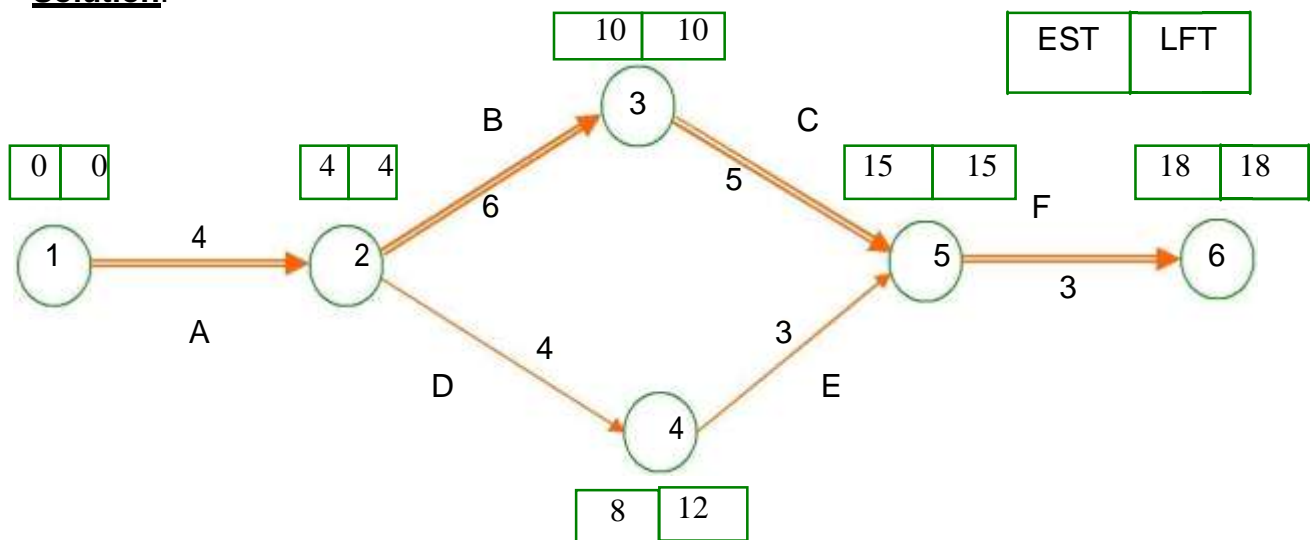
$$\text{Independent float} = \text{EST of Head event} - \text{LFT of Trail event} - \text{Activity duration}$$

Problems:

1) A small engineering project consists of 6 activities namely ABCDE & F with duration of 4, 6, 5, 4, 3 and 3 days respectively. Draw the network diagram and calculate EST, LST, EFT, LFT and floats. Mark the critical path and find total project duration.

Activity	A	B	C	D	E	F
Preceding activity	-	A	B	A	D	C,E
Duration	4	6	5	4	3	3

Solution:



Critical path = A-B-C-F

Project duration = 18 days

Activity	Duration	EST	LST	EFT	LFT	Total float	Free float	Independent float
A	4	0	0	4	4	0	0	0
B	6	4	4	10	10	0	0	0
C	5	10	10	15	15	0	0	0
D	4	4	8	8	12	4	0	0
E	3	8	12	11	15	4	4	0
F	3	15	15	18	18	0	0	0

Note: $LST = LFT - \text{activity duration}$

$LFT = EST + \text{activity duration}$

$\text{Total float} = LST - EST$ or $LFT - EFT$

$\text{Free float} = EST \text{ of Head Event} - EST \text{ of Trail Event} - \text{Activity duration}$

$\text{Independent float} = EST \text{ of Head event} - LFT \text{ of Trail event} - \text{Activity duration}$

2) A small engineering project consists of six activities. The three time estimates in number days for each activity are given below.

Activity	t_o	t_m	t_p
1-2	2	5	8
2-3	1	1	1
3-5	0	6	18
5-6	7	7	7
1-4	3	3	3
4-5	2	8	14

Find out:

1. Calculate the values of expected time (t_e), and S.D variance (σ^2) of each activity
14. Draw the network diagram and mark t_e on each activity
15. Calculate EST and LFT and mark them on the network diagram
16. Calculate total slack for each activity
17. Identify the critical path and mark on the network diagram
18. Probability of completing project in 25 days.

Solution:

Activity	t_o	t_m	t_p	$t_e = \frac{t_o + 4t_m + t_p}{6}$ (Duration)	S.D (σ) = $\frac{t_p - t_o}{6}$	Variance (σ^2) = $(\sigma t)^2$
1-2	2	5	8	5	1	1
2-3	1	1	1	1	0	0
3-5	0	6	18	7	3	9
5-6	7	7	7	7	0	0
1-4	3	3	3	3	0	0
4-5	2	8	14	8	2	4

5

Activity	EST	LFT	LST	EFT	Slack
1-2	0	5	0	5	0
2-3	3	6	5	6	0
3-5	6	13	6	13	0
5-6	13	20	13	20	0
1-4	0	5	2	3	2
4-5	3	13	5	11	2

Critical path = 1-2-3-5-6 = 20 days

Probability for completing project in 25 days:

$$Z = \frac{t_s - t_e}{\sigma}$$

Here $t_s = 25$ days, $t_e = 20$ days, $\sigma = 1 + 0 + 9 + 0 = 10$ ✓

$$z = \frac{25-20}{\sqrt{1+0+9+0}} = \frac{5}{\sqrt{10}} = \frac{5}{3.33} = 1.50$$

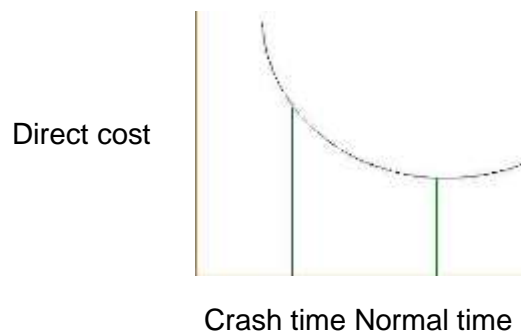
From the table value ($z = 1.50$) = **93.32%**

Project Management – II

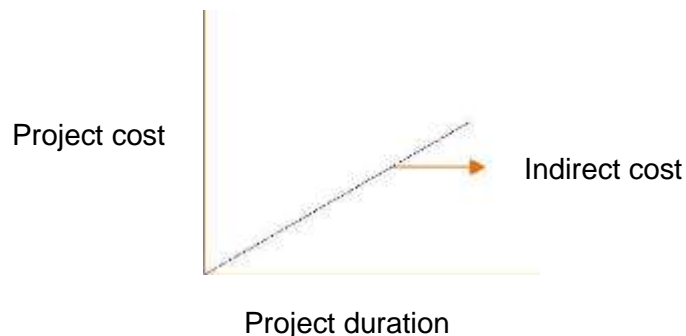
Project crashing: In this chapter, we will discuss the concepts of direct and indirect costs, the relationship between project time and project cost, the concept of cost slope and how the optimum cost and optimum duration are ensured for a given projects while crashing.

Project costs: Costs associated with any project can be classified into two categories a) Direct cost b) Indirect cost

a) Direct cost: These costs are those, which are directly proportional to the number of activities involved in the project Ex: Raw material cost



b) Indirect cost: In direct cost are those costs that are determined per day. Some of examples for indirect costs are supervisory personnel salary, supplies, rent, interest an borrowings, ads, depreciation. These costs are directly proportional to the number of days of the duration of the project. If the project duration is reduced the indirect cost also comes down.



Normal cost (N_C): It is the lowest cost of completing an activity in the minimum time, employing normal means i.e. not using overtime or other special resource.

Normal time (N_T): It is the minimum time required to achieve the normal cost

Crash cost (C_C): It is the least cost of completing an activity by employing all possible means like overtime, additional machinery, proper materials etc.

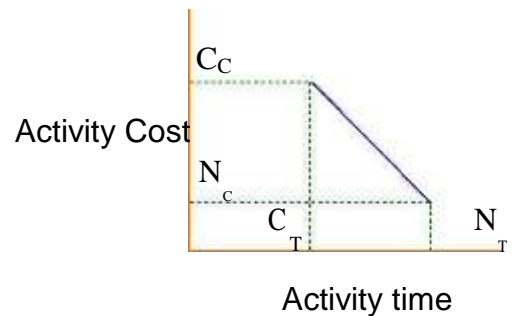
Crash time (C_T): It is the absolute minimum time associated with the crash cost.

Cost Slope: Cost Slope is the amount that has to be spent over and above the normal direct cost for reducing the duration by one unit of time (day, week etc.).

Cost slope is defined as the additional cost for reducing one unit of time, assuming a given rate of increase in direct cost with a decrease in one unit of time.

$$\text{Costslope} = \frac{\text{CrashCOSt} - \text{NormalCOSt}}{\text{Normal time} - \text{Crashtime}}$$

$$s = \frac{C_C - N_C}{N_T - C_T}$$



Crashing of Network: After identifying the critical path, it is necessary to identify the priority to crash the activities by calculating the cost slope.

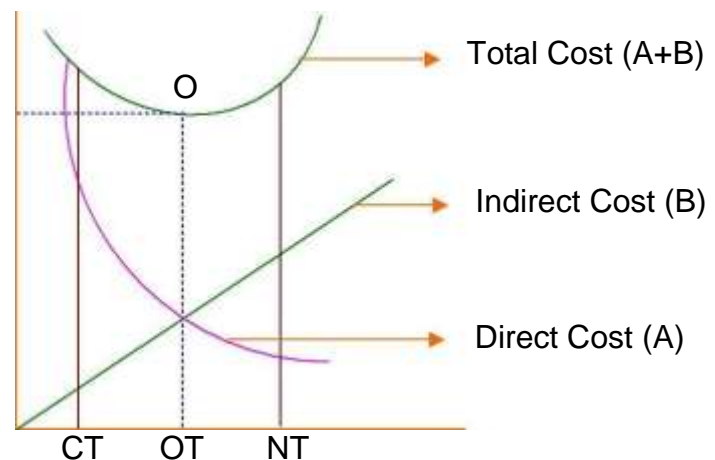
For reducing the duration extra expenditure to be incurred, but to save resources, organizations keep this extra expenditure at a minimum.

CT = Crash Time

OT = Optimum Time

NT = NormalTime

Project Cost



Project duration

When the direct cost (A) decrease with an increase in time, as the project duration increase, the indirect cost (B) like overheads, depreciation, insurance etc. increases. The total cost (A+B) curve is a flat U-shaped curve, with implies that only up to a particular point (O) the crashing is economical, not beyond. The time duration, which involves the least total cost, is the optimum duration at optimum cost. Crashing the duration of a project may not be possible beyond a particular point.

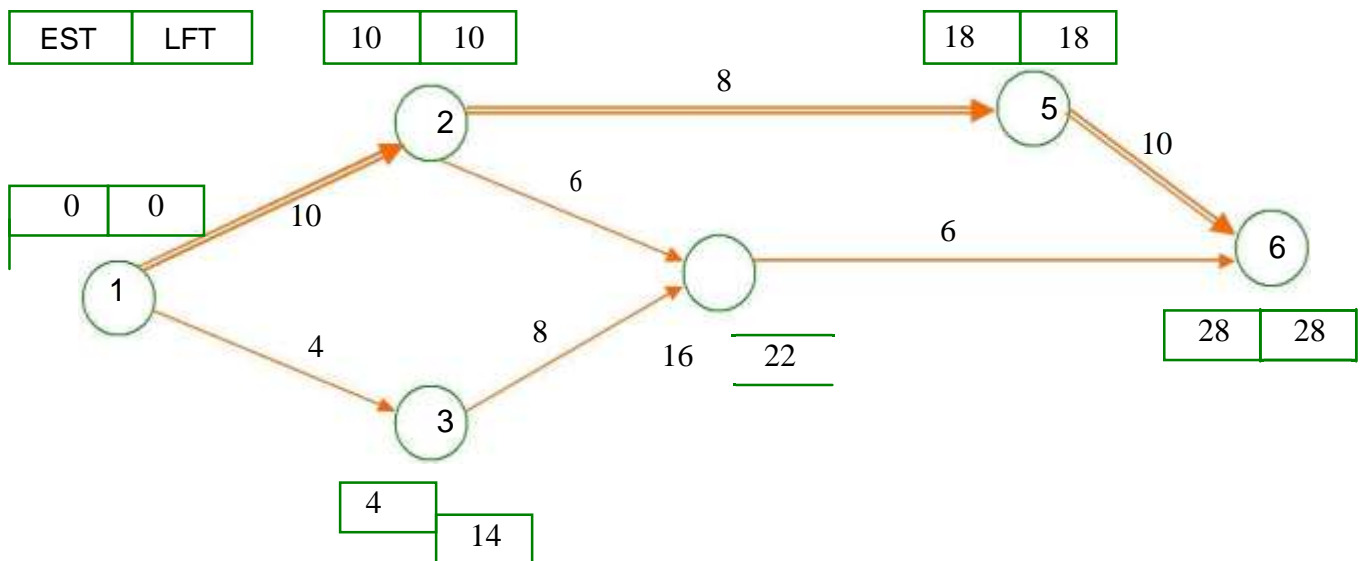
Problems:

n) Given the following data, work out the minimum duration of the project and corresponding cost

Activity	Job	Normal time	Crashing time	Normal cost	Crashing cost
A	1-2	10	6	400	600
B	1-3	4	2	100	140
C	2-4	6	4	360	440
D	3-4	8	4	600	900
E	2-5	8	6	840	1100
F	4-6	6	2	200	300
G	5-6	10	8	1200	1400

Solution:

Activity	Job	Normal time (N _T)	Crashing Time (C _T)	Normal cost (N _C)	Crashing cost (C _C)	COSTSLOPE = $\frac{C_C - N_C}{N_T - C_T}$	Priorities
A	1-2	10	6	400	600	50	1
B	1-3	4	2	100	140	20	
C	2-4	6	4	360	440	40	
D	3-4	8	4	600	900	75	
E	2-5	8	6	840	1100	130	2
F	4-6	6	2	200	300	50	
G	5-6	10	8	1200	1400	100	3

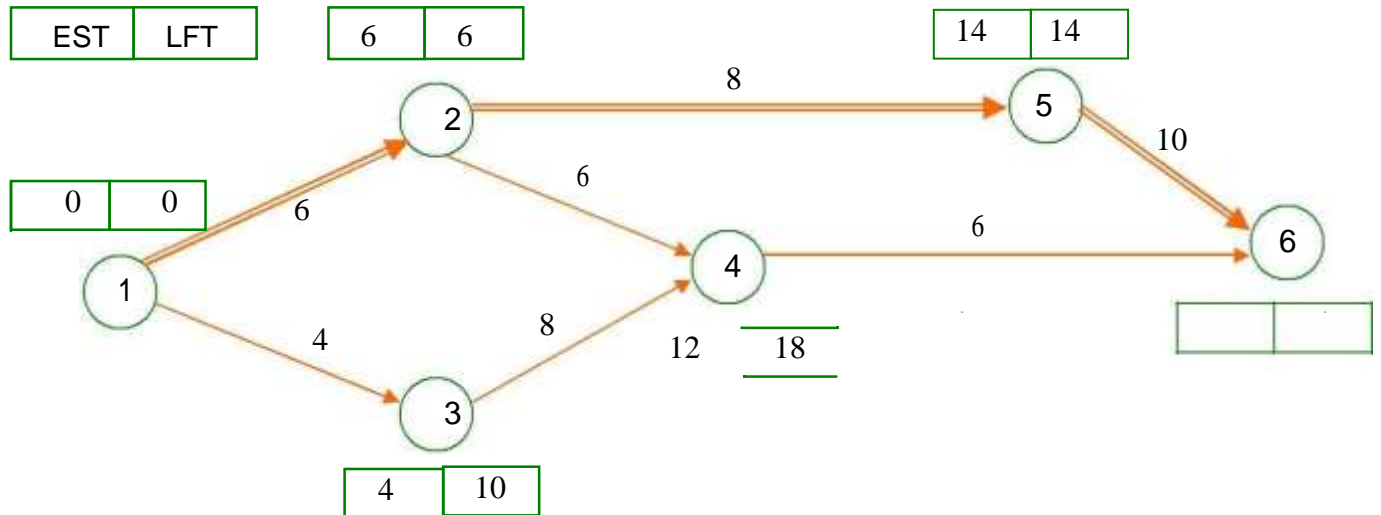


Critical path is 1-2-5-6 and Duration is 28 days

Total cost is = Direct cost + Indirect cost

$$= (10+4+6+8+8+6+10) + 0 = 52/-$$

1-2 activity crashing by 4 days:

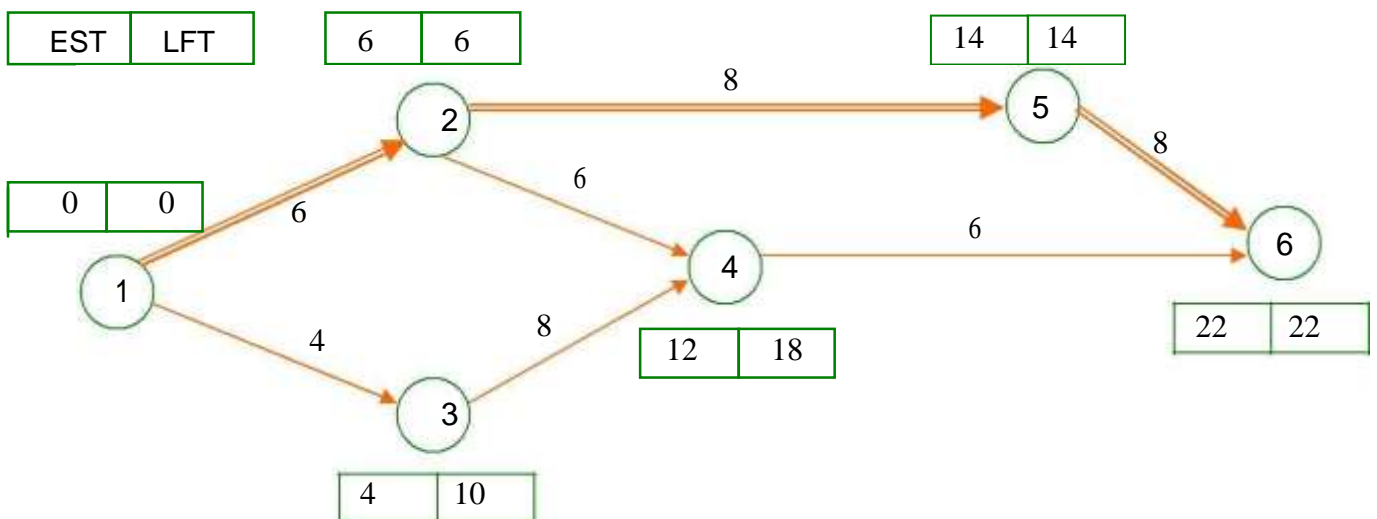


Critical path is 1-2-5-6 and Duration is 24 days

Total cost is = Direct cost + Indirect cost

$$=(52 + (4 \times 50) + 0) = 252/-$$

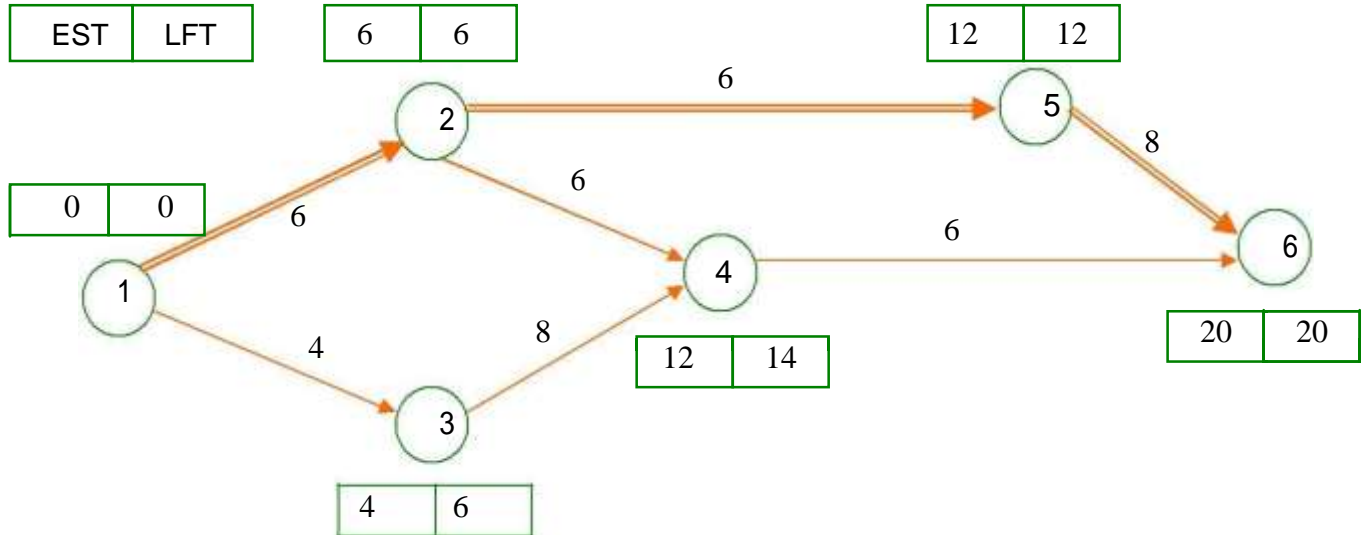
5-6 activity crashing by 2 days:



Critical path is 1-2-5-6 and Duration is 22 days

Total cost is = Direct cost + Indirect cost
 =(252 + (2 x 100) + 0) = 452/-

2-5 activity crashing by 2 days:



Critical path is 1-2-5-6 and Project Duration is 20 days

Total cost is = Direct cost + Indirect cost
 =(452 + (2 x 130) + 0) = 712/-

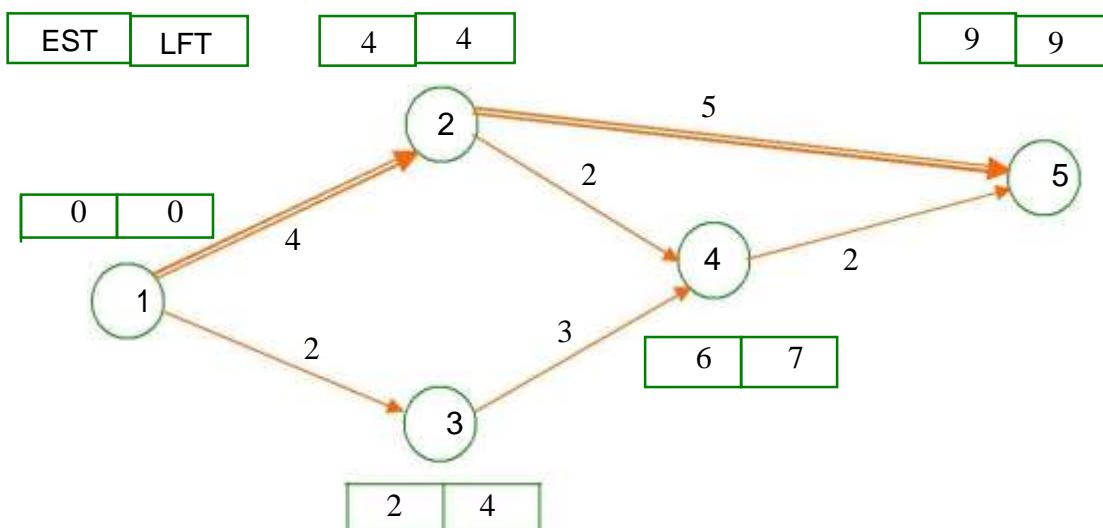
Optimum cost = 712/-
Optimum Duration = 20days

2) The following table gives the information relating to a project. By using the given data calculate the optimum duration of the project. Where indirect cost is estimated Rs.2,000 per day.

Activity	Normal		Crash	
	Time(days)	Cost(Rs.)	Time(days)	Cost(Rs.)
1-2	4	1000	3	2000
1-3	2	1500	1	3500
2-4	2	500	1	900
2-5	5	1000	3	4000
3-4	3	1000	1	2000
4-5	2	800	1	1000

Solution:

Activity	Normal		Crash		$Cost\ Slope = \frac{C_C - N_C}{N_T - C_T}$	Priorities
	Time (days)	Cost (Rs.)	Time (days)	Cost (Rs.)		
1-2	4	1000	3	2000	1000	1
1-3	2	1500	1	3500	1000	
2-4	2	500	1	900	400	
2-5	5	1000	3	4000	1500	2
3-4	3	1000	1	2000	500	
4-5	2	800	1	1000	200	
Total direct cost	5800					



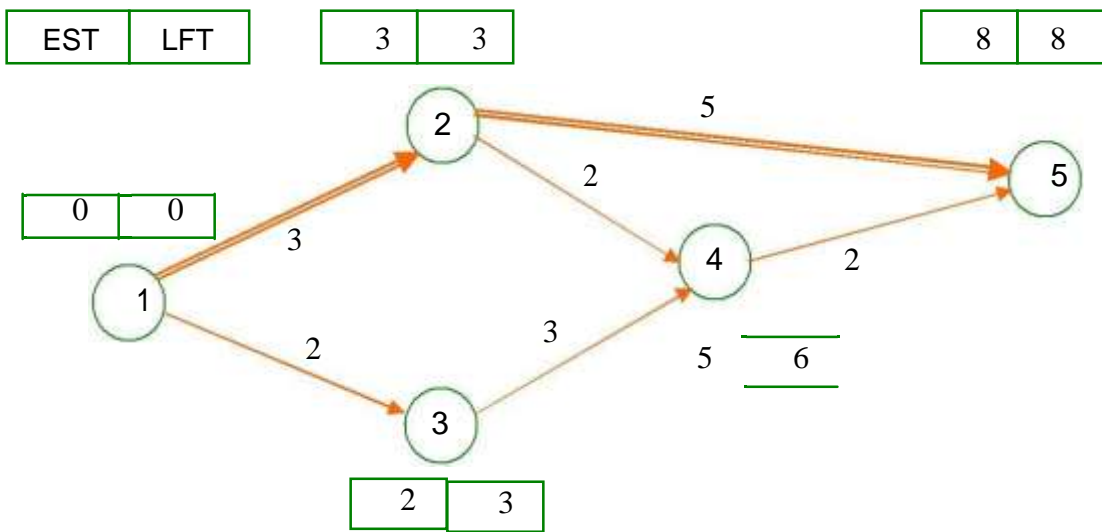
Critical path is 1-2-5 and Project Duration is 9 days

Total cost is = Direct cost + Indirect cost

$$= 5800 + (2000 \times 9)$$

$$= 23,800/-$$

1-2 crashing by 1 day:



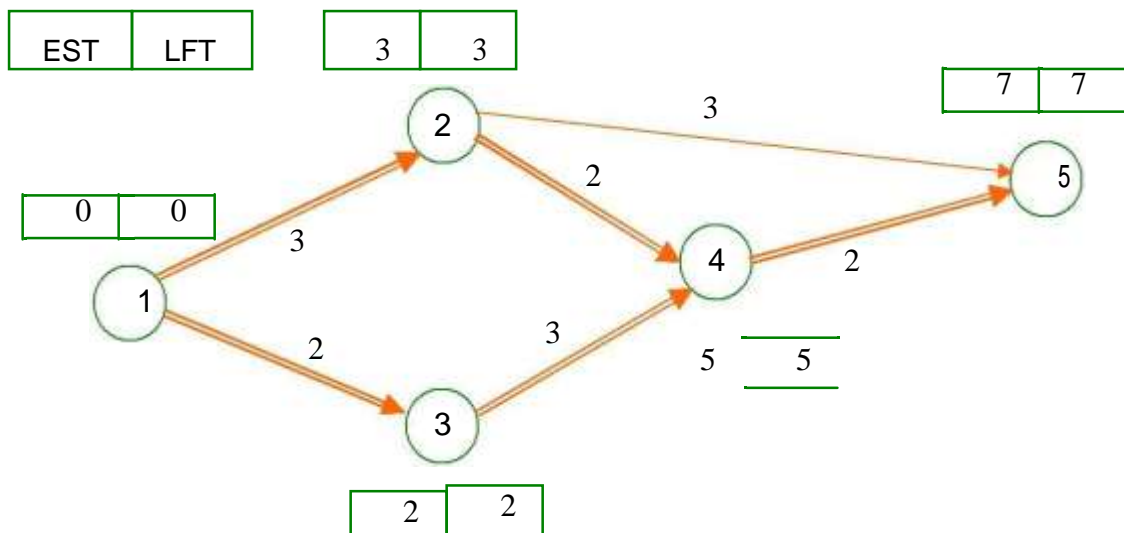
Critical path is 1-2-5 and Project Duration is 8 days

Total cost is = Direct cost + Indirect cost

$$= (5800 + (1 \times 1000)) + (2000 \times 8)$$

$$= 22,800/-$$

2-5(a) crashing by 2 days:



Critical paths are 1-2-4-5 and 1-3-4-5 and duration is 7 days only.

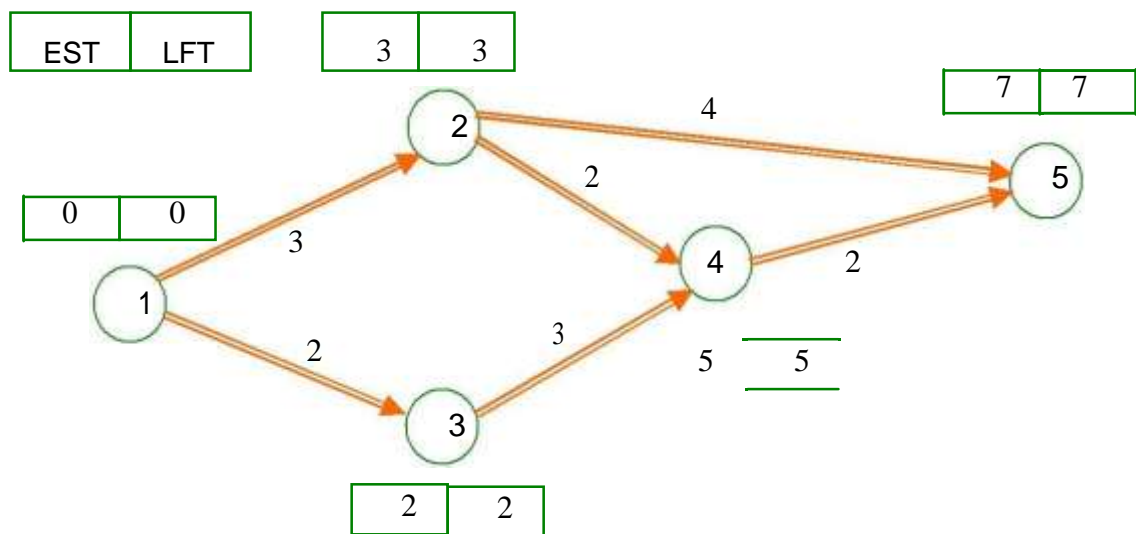
Total cost = Direct cost + Indirect cost

$$14. (6800+(2 \times 1500))+(2000 \times 7)$$

$$15. 23,800/-$$

Here project crashed by 2 days and total cost incurred by the firm is 23,800/- but duration is reduced by only one day. So it is suggested to crash the network by only one day, It can help to reduce the cost. So that 2-5 activity crashing by only 1 day.

2-5(b) activity crashing by 1 day only



Duration is 7 days

Totalcost = Direct cost + Indirectcost

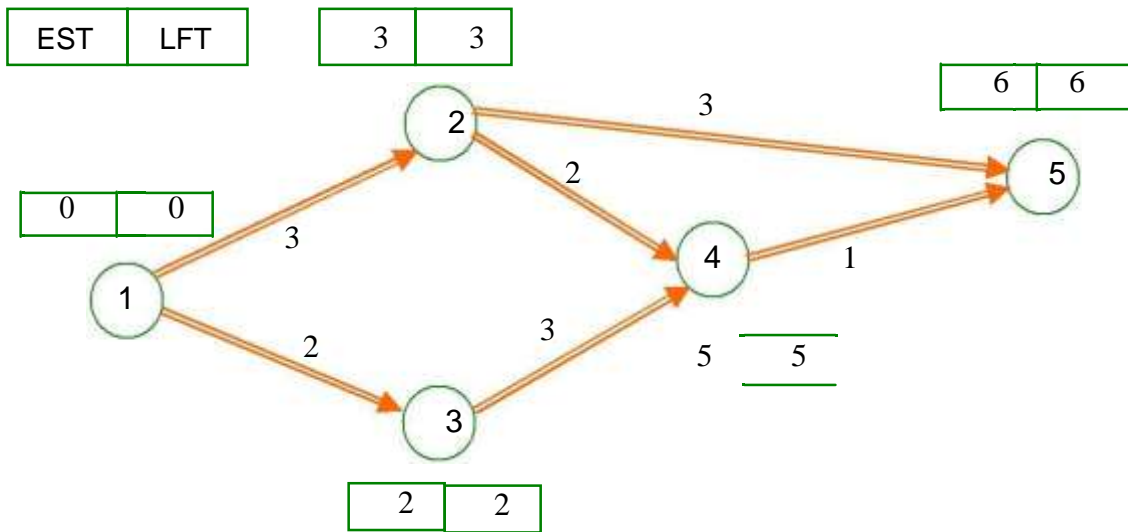
$$16. (6800+(1 \times 1500))+(2000 \times 7)$$

$$17. 8300 +14000$$

$$18. 22,300/-$$

All activities comes under the critical activities, the priority are changed according to the cost slope 4-5 activity having minimum cost slope. So that it is possible to crash out 4-5 activity by one day only and 2-5 by one day simultaneously

4-5 activity crashing by 1 day and 2-5 crashing by 1 day only:



Duration is 6 days

Totalcost = Direct cost + Indirectcost

16. $(8,300 + (1 \times 1500) + (1 \times 200)) + (2000 \times 6)$

17. $(8300 + 1700) + (12000)$

18. 22,000/-

This network diagram not possible to crashing further, So that the project duration is 6 days and optimum cost is Rs.22,000/-

Optimumcost = 22,000/-

Optimum Duration = 6days

UNIT – V

INTRODUCTION TO STRATEGIC MANAGEMENT

Corporate Planning: Corporate planning refers to the process of planning undertaken by top management to achieve their organization goals.

Two significant phases incorporate planning:

23. Environmental Scanning

24. Strategy formulation and implementation

Mission is the guiding force for all the activities here. The first step in the process of achievement of the mission is to break the mission in to objectives, strategies and programme have to be formulated and implemented to achieve the given objectives which would eventually lead to the fulfillment of mission.

Mission: This is also called overall objective or overall goal.

Mission or purpose: The mission or purpose identifies the basic function or task of an enterprises or agency or of any part of its. Every kind of organized operation has, or at least should have if it is to be meaningful, purpose or mission.

Some writes distinguish between purpose and mission. While a business for example may have a social purpose of producing and distributing goods and services. It can accomplish this by fulfilling a mission of producing certain line of products.

Objectives: Objective are the ends towards which activities is aimed-they are results to be achieved. They represent not only the end point of planning but the end toward which point of planning but the end toward which organizing, staffing, leading and controlling are aimed. While enterprises objectives are basic plan of firm a department may also have its own objectives.

Goal: It goals naturally contribute to the attainment of enterprises objectives but the two sets of goals may entirely different.

For example: The objective of a business might be to make a certain profit by producing a given line of home entertainment equipment, while the goal of the manufacture department might be to produce the required number of television setsofgivendes

Strategies: —Plan of Action

- s) General programs of action and development of resources to attain comprehensive objectives
- t) The program of objectives of an organization and their changes, resources used to attain these objectives.
- u) The determination of basic long-term objectives of an enterprise and adoption of courses of action and allocation of resources necessary to achieve the goals.

Policy: Policy a broad guideline set by the top management for the purpose of making decisions at different levels in the organization, once the corporate objectives are established policies can be formulated organization policy reflects the owner's attitude to different segments such as creditors the employees, customers and society at large.

Programmes: Programmes refer to the logical sequence of operations to be performed in a given project based on a set of goals, policies, procedures, rules and task assignments. They are used to carry out a given course of action.

Purpose: A strategy is an operational tool to achieve the goals, and thus, the corporate mission. Strategies do not attempt to outline exactly how the enterprise is to accomplish its objective. A company may view downsizing in a competitive market to render cost effective services. Thus, strategy provides a framework to guide thinking and action.

Strategic Management Process: Strategic management is a process or series of steps. The basic steps of the strategic management process are

Identifying Corporate Mission: Identify what the organization wants to achieve to start with for the purpose of it is necessary that all concerned parties understand the overall purpose of the organization and the methods of attaining them. It is also desirable that they agree on the corporate policies of the organization.

Formulate strategic objectives: By preparing statements of mission, policy, strategy, and goals, the top management established the frame work within which its divisions or departments prepare their plans. It is essential that the members of the organization agree on these given strategic objectives. The strategic objectives thus formulated reinforce the commitment of the members of the organization to achieve the corporategoals.

Appraise internal and external environment: To evolve alternative strategies to achieve these goals, a detailed appraisal of both the internal and external environment is carried out. The appraisal of internal environment reveals the strengths and weakness of the firm. The appraisal of external environment reveals the opportunities and threats for the firm. It is popularly called as SWOT analysis capitalizes on internal strengths, make use of best opportunities and beware of the threats in the external environment.

Develop and evaluate alternative strategies: There could be some alternative strategies to pursue a given goals. If the goal is to expand the business, the following could be the three alternatives.

Sold new products to the existing product line

Finding new markets, a part from the present market territories.

Manufacturing within the organization, the components, which were earlier procured from outside.

Similarly, if the goal is to attain stability, the alternative strategies could be to maintain the following.

The existing range of products

The existing markets

The functions presently being carried out.

Select the best strategy: For the firm to be more successful, it is necessary to focus its strategies around its strengths and opportunities. It is a prerequisite that the members of the organization agree on the strategic plan. Such a plan, which has been generally agreed upon, is normally considered as the best strategy.

Establish strategic business units (SBUs): It is more strategic to define a business unit in terms of customer groups, needs and/or technology and set up the business unit accordingly. Most of companies define their businesses in terms of products.

Fix target allot resources to each SBU: The development of SBUs based on appropriate finding the top level management knows that its portfolio has certain old, established relatively new, and brand new products.

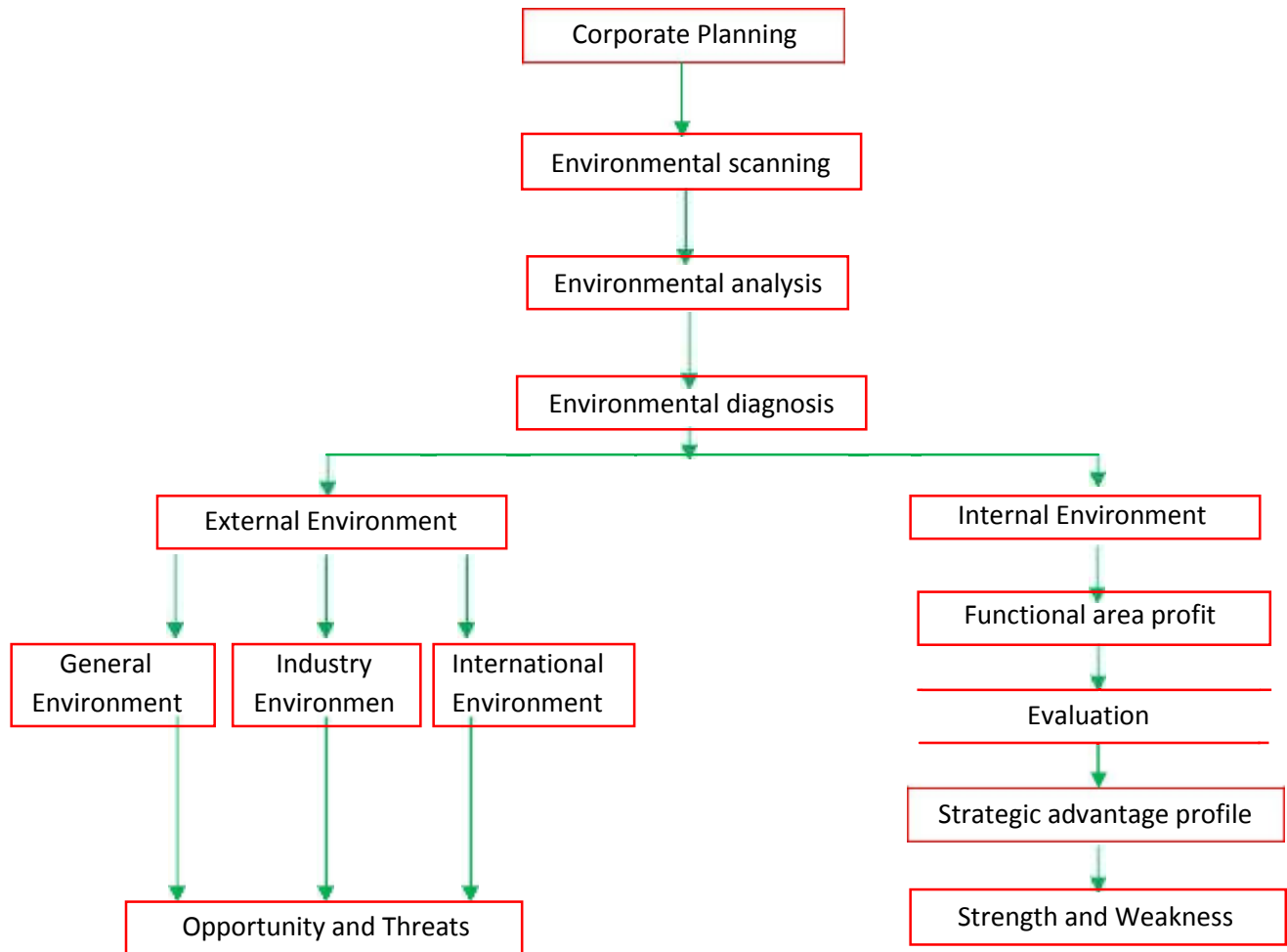
Resources should be allocated based on market growth rate and relative market share of SBUs. Here resources mean executive talent money and time.

Developing operating plans: The operating plan explain how the long-term goals of the organization can be met, the corporate plans reveal how much the projected sales and revenue are where the top management finds a significance gap between the targeted sales and actual sales, it can either develop the existing business or acquire a new one to fill the gap.

Monitor performance: The results of the operating plans should be will monitored from time to time. In the case of poor performance, check up with the members of the team to find out their practical problems and sort these out. Also, it is essential to verify whether there are any gaps in formulating the operating/tactical plans.

Revise the operating plans, where necessary: It is necessary to rise the operational plans particularly when the firm does not perform as well as expected. The planes can be revised in terms of focus, resource or time frame

Environment scanning process



Environmental Scanning: Environmental scanning is a vital part of the corporate planning process. Effective planners try to anticipate what is likely to happen or attempt to influence the environment in favourable directions. This requires long-term strategic vision and commitments to corporate planning.

Why environmental scanning:

The banks and business enterprises in the public sector are being disinvested by the government.

The government policies keeping changing the current focus of the government of India has been an globalization, privatization, deregulation. As a results foreign goods are being dumped into the markets.

Computers have wiped out the market for typewriters and electronic type writers.

Info-tech industry, which was very strong for over decades, suddenly revealed downtrend.

The advent of television channels has almost zeroed down the market for VCR and significantly affected the flow of film viewer traffic.

Environmental analysis: Refers to the process of analyzing the environment, component-wise or sector-wise to provide a basis for further diagnosis. It interrelates the formation of objectives, generation of alternative strategies, and other related issues.

Environmental diagnosis: Comprises the managerial decisions based on the perceived opportunities and threats of the firm. In effect, it helps to determine the nature of the impending tasks to take advantage of opportunity or to effectively manage threat.

External Environment Analysis (Opportunity and Threat): The external environment has a profound impact on the business operations irrespective of the nature of the business. The business has to monitor the key forces both in to micro and macro environment. The forces in the micro-environment may be customer competitors, and other

The forces in the macro environment may be demographic, economic, technological socio-cultural, political or legal. All these factors and parties affect the business operations both in the short and long run. These factors can be grouped under three parts of the environment.

16. General environment

17. Industry environment

18. International environment

19. General environment: A firm is said to be more effective when its strategy caters to the needs effective when its strategy caters to the needs of the environment. The additional features added to the main product at times could provide a new life to the main product. The corporate units, which realize this, will survive in the long-run.

Thus, the major causes of growth, decline, and other large scale changes in firms are the factor in the external environment, not internal development.

Socio-economic sector

The technological sector

The government sector

20. Industry environment: It is an important component of the overall environmental analysis as input for corporate planning. Industry refers to the group of firms carrying on similar activity. It has three sectors, customers, suppliers and competitors.

Customers: The strategist must identify and analyze the customers for the organization locates the potential customers and the emerging changes in their buying pattern. It is necessary to identify the profile of buyers in terms of their needs and preferences based on the basic demographic factors such as age, income size of household and consumption pattern. These factors create the primary demand for products or service and help to scan the geographical environment for potential market and customers.

Suppliers: Strategist also must determine the availability and costs of supply condition including raw materials, energy, prevailing technology, money and labour. The supplier can influence a firm and its strategy, particularly when the firm is outsourcing its logistic requirements.

Competition: The strategist moulds his strategy in the light of the competitor's strategy, the exit or entry of competitors to be analyzed and diagnosed.

21. International Environment: The strategy of globalization implies a great source of opportunities and also threats to business firms. Such firms, which make use of the opportunities, would flourish and those, which cannot gear up, would demise.

Internal Environment analysis and diagnosis: Internal environmental analysis and diagnosis is a process of analyzing and diagnosing the firm's internal strengths and weaknesses. By identifying its strength and weaknesses, the firm can strategically exploit the available opportunities, overcome threats, and correct weaknesses placing itself at a competitive advantage.

Conducting internal analysis and diagnosis: Identify first the internal strength and weaknesses. The strength and weaknesses may include the following.

Marketing factors

Research and development

Engineering design and management

Production management

Managerial personnel

Accounting and financial policies and procedures.

Profile of research and development:

Financial resources (budget to conduct research, to develop new products and processes, improve existing processes and so on)

Infrastructure (in terms of state-of-the-art technologies)

Human resources (how many scientist and engineers are required, presently available, turnover of key personnel)

Organizational system (system to monitor technological developments from time to time)

Strategy advantage profile: The ultimate result of such a detailed internal analysis to build a strategic advantage profile strategic advantage profile is a tool used to evaluate systematically the enterprises internal factors the competitive strengths or weaknesses for each internal area such as marketing, R &D and others

SWOT Analysis: SWOT analysis is defined as the rational and overall evaluation of a company's strength, weakness, opportunities, and threats which are likely to affect the strategic choice significantly.

External environment analysis (Opportunities and Threats): The external environment has a profound impact on the business operations irrespective of the nature and size of the business. The business has to monitor its key macro-environment forces and micro economic parties.

Opportunities: It necessary should identify what opportunities are available to it to focus upon. The latest technology, deregulated or free markets, liberalized rules and regulations and other may make a lot of difference for a business organization provided it can envision how to avail these visionary identify opportunities from treats.

Threats: Some development in the external environment represents threats. A threat is a challenge posed by an unfavorable trend or a development that results in the loss of sales or profit till a defensive marketing action is initiated. A few example of threat could be outlined as change in government policy such as liberalization privatization and globalization, changing technology changing value systems environmental constraints law and order.

Internal environment analysis (Strength and Weakness): It is necessary to analyze one's own strength and weakness periodically to sustain the degree of its competitive strength. Generally top management or an outside consultant reviews competencies pertaining to marketing, financial, manufacturing and organizational system and rates each factor as a major strength, minor strength, mental, factor, minor weakness, or major weakness.

Strength: It is not necessary that a business organization has to correct all its weakness nor that its propagate its strength. The big question is whether the business should limit itself to those opportunities, where its possesses the required strength or should it consider better opportunities where it might have to develop certain strength.

Weakness: Some times the company may not do well not because its departments lack the required motivation but because they do not work together as a team for example consider the case of an electronics company which employs engineers, sales and service staff for its operations. It is not adequate if they keep on doing their work. The organization becomes more effective only when they work as a team. It is therefore, critically important to build effective teams and assess the effectiveness of these teams. This is a part of the internal environmental audit. Progressive companies adopt this strategy.

<p><u>Strength:</u></p> <ol style="list-style-type: none"> 1) Value for money programme 2) Pool of trained faculty 3) Wide choice of offering 4) National network of well equipped training centre 	<p><u>Weakness:</u></p> <ol style="list-style-type: none"> 1) Not aggressive in selling 2) Course differentials not sharp 3) Counselor enthusiasm inadequate 4) Customer service not focused enough
<p><u>Opportunities:</u></p> <ol style="list-style-type: none"> 1) Growing demand for computer education 2) Computer library becoming a necessity 3) Growth of rich training needs 4) Need for customized training modules 	<p><u>Threats:</u></p> <ol style="list-style-type: none"> 1) Rise in number of competitors 2) High rate of technological obsolescence 3) Commoditization of training under cutting offees.

Strategy Formulation: This is often referred as strategic planning or long-range planning. This process is primarily analytical, not action-oriented. The strategy formulation process is concerned with developing a corporate mission, objectives, strategy and policy.

This process involves scanning external and internal environmental factors, analysis of the strategic factors and generation, evaluation, selection of the best alternative strategy appropriate to the analysis.

Henry Mintzberg has pointed out that corporations' objectives and strategies are strongly affected by top management's view of the world. This view determines the mode to be used in strategy formulation. These modes include

Entrepreneurial mode: one powerful individual formulates Strategy.

The focus is on opportunities rather than on problems.

Strategy is guided by the founder's own vision of direction.

Adaptive Mode: This strategy formulation mode is characterized by reactive solutions to existing problems rather than a proactive search for new opportunities.

Planning Mode: Analysts assume main responsibility for strategy formulation.

Strategic planning includes both the practice search for new opportunities and the reactive solution of existing problems.

Thus, strategy formulation process involves environmental analysis organizational analysis, development of strategic alternatives and analysis and selecting the most appropriate strategy from the alternatives developed.

The corporate level strategies include:

Stability strategies Growth strategies

Retrenchment strategies

Combination strategy or port-folio restructuring

Implementation of strategies:

Institutionalization of strategy

Setting proper organizational climate Developing appropriate operating plans

Developing appropriate organizational structures Periodic review of strategy

CONTEMPORARY STRATEGIC ISSUES

Just – In – Time (JIT):When components arrive as and when required in a manufacturing operating by workers. It is called just-in-time.

Some we would at a stroke eliminate any inventory of parts, they would simply arrive just-in-time. Similarly we could produce finished goods just-in-time to be handed to a customer who wants them. So at conceptual extremes. JIT has no need for inventory or stock, either of

raw materials or working in progress or finished goods.

Total Quality Management: It is a term first coined by the U.S. Naval Air Systems Command to describe its Japanese-style management approach to quality improvement. It is a management approach to long-term success through customer satisfaction.

In a TQM effort, all members of an organization participate in improving processes, products, services and the culture in which they work.

Six Sigma: Six sigma is a set of practices developed by Motorola to systematically improve processes by eliminating defects. A defect is defined as non-conformity of a product or service to its specifications.

Six Sigma refers to the ability of highly capable processes to produce output within specification. In particular, processes that operate with Six Sigma quality produce at a defect level below 3.4 defects per million opportunities.

The statistical representation of six sigma quantitatively shows how a process is performing. To achieve six sigma, a process must not produce more than 3.4 defects per million opportunities. A six sigma defect is defined as anything outside of customer specification. A six sigma opportunity is then the total quantity of chances for a defect.

Definition: Six Sigma at any organization simply means a measure of quality that strives for near perfection. Six sigma is a disciplined, data-driven approach and methodology for eliminating defects in any process from manufacturing to transactional and from product to service.

Capability Maturing Model: Capability Maturity Model (CMM) is a collection of instructions an organization can follow with the purpose to gain better control over its software development process.

The CMM ranks software development organizations in a hierarchy of five levels, each with a progressively greater capability of producing quality software. Each level is described as a level of maturity. Those 5 levels are equipped with different numbers of instructions to follow.

Level – 1 - Initial : At maturity level-1 processes are usually ad hoc and the organization usually does not provide a stable environment

Level – 2 - Repeatable: At this maturity level-2, software development successes are repeatable. The organization may use some basic project management to track cost an

Level-3-Defined: A maturity level-3, processes are well characterized and understood, and are described in standards procedure, tools, and methods.

Level – 4 - Managed: Using precise measurement, management can effectively control the software development effort. In particular, management can identify ways to adjust and adopt the process to particular projects without measurable losses of quality or deviations from specifications.

- **Optimizing**: This maturity level focuses on continually improving process performance through both incremental and innovative technological improvement.

Supply Chain Management: It is the process of planning, implementing and controlling the operations of the supply chain as efficiently as possible supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of consumption.

Enterprise Resource Planning (ERP): It integrates all data and processes of an organization into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data.

ERP systems cover all basic functions of an organization, regardless of the organization's business, non-profit organization, non-governmental organization or government.

Performance Management is covered with communication. This is done by creating a climate in which a continuing dialogue between managers and the members of their teams takes place to define expectations and share information on the organization's mission, values and objectives. This establishes mutual understanding of what is to be achieved and a framework for managing and developing people to ensure that it will be achieved

--- **By Armstrong & Murlis (1994).**

Performance Management is about managing the organization. It is a natural process of management, not a system or technique.

--- **By Fowler (1990).**

Business Process Outsourcing (BPO): BPO refers to a decision to sub-contract some or all non-core processes. The main motive for business process outsourcing is allow the company to invest more time, money and human resources into core activities and building strategies, which fuel company growth.

The global market to day is highly competitive and ever-changing. A company must focus on improving productivity and yet, cut down costs. There, a lot of tasks that use up precious time, resources and energy, are being outsourced. BPOs or the units to which work is being outsourced, are flexible, quicker, cheaper and very efficient.

BPO is the contracting of specific business task, such as payroll to a third-party service provider.

BPO is often divided into two categories.

s) Back Office Outsourcing: This includes internal business functions such as billing or purchasing.

t) Front Office Outsourcing: This includes customer-related services such as marketing or technical support.

Business Process Re-engineering (BPR):

Definition: The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality service and speed.

--- By Hammer and Champy

BPR is a management approach aiming at improvements by means of elevating efficiency and effectiveness of the processes that exist within and across organizations. The key to BPR is for organization to look at their business processes from a clean slate perspective and determine how they can best construct these processes to improve how they conduct business.

Bench Marking: A process of searching for, identifying, and using ideas, techniques and improvement of other companies/situations in its own activities.

Definition: A systematic and ongoing process of improving performance by measuring a product, service or process against a partner that has mastered it.

In short – comparing methods against the best to identify changes.

19) A quality management tool that includes a set of practices aimed at improving product and service quality

Bench marking involves measuring the performance of the organization, team or individuals against the best practice for the industry, function or particular activity.

Balance scorecard: It is a management system that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback on both

strategic performance and result. When full deployed, the balance scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise The balance scorecard suggests that we view the organization from four perspectives' and to develop metrics.

- 19.The learning and growth perspective
- 20.The business process perspective
- 21.The customer perspective
- 22.The financial perspective.

