

1.1.] Management :-

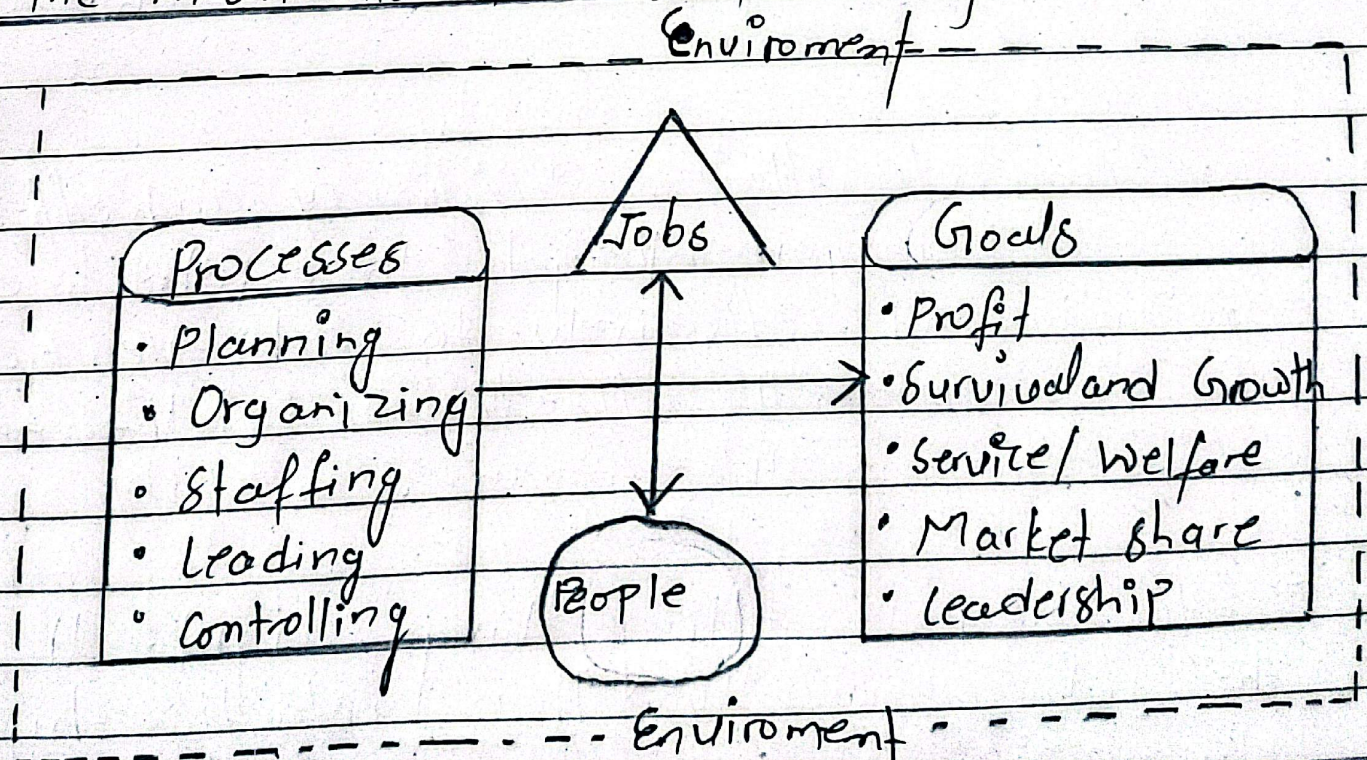
→ Management is the process of planning, organizing, leading and controlling resources such as people, money, time and materials to achieve specific goals efficiently and effectively.

In simple word,

→ Management means getting work done through people in the best possible way.

Characteristics of Management (Nature)

→ The main characteristics of management are:



1. Management achieves goals:

Goals are end results to be achieved by management. They can be multiple.

Goals can be:

- profit
- survival and growth
- service
- Market share
- Leadership.

2. Management gets the jobs done:

Jobs are the focus of management. They are needed to perform various activities such as production, marketing, finance, human resource management and research.

3. Management attains efficiency and effectiveness.

Management gets the jobs done efficiently and effectively to achieve goals. For management, effectiveness is the end, efficiency is the means.

→ Efficiency is getting things right. It is doing the job correctly. It is relationship between inputs and outputs.

→ Effectiveness is doing the right thing.
It indicates how well the goals are achieved.

4) Management works with and through people.
Management focuses on people. It is a social process. It works with and through people to get the jobs done. The human side of enterprise is very important in management. It emphasizes team work.

5. Management is a process.
Management uses the process of Planning, organizing, staffing, leading and Controlling for attaining goals. These are the function of management.

6. Management has environment.
Management operates in a dynamic environment. The forces in the environment are political, legal, economic, socio cultural, technological. Management adapts to changes in environment.

#. Principles of management :-

principles are generalizations. They guide management practice. They are based on management function.

Important principles of management :- They are :

1. Division of work :

This is the principle of specialization. An employer should be assigned only one type of work to increase output.

• In practice, activities are grouped into departments such as production, marketing, finance, human resource management. This leads to functional division of work.

2. Authority and responsibility :

Authority is legitimate power. It is the right to give order. Responsibility is obligation to perform the work. This principle states that authority should flow from responsibility. So, the authority and responsibility both should flow together.

3. Unity of Command : This principle state that one employee should have only one boss. Multiple bosses weaken discipline, divide loyalty, create conflicts and undermine authority.

4. Unity of direction : This principle states that there should be one head and one plan for a group of activities having the same objective. For example, all marketing activities should be directed by one person.

5. Scalar Chain of Command (Hierarchy) : Management should have a scalar chain of command. All employees should be linked with each other in superior-subordinate relationships. Orders and communication should pass through the scalar chain.

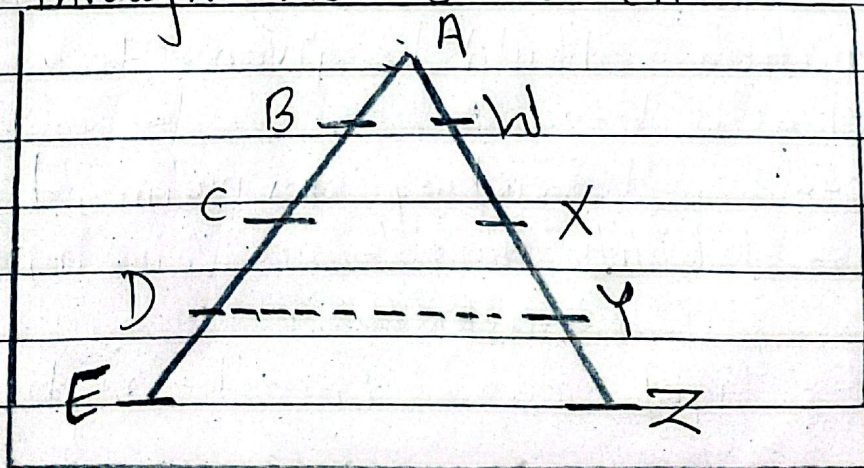


fig: Organizational chart in scalar chain of command.

6. Span of management:

This principle states that there is a limit to the number of subordinates that a superior can supervise. Organization charts reflect span of management. This principle is also known as span of control.

7. Superiority of organization interests:

This principle states that the interests of organization should be above the interests of individual.

8. Discipline:

The principle states that discipline is essential for proper functioning of organization. However, discipline is what leaders make of it.

9. Human resource management:

This principle states that fair and equitable remuneration should be given to employees. There should be:

- Good working environment
- Stability of tenure for employees or job security
- Right man in the right job.

10. Management by exception:

This principle states that management should pay attention only to exceptional cases. It requires delegation of authority to subordinates.

11. Supportive relationships:

This principle states that managers should build supportive relationships with subordinates.

#. Functions of Management.

The functions of management are:

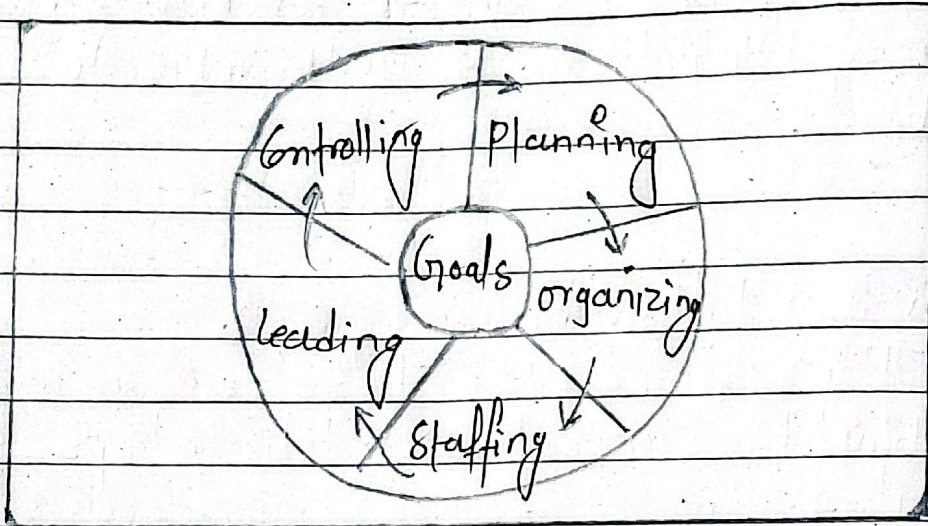


Fig: Function of management.

1. Planning :

It is setting goals and deciding how best to achieve them. Planning is predetermining future. It involves selecting goals and courses of actions to achieve them. It discovers alternatives. It requires decision making by every level of managers.

2. Organizing :

It is determining how to group activities and resources. It is differentiating and coordinating activities to carry out the plan. It is establishing a structure.

It involves:

- Defining task required to achieve goals.
- Grouping the task in departments.
- Designing a structure.

Organizing include grouping tasks, designing authority, responsibility structure, creating channels of communication and coordinating mechanism.

3. Staffing:

It is acquiring and assigning people to carryout tasks. Staffing is filling and keeping filled positions in the organization structure. Staffing is the human resources management function in organization.

It involves:

- Acquiring, developing, utilizing and maintaining people.
- manpower planning to determine requirement.

4. Leading:

It is directing the activities of others. It is getting people to work together.

leading is influencing and motivating people to perform tasks for goal achievement. It is concerned with interpersonal aspect of managing. It consists of: (LMC)

- leadership
- Motivation
- Communication.

5. Controlling:

Control is monitoring and correcting ongoing activities to facilitate goal achievement. It is the measurement and correction of performance to achieve planned targets. It is a cyclical process.

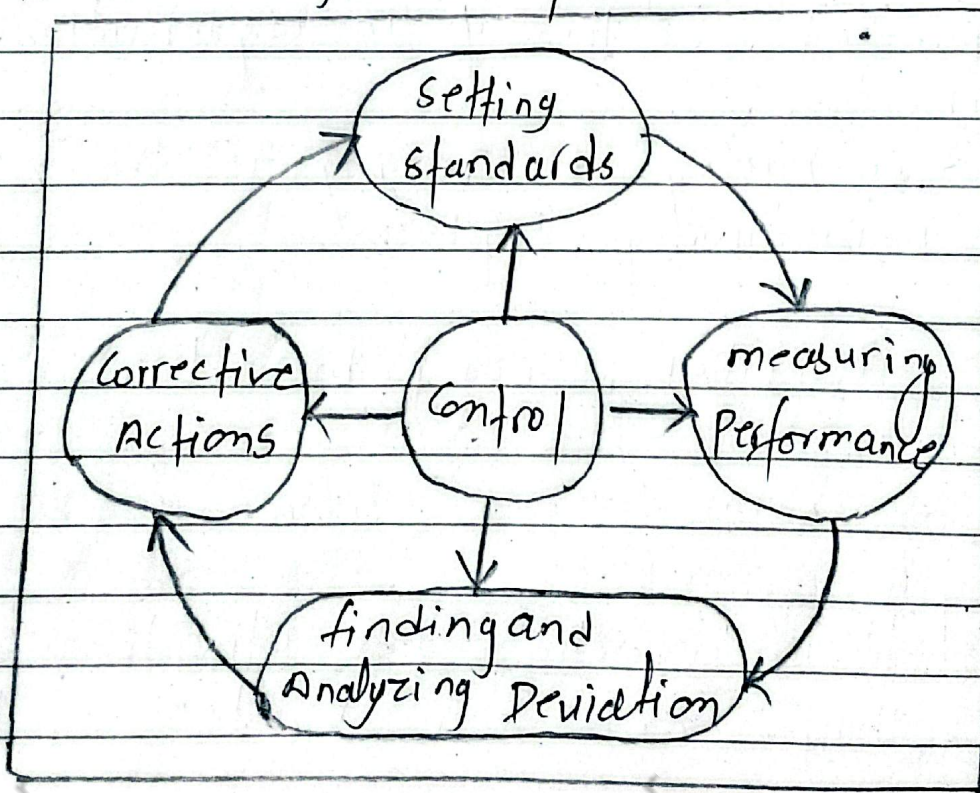


fig: The process of Control

Level and Scope of management:

Level of Management.

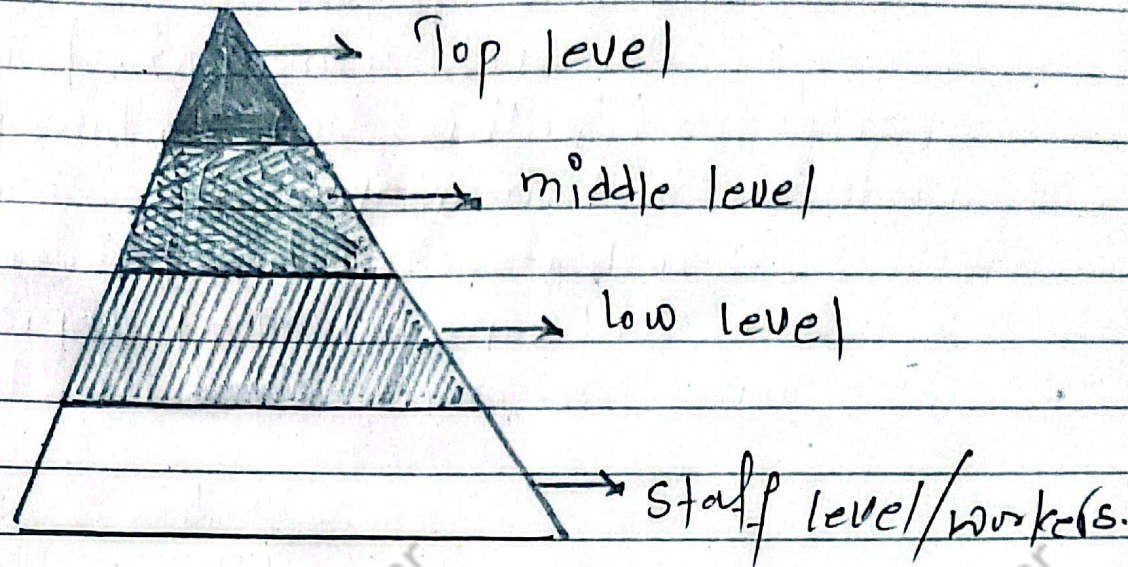


fig: Hierarchy of level of management.

1. Top Level management:

They are the highest of management. They are a small group of executives. They have the overall responsibility for the survival, growth and welfare of the organization. They make decision and establish policies. It include,

Board chairperson, chief executive officer (CEO), managing Director (MD), General manager (GM), president represents top managers of this level of management.

2. Middle level of management:

They are largest group of managers in most organizations. They are subordinate to top management.

→ Middle level management implement strategies, policies and plans developed by top level management.

→ It includes, Department managers, division head and plant superintendent represent middle level management.

3. Low level management.

They are known as first line management. They hold entry level management position. They are subordinate to middle level management.

→ It includes, Supervisor, foreman, section head represent lower level management.

4. Staff level / Workers:

Workers are the employee who:

→ operate machine, provide services, handle daily tasks, produce goods and follow instruction from Supervisors.

Scope of management:

→ Scope means areas covered by management.

→ Management applies everywhere, in every type of organization.

The Scope includes:-

1. Planning.

What to do, when to do, how to do.

2. Organizing:

Arranging people, materials and resources.

3. Staffing:

Recruitment, selection, training, development.

4. Directing:

motivating, guiding, communicating, leading

5. Controlling: Setting standards, measuring performance. Correcting mistakes.

6. Coordination:

Ensuring all department work together smoothly.

7. Decision making:

Choosing the best possible action.

8. Innovation:

Introducing new ideas, technologies, and methods.

1.2] Organization :-

Organization is a System composed of people, structure and technology for achieving common goals in a dynamic environment.

→ characteristics of organization :-

The characteristics of organization are.

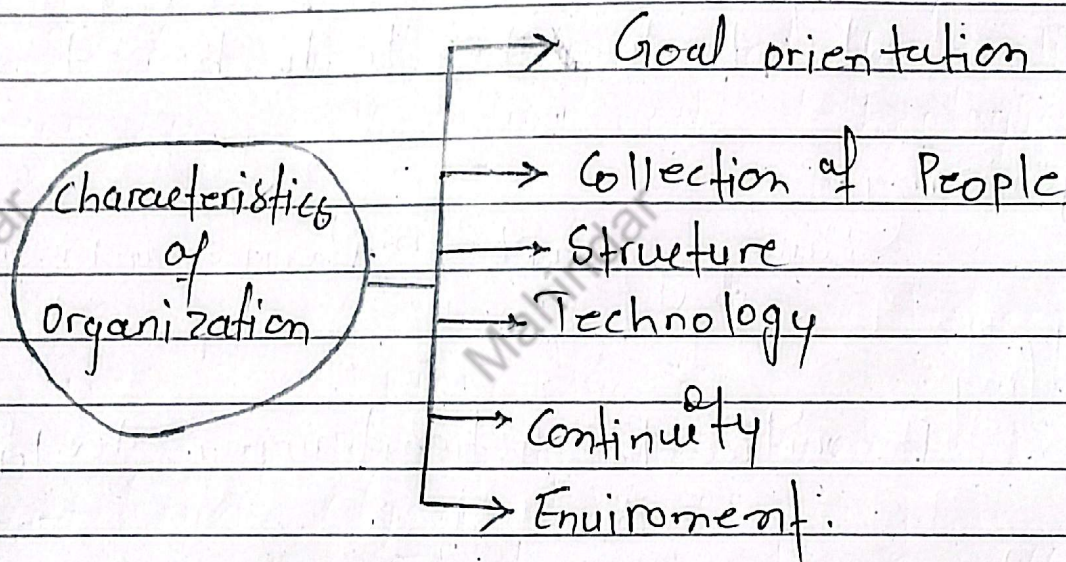


fig: characteristics of organization.

1. Goal orientation :

Organizations are goal oriented. They are created to achieve common goals. Goals provides reason for the existence of organization. They provide direction and guide actions of organization.

Goals can be single or multiple.

The important goals are profit, survival, growth service, leadership etc.

2. Collection of People:

Organization is a human association.

It is created by people. It consists of people working together. They establish goals. They interact with each other at work.

3. Structure:

Structure defines jobs and relationships. It involves differentiation of activities and integration of efforts.

→ Differentiation is concerned with division of work.

→ Integration is with coordination of individual.

4) Technology:

Organizations transform inputs into outputs. People use technology to perform activities. Technology refers to the knowledge and skills required to perform activities. It is represented by equipment, technique, skill and processes.

5. Continuity:

Continuity provides stability. Most organizations have continuity. They tend to stay alive. But this does not always happen.

6. Environment:

Organization exists in a dynamic environment. It is influenced by environment. The forces in the environment are political, economic, socio cultural and technological.

Types of Organization :-

1. formal organizations :-

A formal organization is officially structured and follows rules.

key features :-

- Clear hierarchy (Boss → manager → employee)
- Defined roles and responsibilities
- fixed rules and procedures.
- Workflows are planned.
- Example: Schools, Banks, Companies etc.

2. Informal organization:

An informal organization forms naturally within a formal organization.

key features:-

- No official structure.
- formed through personal relationships and friendships
- Communication is casual.
- Helps reduce stress and improves teamwork.
- Example: friend's group in a company, student's forming study groups etc.

3. Virtual Organization:

An virtual organization operates mainly through digital or online communication.

key features:-

- Employees work from different locations.
- Communication happens through email, zoom, WhatsApp
- Less physical office space.
- flexible work environment.
- Example: Remote working companies, Online business and startups, freelancers collaborating online etc

1.3] Engineering Management:

→ Engineering management means planning, organizing, directing and controlling engineering activities like.

- Designing product
- Developing systems
- managing technical teams.
- overseeing engineering projects
- Improving processes.
- Making decisions using both engineering and management knowledge.

#. Importance of management in technology driven environments:

→ Technology driven environments are fast, innovative and constantly changing. In such environments management becomes essential to guide people, processes and technology effectively.

1. Managing Rapid Technological change.

Technology changes quickly. Good management helps organizations:

- Adapt to new tools and system
- Stay updated with innovations.
- Remain competitive in the market.

2. Coordination Between Humans and Technology.

→ Managers ensure:

- people understand how to use new technology.
- workflows run smoothly with machines, software and automation.

3. Better Decision Making Through Data:

Modern technology generates huge amounts of data. Management uses this data for:

- Strategic planning
- predicting trends
- Improving products and services.

4. Increased Productivity and Efficiency:

- Technology is used correctly to reduce error.
- Work becomes faster and more efficient.
- Costs are reduced through automation and optimization.

5. Innovation and Creativity:

- Research and development
- New ideas and experimentation
- Creating technologically advanced products.

6. Cybersecurity and Risk Management:
In tech environment, risks are higher.
management ensures:

- Data security
- Safety protocols
- Backup and disaster recovery systems.

7. Training and Skill development:
Technology changes, so skill must also
change. management provides:

- Training program
- Workshops
- upskilling and reskilling opportunities.

8. Quality Assurance:
management ensures:

- product/service meet quality standards.
- Testing and monitoring are done properly
- Continuous improvement happens.

9. Maintaining Competitive advantage.
Management helps the company:

- lead the market
- serve customers better
- Develop unique technological solutions.

10. Customer Satisfaction:

management uses technology to:

- Provide faster service
- Improve communication
- personalize user experience.

II Engineering functions in organizations:

Organizations typically group their engineering work into several key functional areas. These functions ensure smooth product development, operations, quality and business growth.

1. Product development:

focuses on creating new products or improving existing ones.

Responsibilities:-

- Concept development
- Design (mechanical, electrical, software etc)
- Prototyping and testing
- Integration of technologies.
- product lifecycle management.

2. Operations :-

Ensures that products or services are produced efficiently, consistently and cost-effectively.

Responsibilities :-

- Production and manufacturing
- Process engineering
- Supply chain and logistics
- maintenance of equipment.
- Resource and capacity planning.

3. IT System / Digital Engineering :-

Handles all technology systems that support business processes.

Responsibilities :-

- IT infrastructure (servers, network, cloud)
- Software development and deployment
- Cyber Security
- Automation and digital transformation (AI, data analytics)

4. Quality assurance / Quality Engineering :-

Ensures products and processes meet standards and customer expectations.

Responsibilities :-

- Inspection & testing
- Process validation
- Compliance and audits
- Failure analysis
- Continuous improvement (six sigma, lean).

5. Maintenance and Reliability:

- keeps machines and equipment in good working condition.
- performs preventive/predictive maintenance and failure analysis.

6. Research & Innovation:

- Works on new technologies and future product ideas.
- Conducts experiments, feasibility studies and advanced engineering research.

7. Technical support / field Engineering

- provide technical help to customers or internal team.
- Handles troubleshooting, installation, maintenance and training.

Roles and responsibilities of an engineering manager :-

1. **Team Leadership :**
 - leads, guides and mentors engineers.
 - Builds a positive team culture and encourages collaboration.
2. **Project planning and Execution:**
 - Creates project plans, schedules, and budgets.
 - Ensures projects are delivered on time and within scope.
3. **Technical Oversight :-**
 - Reviews designs, code, and technical documents.
 - Ensures engineering solutions meet standards and requirements.
4. **Resource Management:**
 - Allocates manpower, tools, and budgets effectively.
 - Hires new engineers and manages workload distribution.
5. **Coordination and Communication :-**
 - Acts as a link between engineering teams and other departments.
 - Communicates projects status, risks and progress.

6. Quality and Process Improvement :-

- Implements engineering's best practices, standards and procedures.
- Ensures quality assurance and continuous improvement.

7. Problem Solving and Decision Making :-

- Identifies technical or operational issues and resolves them quickly.
- Makes informed decisions based on data and engineering judgment.

8. Risk Management:

- Anticipates risks in projects or systems.
- Implements mitigation plans to avoid failures or delays.

9. Innovation and Strategy Alignment:

- Encourages adoption of new technologies and tools.
- Aligns engineering goals with the company's long-term strategy.

10. Performance Evaluation :

- Conducts performance reviews for team members.
- Provides feedback, training, and growth opportunities.

2.1 Planning :-

planning is predetermining future. It is the process of setting goals and choosing the actions to achieve those goals. It is looking ahead.

or,

planning is deciding in advance about what to do, how to do it, when to do it, and who is to do it. It provides the ends to be achieved.

Levels of planning :-

(Type of planning) :- According to Managerial Hierarchy.

plan is a formal statement of future goals and actions to achieve them. According to managerial hierarchy.

1.] Corporate Plan (Strategic Plan) :-

It is organizationwide. It establishes overall corporate mission, goals and strategies. It is long term time period.

Its responsibilities is top management level.
it includes like CEO, directors, owners.

It focus on :-

- Setting the overall goals of the organization.
- Deciding the future direction.
- making major decisions like:
 - what products/services to offer.
 - which markets to enter
 - long term growth plans.

→ Example :-

A company deciding to expand its business to another country.

2.] Tactical plan (Department plan) :-

It specifies how overall goals are to be achieved. It defines tactical goals for implementing corporate plan. It is medium term time period. Its responsibilities is middle level management like department heads, branch managers.

It focus on :-

- Converting strategic plans into action plans.

- Allocating resources to departments.
- Making policies and procedures.
- Setting monthly or yearly targets.

Example :-

A marketing manager planning a 1-year advertising campaign to support the company's expansion.

3] Operational Plan (unit plan) :-

It is concerned with day to day operations. It is action plan for each unit.

It defines operational goals and specific actions for implementing tactical plan. It identifies the best mix of resources to be allocated to the unit.

It is short term time period like daily, weekly, monthly. It's responsibility is lower level management like supervisors, team leaders.

It focus on :-

- day to day operations
- Scheduling tasks.
- Assigning work to employees.
- Making sure everything runs smoothly.

Example :-

A Supervisor preparing a daily work schedule for staff.

Importance of planning (purposes of planning):-

Planning is looking ahead in a systematic way. Today most organizations plan. Planning is important for organizational effectiveness.

Importance of planning

- Uncertainty Reduction
- Goal focus
- Better Coordination
- Efficiency Promotion
- Environmental Adaptation
- Commitment
- Control

1. Uncertainty Reduction:-

Planning reduces uncertainty. It predetermines future targets and actions. Forecasting and environmental scanning help anticipate

future uncertainties.

2. Goal focus :-

planning helps managers to focus on goals. It defines goals and determines courses of action to achieve them. It gives direction.

3. Better Coordination :-

planning facilitates better mobilization, allocation and coordination of resources. Communication about plans avoids confusion. Integrated thinking is promoted.

4. Efficiency Promotion :-

planning facilitates efficient use of resources. It is a rational approach for goal achievement. It helps to do the job correctly.

5. Environmental Adaptation :-

planning identifies environmental opportunities and threats. It helps organizations adapt to change. It reduces the negative impact of change. Change management becomes effective.

6. Commitment :-

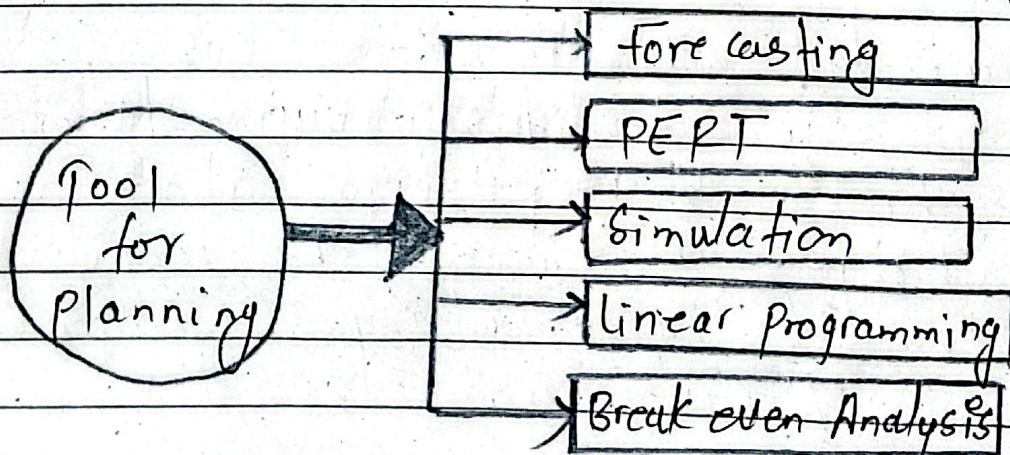
planning ensures commitment of managers and employees to goals and courses of actions. It encourages sense of involvement and team spirit.

7. Control :-

Control is not possible without planning. planning sets standards of performance for control.

8. Tools for planning :-

Various quantitative tools can be used to enhance the efficiency and effectiveness of planning. The important quantitative tools for planning are :-



1. Forecasting :-

Forecasting is the process of developing premises about the future for planning purpose. Various types of forecasting can be:-

a) sales forecasting:

It predicts future sales.

b) Technological forecasting:

Technology is fast changing and its forecast is crucial for planning.

c) Resource forecasting.

It projects the future needs and the availability of human resources, raw materials, financial and other resources.

2. PERT (Programme Evaluation and Review Technique)

It is a network technique. It is used to plan and control the activities of complex projects. PERT facilitates the control of projects through monitoring. All activities are connected sequentially to form a network.

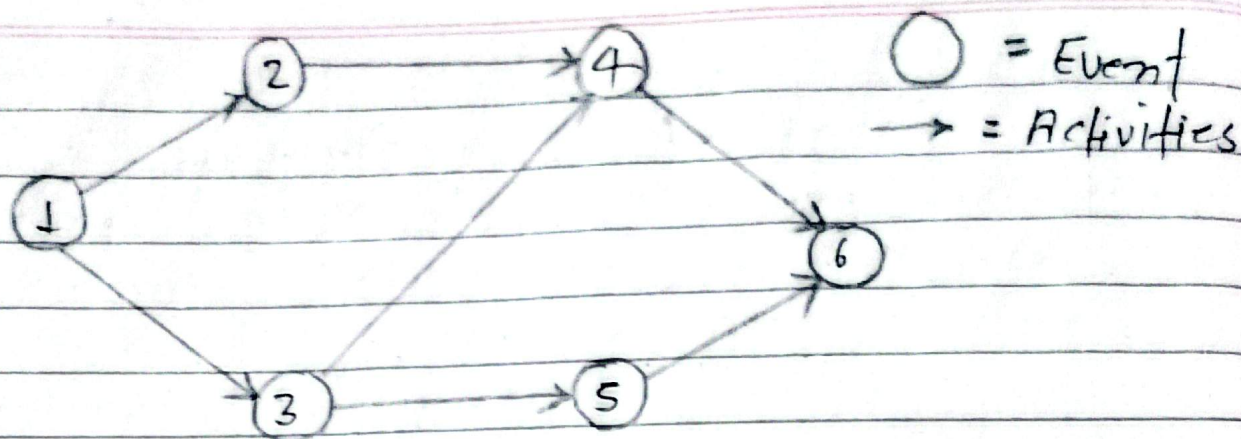


fig: PERT Network.

3. Simulations :-

They are model of a real world situation that can manipulated to discover how it functions. They analyze the sensitivity of planning variables. They are based on assumptions. Computer is used for simulations.

4. Linear Programming :-

It determines the optimal combination of resources and activities. It is appropriate when an objective is to be met within a set of constraints.

5. Break Even Analysis (BEP):-

It identifies the point of no profit no loss. Total costs are classified into fixed and variable. Variable costs vary directly with production level.

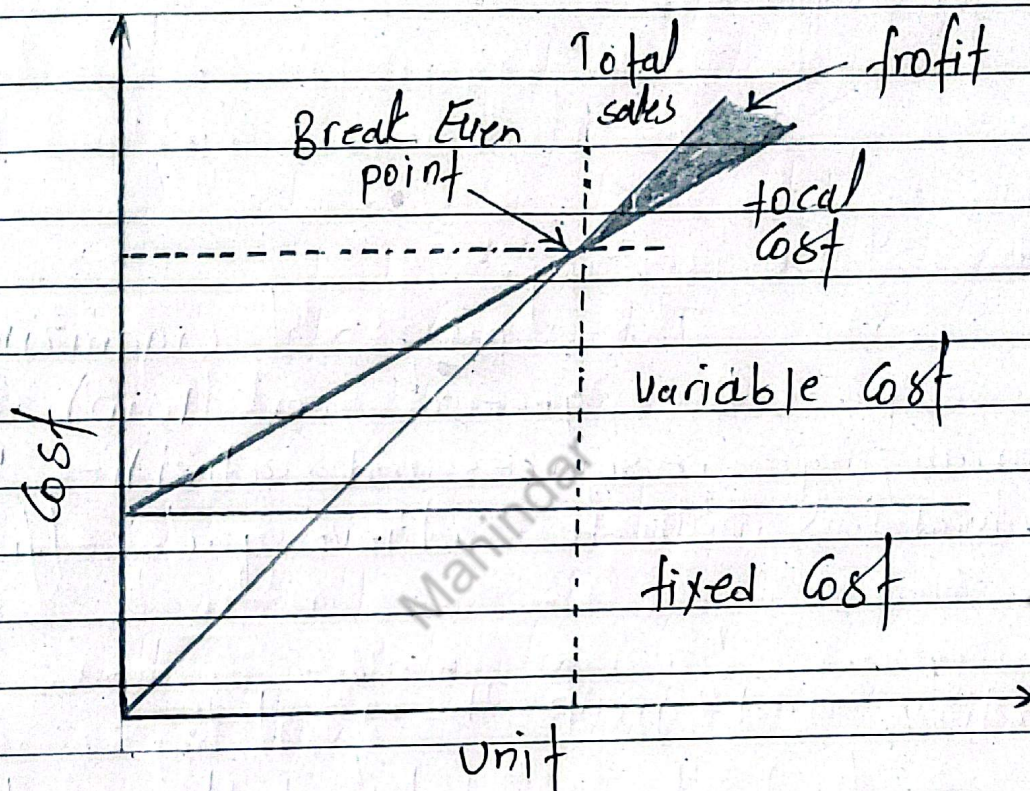


fig: Simple Break Even chart.

→ Break Even Analysis is an accounting oriented technique. It assumes that fixed and variable costs and selling price will not change. The formula used is:

$$BEP = \frac{\text{Total Fixed Cost}}{\text{Unit Selling Price} - \text{Unit Variable Cost}} = BEP \text{ in units}$$

2.2] Organizing :-

Organizing is the process of creating structure. It is deciding how best to group organizational activities and resources. It is an important function of management.

Process of organizing :-

The process of organizing (in management or general workflow) refers to arranging resources and activities in a structured way to achieve goals efficiently.

1. Identify and group the work:

→ find the out what tasks need to be done.

→ Group similar tasks together.

→ Example: All marketing tasks in one group, All finance tasks in another.

2. Divide the work (Division of labor): -

→ Assign each group of tasks to individuals or teams.

→ make sure no one is overloaded and the work is balanced.

3. Assign responsibilities :-

→ Decide who is responsible for each task or department.

→ clearly explain what each person must do.

4. Establish authority :-

→ Give the right level of power to each person so they can carry out their tasks.

→ Example: A manager can make decision; an employee follows instructions.

5. Coordination resources :-

→ Arrange people, tools, money and materials so the work flows smoothly.

6. Establish relationships (Hierarchy & structure) :-

→ Create reporting relationships (who reports to whom).

→ Build an organizational structure such as line organization, functional organization and matrix organization.

7. Ensure proper Communication :
→ create channels for clear communication to avoid confusion.
8. Review and adjust :-
→ Check if the organization is working well.
→ Make changes if there are problems or if goals change.

#. Organization Structure :-

An organization is a network of relationships. Organization structure is the framework for creating pattern of relationships.

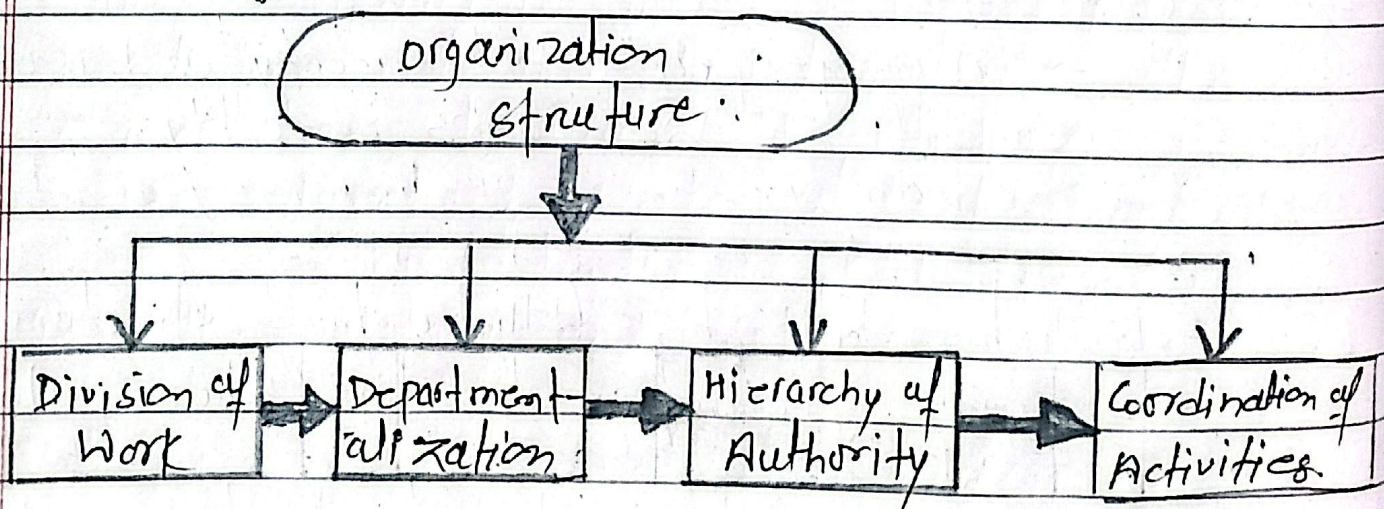


fig: Organization Structure

1. Division of Work :

Total workload is divided into tasks for job specialization. Jobs are designed.

2. Departmentalization :

Tasks and employees are grouped into departments. Organization charts are drawn up. Jobs are grouped. It is also known as grouping of jobs in some logical arrangement.

3. Hierarchy of Authority :-

Authority responsibility relationships are established to specify who reports to whom. Span of management and chain of command are decided. Delegation of authority is done.

4. Coordination :-

Activities are coordinated by setting up mechanisms for integration. Communication channels and committees are used for coordination.

Types of organization structure (Types of organization design) :-

Organization structure can be following types

1. Traditional structure :

- (i) Line organization structure
- (ii) functional organization structure.

2. Modern structure :-

- (i) matrix organization structure
- (ii) network organization structure
- (iii) hybrid organization structure.

(i) Line organization structure :-

It is the traditional organization structure. Superior-subordinate relationship with direct lines of authority characterize this organization structure. It entitles a manager to direct the work of subordinates.

This structure is still popular in the military and police.

→ It is based on scalar principle.

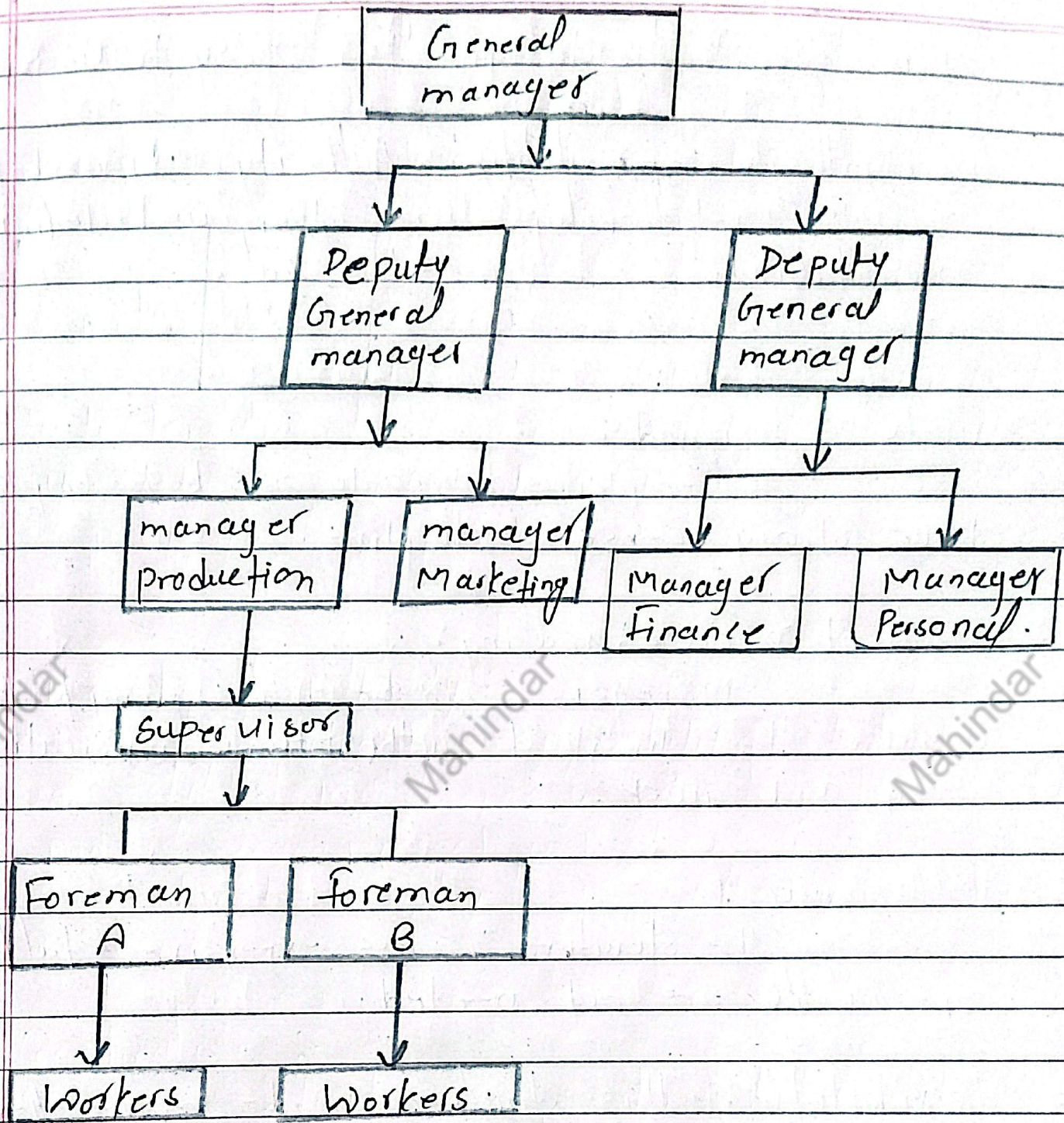


fig: line organization structure.

Advantage :

1. Simplicity :

It is simple to design. It is easy to understand.

2. Fixed authority responsibility: Authority responsibility relationships are clear and definite. Accountability is also clear cut.
3. Unity of Command:
One employee has only one boss. Employees have strong sense of discipline.
4. Prompt Decision making:
Managers can make prompt decision within the limit of authority. Communication is easy and quick.
5. Efficiency:
The structure is less expensive. Staff specialists are not needed.
6. Flexibility: This structure can be made flexible to suit changing condition.
7. Management Development:
Delegation, job rotation, monitoring etc. help develop the managers.

#. Disadvantage :-

1. Autocratic :

Centralization of authority at the top can lead to autocratic behavior.

2. Lack of Specialization :-

Employee are generalists. This limits the scope for specialization.

3. Overloading :

Key managers perform diverse nature of jobs. This may cause job overloading.

4. One way Communication :

Generally, there is one way communication from top to bottom.

5. Inefficiency :

Lack of expert advice can lead to waste of resource. Inefficiency results.

(ii) Functional Organization Structure :

This structure focuses on work specialization. It is based on grouping of activities by functions performed.

This structure is useful for small size organizations. All the functional areas need each other to survive.

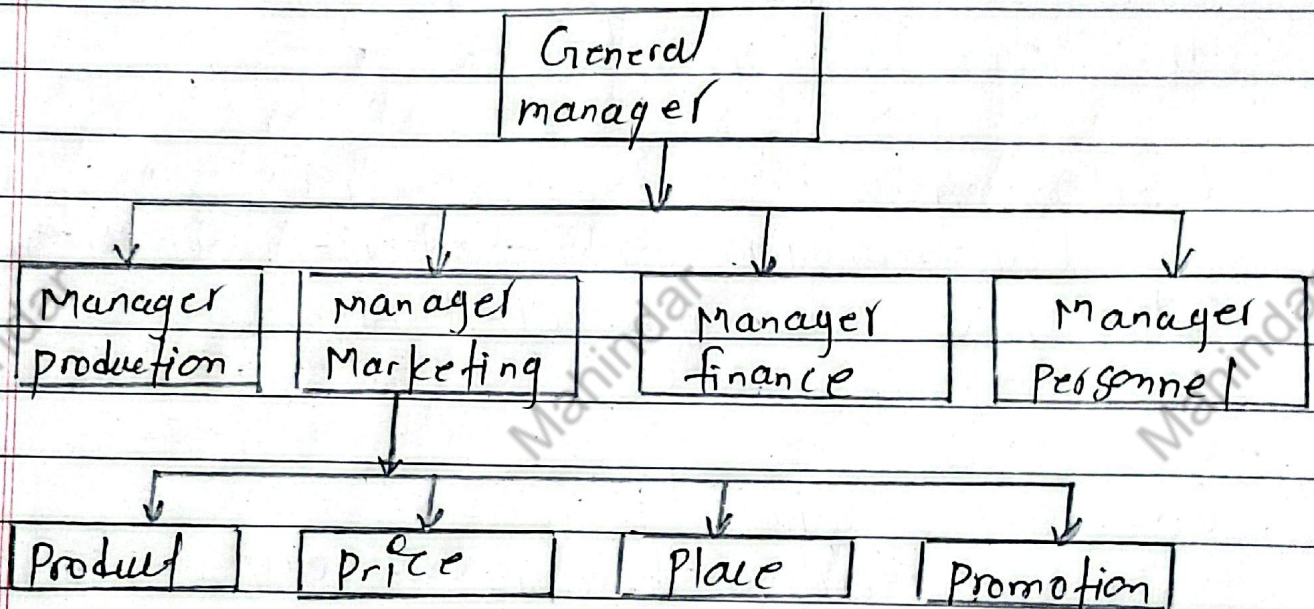


fig: Functional organization Structure

Advantages :-

1. Specialization :

It facilitates work specialization. It provides specialists. Specialists skills can be used.

2. Coordination :-

It allows coordination within functions. Unity of effort becomes possible.

3. Efficiency :-

Specialist managers increase degree of efficiency. Wastage can be controlled. Decisions are uniform.

4. Direction and Control :-

It facilitates better direction and control.

5. Career Progression :-

It facilitates career progression within functional area. Management development is also facilitated.

Disadvantages :-

1. Lack of Environmental Adaptation :-

This structure is suited to a stable environment. It does not adapt to environmental changes.

2. Poor Coordination :

It provides poor coordination across functional departments. This constrains communication.

3. Decision Delays :-

Decision making authority is concentrated at the top. This causes delays in decision making.

4. Lack of unity Command :-

This structure violates the principle of unity of command. This weakens discipline and leads to conflicts.

5. Complicated :-

This structure is complicated in operation.

Modern organization structure :-

(i) Matrix organization structure :-

This structure superimposes project structure on functional structure. The basic organization structure is functional. This structure is widely used for project management. The matrix structure combines functional and project structure. Every project is headed by a project manager.

This is called project management structure.

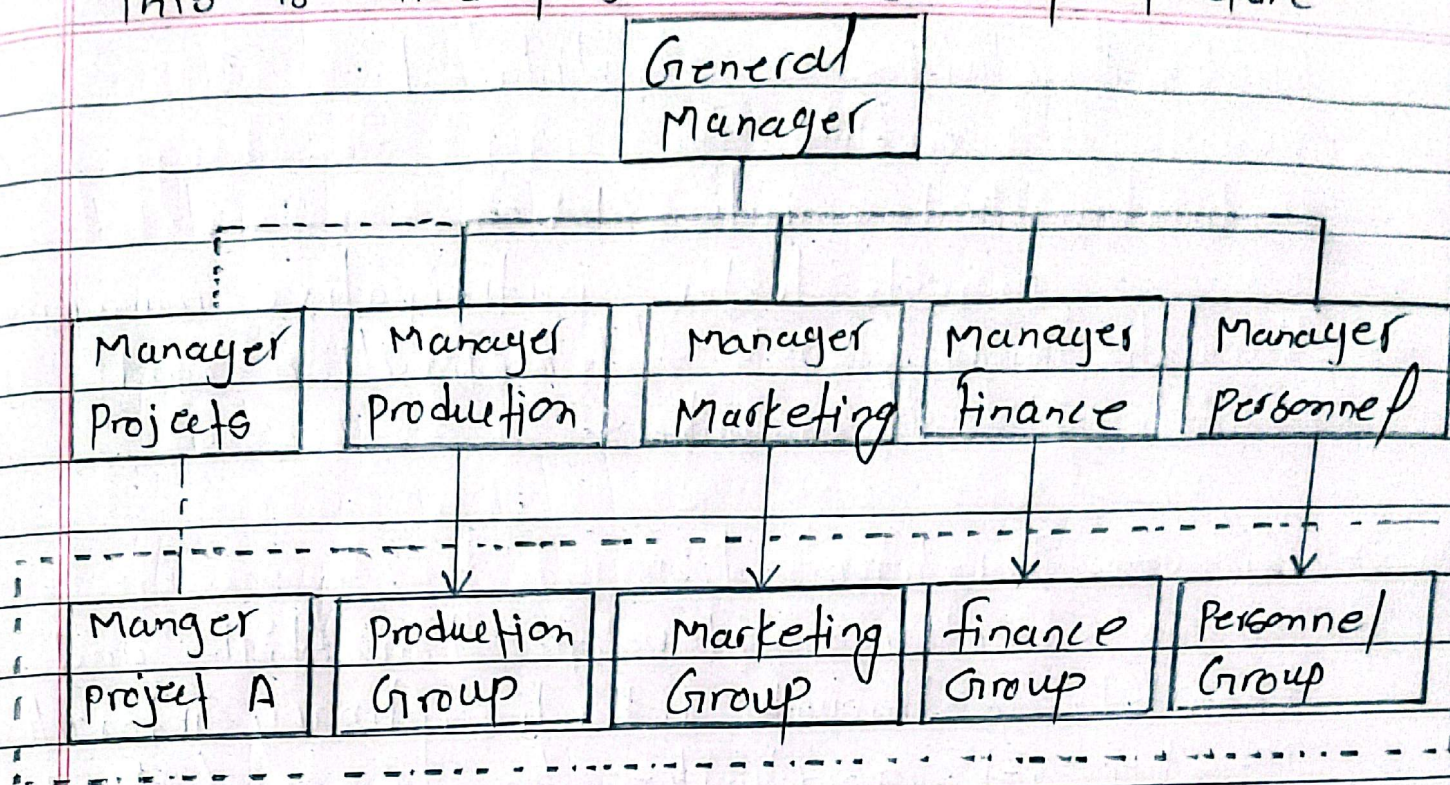


fig: matrix organization structure

Advantages :-

1. Environmental Adaptation :-

This structure is able to adapt to changes in the environment.

2. flexibility :-

This structure fosters flexibility throughout the organization.

3. Efficiency :-

This structure facilitates efficiency utilization of specialized resources. cross

functional activities are facilitated.

4. Motivation and Commitment :-

projects foster participative management through high levels of motivation and commitment of members.

5. Employee Development :-

Employees develop their skills and knowledge through interdisciplinary interactions. Member get opportunities for personal development.

Disadvantage :-

1. Multiple Command Structure :-

Employees have more than one boss. They receive orders from departmental boss as well as project boss.

2. Power Struggle :-

This structure causes power struggle between functional managers and project managers for allocation of resource.

3. Duplication :-

Project groups can duplicate efforts of departments.

4. Costly :-

This structure is costly to implement and maintain.

5. Interpersonal Skills :-

This structure demands a higher level of interpersonal skills.

(ii) Network organization structure :-

Network structure is a series of independent business units linked together by internet and computers in an information system that designs, produces and markets products. It is composed of a series of project groups or collaborations linked by networks.

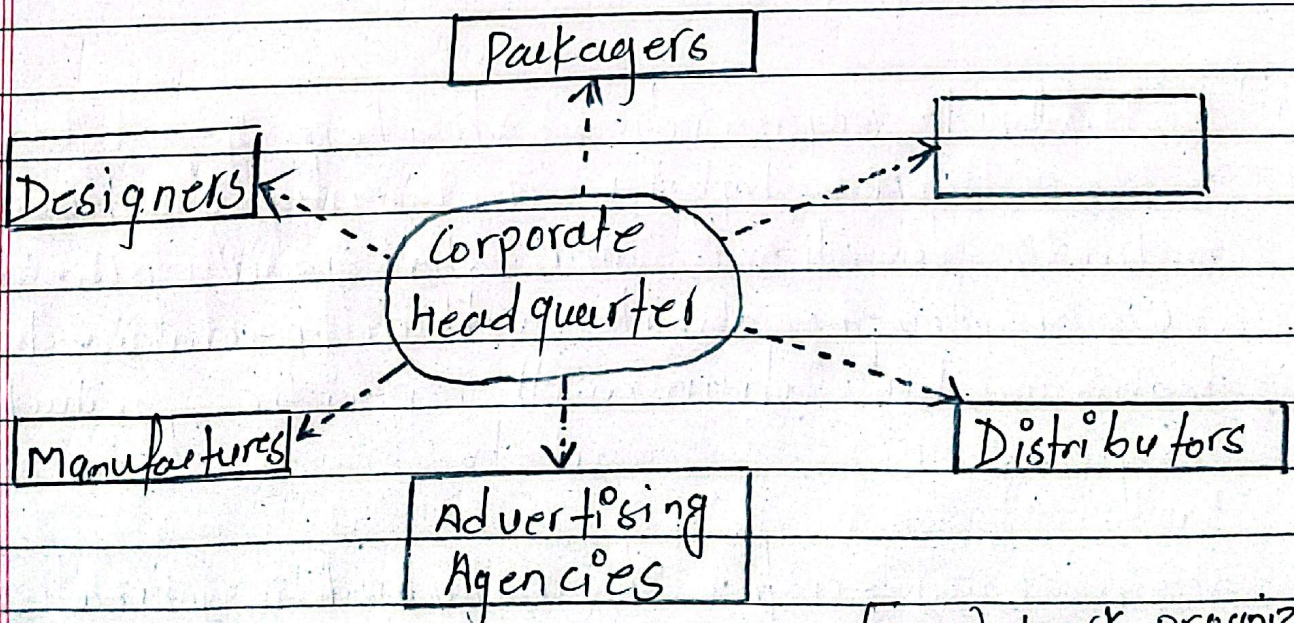


fig: Network organization structure

Advantages :-

- Provides flexibility to adapt to changing environments.
- Take advantages of efficiency of export firms through outsourcing.
- Allows concentration in distinctive competencies in which the company does best.

Disadvantages :-

- Too many actors cause conflicts.
- Information sharing with networked firms can create competitors.

(iii) Hybrid Organization Structure :-

A hybrid organizational structure combines functional and divisional element, so employees work within specialized teams but align with specific products regions or markets.

Key characteristic of a hybrid organization.

- Versatility
- Decentralized decision making
- Centralized oversight
- Collaboration across unit.

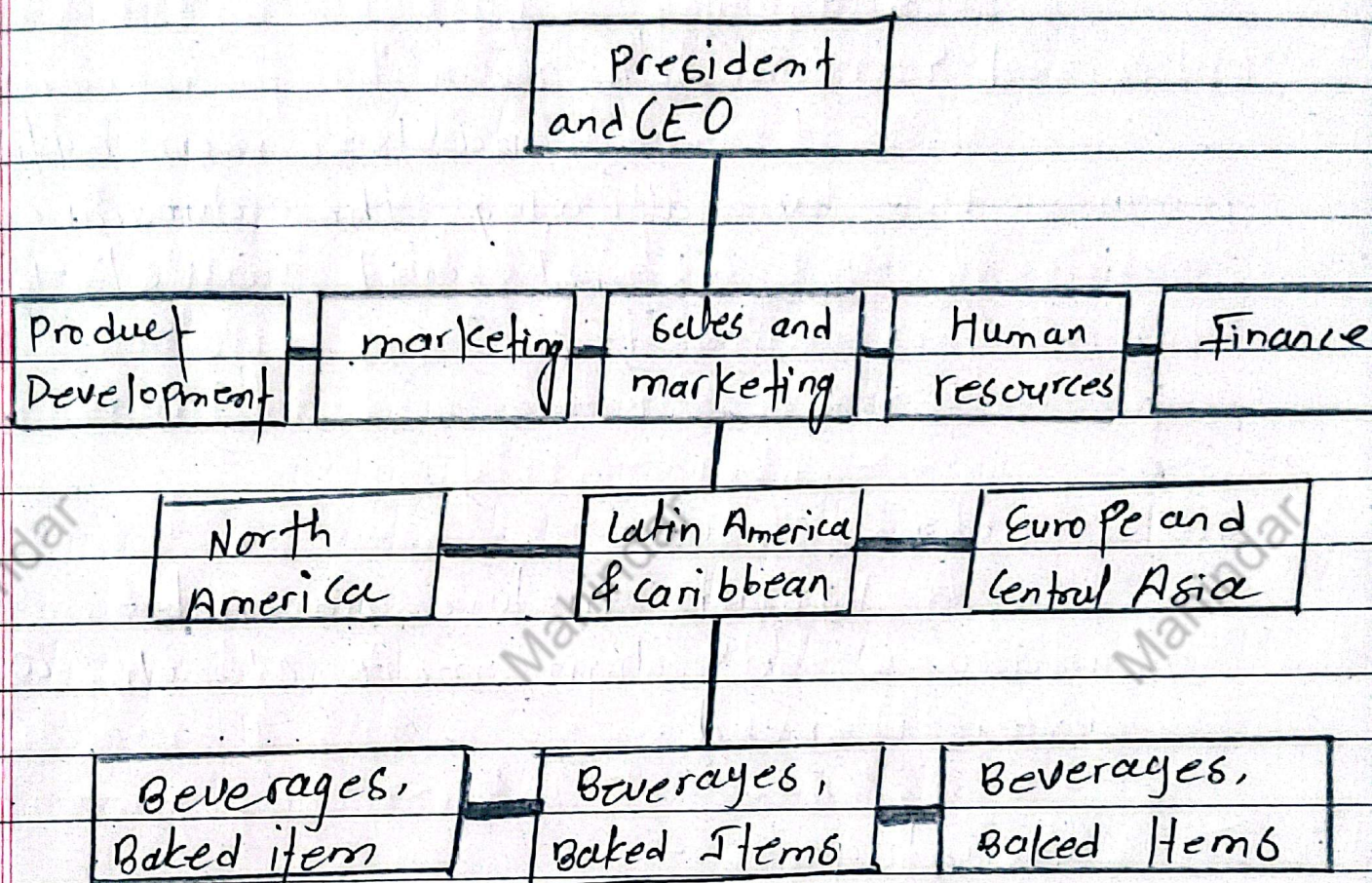


fig: Hybrid organization structure.

Advantages:-

1. flexibility and adaptability :-

A hybrid structure allows organization to be more adaptable to market or industry changes.

2. Scalability :-

This structure can be more scalable than purely functional or divisional structures.

3. Optimized resource allocation :-

This structure enables more efficient resource use by allowing the dynamic assignment of personnel and assets where they're most needed.

4. Better Customer focus :-

A hybrid structure can enable organizations to align more closely with customer needs.

Disadvantages :-

1. Complexity in management: managing a hybrid structure can be challenging due to the varied forms of governance and coordination mechanisms needed across different divisions and functional areas.

2. Risk of ambiguity :- Due to its multifaceted nature, it can be difficult to

pinpoint responsibility and accountability in a hybrid structure.

3. Difficulties in performance measurement: -
measuring performance can be more complicated in a hybrid structure due to the diverse and overlapping areas of responsibility.

#. Emerging planning and organizing issues for ICT enterprises.

Emerging planning and organizing issues for ICT enterprises include cybersecurity, data management and privacy, rapidly evolving technology integration, bridging the skills gap, and ensuring ICT strategies align with business goals.

Other challenges involve managing budgets, digital resilience, and adapting to new organizational models to handle increasing complexity and automation.

Strategic and organizational Challenges :-

- Alignment with business goals.
- Digital resilience
- Budgeting and resource allocation.
- organizational change management.

Technology and Infrastructure Issues :-

- Rapid technology evolution
- Infrastructure and data management.
- Cybersecurity.

Talent and Skills :-

- Skills gap
- Employee and customer engagement

Other issues :-

- Vendor management
- Policy and Compliance.

Motivation and Leadership

3.17

Motivation :-

-- Motivation is a process that accounts for an individual's intensity, direction and persistence of effort toward attaining a goal.

→ Key elements in motivation are:

(i) Effort :- Effort energizes behaviour.

(ii) Goals :- Goal direct behaviour.

(iii) Need :- Individuals have needs.

Theories of Motivation :-

Maslow's hierarchy :-

(Theory of Hierarchy of needs (Abraham Maslow)

Maslow advocated hierarchy of needs theory. It states that need motivate individuals.

Human needs are arranged in a hierarchy.

A person progresses step by step up the need hierarchy.

The basic premises of Maslow's theory are

- a) Man is a wanting being: Man continuously wants more and more. No need is ever fully satisfied. When one need is satisfied, another emerges. Needs activate individuals to work.
- b) Satisfied needs do not motivate: This is the deficit principle of motivation. A satisfied need does not motivate.
- c) Needs have a hierarchy: Human needs are arranged in a hierarchy. Needs are satisfied in an order.

This is the progressive principle of motivation. People have a set of five needs. They are

- physiological needs
- safety needs
- social needs
- Esteem needs
- Self Actualization needs.

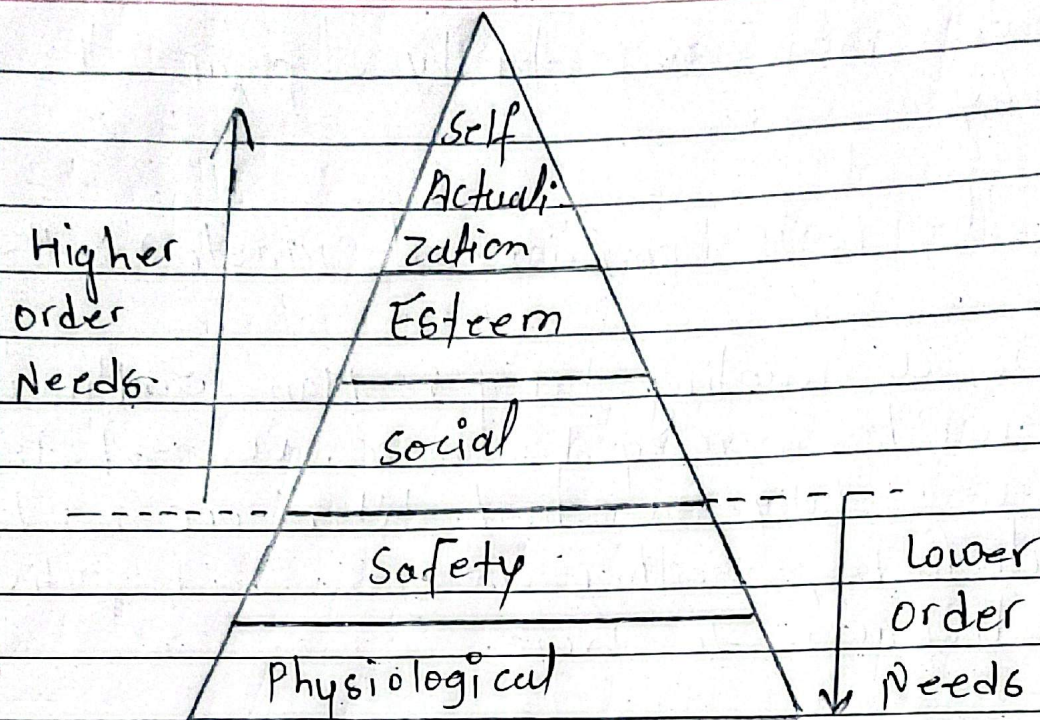


fig: Maslow's Hierarchy of Needs.

Physiological and Safety needs are lower order needs. They are most pressing. Social, Esteem, and Self actualization needs are higher order needs. They are least pressing.

- a) Physiological needs :- They include basic survival needs for food, water, clothing, shelter, sex. They are the lowest order needs. They are bodily requirements.
- b) Safety needs : They consist of needs for protection from physical and emotional harm.

- c) Social Needs: They consist of needs for affection, belongingness, friendship, and social acceptance.
- d) Esteem Needs (Ego needs): They can be internal self esteem needs. They can external public esteem needs. Internal esteem needs can be for self respect; autonomy, advancement. External esteem needs can be for status, recognition, praise, prestige.
- e) Self Actualization Needs: They consist of needs for achievement, growth, self development, creativity, talent utilization and self fulfillment.

Implication of Maslow's Theory for managers:-

- Motivation is need based.
- Satisfaction of needs motivates people.
- All employees have needs.
- Higher order needs provide higher motivation.
- Satisfied needs do not motivate.

Evaluation of Maslow's Theory :

→ Strengths :-

→ It is a useful guide for understanding motivation.

→ It is simple, practical and easy to understand.

→ Weakness of :-

→ Research has failed to verify the hierarchical arrangement of needs.

→ People are motivated not only by needs but also by perceptions, expectations, and experience.

→ Situational factors have been neglected.

#. Motivation Hygiene Theory (Frederick Herzberg).

Two factor

Herberg advocated Motivation Hygiene Theory of motivation. It states that not all job factors motivate employees. They have two factors:-

a) Hygiene Factors :

They are extrinsic factors. They are related to job context. The absence of these factors causes job dissatisfaction.

These factors do not motivate. The factors are :-

- i) Company Policy and Administration : They guide decision making and to implement decisions.
- ii) Technical Supervision : It is Superiors guiding subordinates.
- iii) Interpersonal Relations : They can be with superiors, peers and subordinates.
- iv) Salary : It is financial reward for work done.
- v) Job security : It is tenure of employment.
- vi) Personal Life : Employee's personal life at work place.

vii) Work Conditions :- Environment at work place

viii) Status : It is rank given by other in the work places.

b) Motivating Factors :

They are intrinsic factors. They are related to job content. The presence of these factors causes job satisfaction. But the absence of these factors does not lead to job dissatisfaction. These factors motivate. The factors are :

i) Achievement : The drive to excel.

ii) Recognition : of good work done or of high performance.

iii) Work Itself : Bundle of jobs and tasks. Interesting and Challenging job.

iv) Responsibility : obligation to perform assigned jobs.

v) Advancement : Promotion in the hierarchy.

vi) Growth : Opportunities for personal growth.

Presence of motivation factors leads to higher productivity.

Evaluation of Motivation-Hygiene Theory :-

Strengths of :-

- This theory is popular and well known.
- It increased awareness about importance of motivation in the work place.
- It stimulated research about motivation.

Weaknesses of :-

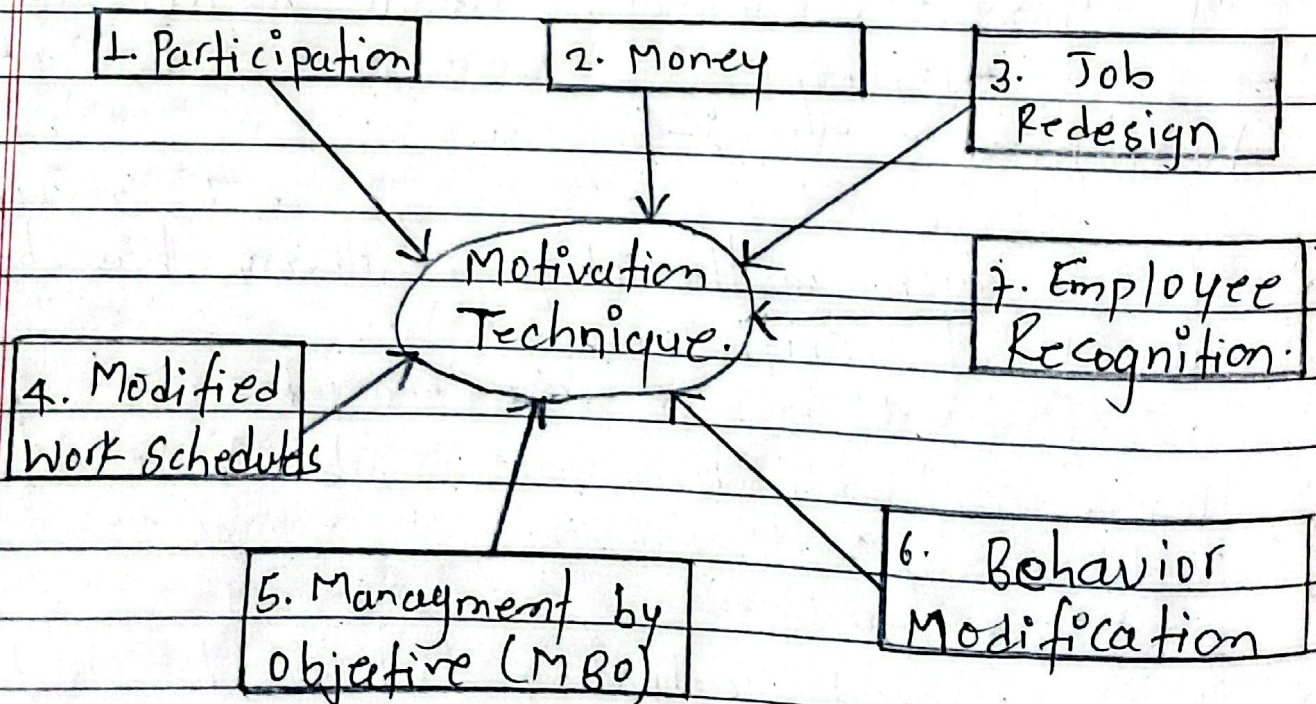
- The research methodology of theory has been subject of criticism.
- Herzberg's findings are subject to different explanations.
- Hygiene and motivating factors are not wholly unidirectional.

→ The theory provides explanations only about job satisfaction.

Techniques of Motivation :-

Motivation is the key to improved work performance. It is the art of energizing people to achieve goals through higher productivity.

Motivation is complex and individualized. Managers can use the following techniques for motivation.



1. **Participation** : Employee participation in decision making is an important motivation technique.

It includes:

- Suggestion Scheme
- Joint Consultation.
- Board member
- Quality Circle.
- Self managed Teams
- Share ownership.

2. **Money** :

Money is reward for work. It serves as a "carrot" for motivation. It can be fixed wages, piece work payment or performance based incentive.

Money is important for fulfilling physiological and safety needs. It includes:

- Performance based.
- Large enough.

3. **Job Redesign** :-

It motivates employee by affecting quality of work life (QWL). QWL is an important motivation technique.

Techniques of job design can be:-

- Job simplification.

- Job rotation
- Job enlargement.
- Job enrichment.

4. Modified Work Schedules :

Modified work Schedules can be used as a motivation technique. They include

- four day week.
- flex time
- Job sharing.

5. Behavior Modification :

It uses positive reinforcement to motivate workers to engage in desired behaviors.

The steps are:-

- Identify desired behaviors to be reinforced
- Measure existing level of performance.
- Identify existing consequences of performance.
- Develop and administer an Intervention strategy.

or,

- Reinforcement through rewards.
- Incentives
- Praise
- Promotion.

6. Management By Objectives (MBO):

MBO is used as a motivational technique for self control of performance.

It includes :-

- Joint goal setting.
- Performance based rewards.
- Feedback

7. Employee Recognition :

Employees should be recognized and praised for the job well done. A simple thank you can do wonders.

3.2] Leadership :

Leadership is the process of directing and influencing the task related activities of group members.

➤ Leadership Styles :-

(i) Autocratic Leadership :

- Leader makes all decision alone.
- Team members have little or no participation.

Advantages :

- fast decision making.
- Useful in emergencies.

Disadvantages :

- low morale.
- less creativity.

Examples : Military leaders, strict managers.

(ii) Democratic (participative) Leadership :

- leader involves team members in decision making.
- final decision is taken by the leader after discussion.

Advantages:

- High motivation.
- Better ideas and teamwork.

Disadvantages:

- Time consuming.
- Not suitable for urgent situations.

Examples: Team leaders in organizations

(iii) Transformational Leadership:

- Leader inspires and motivates followers.
- focus on vision, innovation, and change.

Advantages:

- Encourages growth and creativity.
- Builds strong commitment.

Disadvantages:

- Risk of stress or burnout.
- Depends heavily on leader's vision.

Example: Steve Jobs.

(iv) Servant Leadership:

- Leader puts follower's needs first.
- focus on service, empathy and development.

Advantages:

- High trust and loyalty.
- Strong team relationships.

Disadvantages:

- Slow decision making.
- May reduce authority.

Example: Mahatma Gandhi.

#. Characteristics of Learning Organization in the ICT Industry.

1. Continuous Learning:

- Employees regularly updates skills (AI, cloud, cybersecurity etc.).
- Training, certifications and workshops are encouraged.

2. Knowledge Sharing:

- Use of ICT tools like Intranets, cloud platform, GitHub, LMS
- Open sharing of ideas, code and best practices.

3. Adaptability to Change

- Quickly responds to fast changing technologies.
- Embraces innovation and digital transformations.

4. Use of Advanced ICT tools:

- Learning supported by e-learning platforms, AI, data analytics.
- Virtual labs, simulations, and online collaboration tools.

5. Innovation and Creativity.

- Encourages experimentation and new ideas.
- Supports R&D, hackathons, and innovation labs.

6. Team Learning and Collaboration.

- Cross functional teams work together.
- Agile and DevOps practices promote learning.

7. Leadership Support.

- Leaders promote learning culture.
- provide time, budget, and resources for skill development.

8. Customer focused learning:

- Learns from customer feedback and market data.
- Uses analytics to improve ICT products and services.

9. Performance Improvement.

- Learning is linked to productivity and innovation.
- Continuous improvement through feedback and metrics.

10. System Thinking.

- Understands how technology, people and processes are connected.
- Improves overall organizational performance.

Challenges and strategies for motivating and leading technical workforce.

Challenges in motivating and leading a technical workforce.

1. Rapid Technological Change:

- Skills become out-dated quickly.
- Continuous pressure to learn new technologies.

2. High Employee Expectations.

- Technical professionals expect growth, flexibility, and meaningful work.
- Salary alone is not enough.

3. Work Stress and Burnout.

- Tight deadlines and long working hours.
- Continuous problem-solving causes mental fatigue.

4. Diverse Skill Levels.

- Workforce include freshers and highly experienced experts.
- Difficult to manage uniformly.

5. Resistance to Change

- Employees may resist new tools, processors or system.
- Fear of failure or job insecurity.

6. Remote and Hybrid Work challenges.

- Lack of face-to-face interaction.
- Communication and Collaboration issues.

Strategies for motivating and leading a Technical Workforce.

1. Continuous Learning Opportunities.

- provides training, certifications and workshops.
- Support upskilling and reskilling.

2. Clear Goals and Vision.

- Define project objectives clearly.
- Align individual work with organizational goals.

3. Recognition and Rewards.

- Acknowledge technical achievements.
- Use performance based incentives.

4. Supportive leadership Style.

- Use transformational and servant leadership.
- Encourage mentoring and coaching.

5. Work life Balance:

- flexible work hours and remote work options
- promote mental health and wellness programs.

6. Effective Communication.

- Regular feedback and open discussions.
- Use digital collaboration tools effectively.

Unit - 4

Human Resource Management and Control.

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Human Resource Management:

→ Human resource management involves planning, organizing, directing and controlling the recruitment, development, compensation, integration and maintenance of employees.

Functions of human resource management.

The functions of HRM are generally divided into two main categories

1. Managerial function of HRM
2. Operative (operational) function of HRM.

Managerial Functions of HRM

1. Planning:

- Determining future manpower requirements
- Ensuring the right number of employees at the right time.

2. Organizing:

- Assigning duties and responsibilities.
- Designing organizational structure.

3. Directing:
- Guiding and motivating employees.
 - Leadership and communication.

4. Controlling:
- Monitoring employee performance.
 - Taking corrective actions when needed.

Operative (operational) function of HRM

1. Procurement
 - Recruitment and selection of employees.
 - Placement and induction.
2. Training and Development
 - Improving employee skills and knowledge.
 - Career development programs.
3. Compensation:
 - Wages and salary administration.
 - Incentives and benefits.
4. Maintenance:
 - Employee welfare and safety.
 - Health services and working conditions.

5. Employer relations

- Handling grievances
- Maintaining discipline and harmony.

6. Separation:

- Resignation, retirement, termination.
- Exit interview.

#. Job analysis, job specification, job description.

Job Analysis:

It specifies job requirements and determines qualifications needed for various jobs. It reveals the way the job is actually done. Its components are:-

a) Job specification: It states what the job demands in terms of abilities and qualities in a person to perform the job.

b) Job description: It defines duties, responsibilities, authorities, accountability, relationships. It states what the job holder does.

Recruitment and Selection.

Recruitment:

This step involves attracting candidates to fill the positions. Prospective candidates are identified and stimulated to apply for the job. Sources of recruitment can be:-

a) Internal: within the organization through transfers and promotions of existing personnel.

b) External: Outside the organization from employment exchanges, educational institutions, advertisements, consultants, contractors, and friends and relatives of employees. Advertisement is widely used for recruitment.

Selection:

This step consists of choosing qualified persons from among the prospective candidates. The steps in selection process are:-

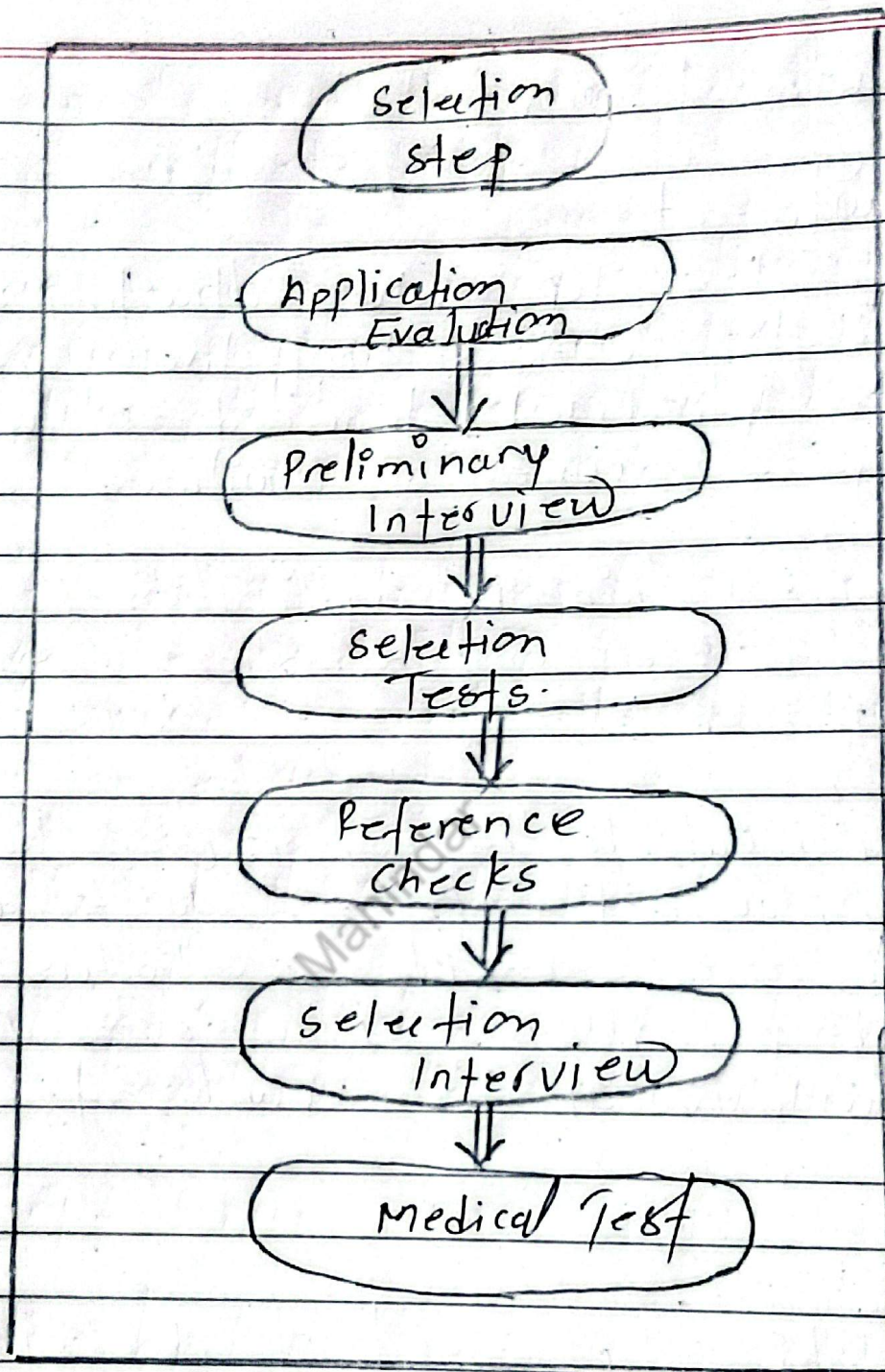


fig: Selection Steps.

- a) **Application Evaluation:** Application are filled in by prospective candidates. They provide personal data and information like age, qualification, experience etc.

- b) Preliminary Interview: It short lists candidates through screening.
- c) Selection tests: They assess suitability of the candidate for the job. They can be:
- Aptitude test
 - Intelligence test
 - personality test
 - Achievement test.
- d) Reference check: Information about character and background of the candidates is checked from reference provided in the application.
- e) Final Interview: This serves the basis for final selection; It is generally done by a panel of experts.
- f) Medical test: It checks medical fitness for the job.

Human Resource Training (On the job and off the job).

Human Resource Training is the process of improving employees' knowledge, skills and abilities to perform their jobs effectively.

On-the job Training (OJT):

On the job training is provided at the actual workplace while the employee is doing the job.

Methods of On the job Training :

- Job Rotation : Employees move between jobs to gain experience.
- Coaching : Senior guides a junior employee.
- Apprenticeship : Practical training under an expert
- mentoring : Experienced employee provides guidance.
- Demonstration : Trainer shows how work is done.

Advantages :-

- learning by doing
- low cost
- Immediate practical experience.

Disadvantages:

- Risk of mistakes
- May disturb regular work.

#. OFF- the job Training :
off the job training is conducted away from the workplace.

Methods of off the job training:

- Classroom lectures.
- Seminars and Workshops
- Case study Method.
- Role playing.
- Simulation and Management Games.

Advantages:

- No work pressure
- Better focus on learning.
- Useful for theoretical knowledge.

Disadvantages:

- more expensive
- less practical exposure.

#. Performance appraisal and Methods :

performance appraisal is the systematic evaluation of the employee's job performance to assess strengths, weaknesses, and potential for future development.

Objectives of performance Appraisal.

- Evaluate employee Performance.
- Identify training needs.
- Decide promotions and Salary increases.
- Improve employee motivation.
- provide feedback for improvement.

#. Methods of performance Appraisal:

→ It's classified into two types

- (i) Traditional Methods.
- (ii) Modern Methods.

#. Traditional Methods :

1) Confidential Report:

- used in government organizations.
- prepared by the immediate superior.

2) Easy method

- Supervisor writes a description of employee performance.

- 3) Straight Ranking Method:
 - Employees ranked from best to worst.
- 4) Paired Comparison Method.
 - Each employee compared with others.
- 5) Graphic Rating Scale:
 - Performance rated on a scale (excellent, good, average, poor).
- 6) Checklist Method.
 - Yes/No questions about employee behavior.

Modern Methods:

- 1) Management by Objectives (MBO):
 - Goals set jointly by manager and employee.
 - Performance evaluated based on goal achievement.
- 2) 360 Degree Appraisal:
 - Feedback from seniors, peers, subordinates and self.
- 3) Assessment Centre Method.
 - Tests, group discussions, role plays.

4. Behaviorally Anchored Rating Scale (BARS):
→ Ratings based on specific job behaviors.

5. Human Resource Accounting:
→ Measures employee contribution in monetary terms.

Challenges in managing people in ICT workforce.

Managing people in the ICT (Information Communication Technology) workforce comes with unique challenges due to rapid technological change, high demand for skills, and diverse work environments.

Key challenges include:-

1. Rapid Technological change.
 - Skills become obsolete quickly.
 - Continuous training and upskilling are required.
2. Talent Shortage & High Competition.
 - Demand for skilled ICT professionals exceeds supply.
 - Difficulty in attracting and retaining top talent.

3. Diverse skill sets & specialization.

- Teams include developers, testers, network engineers, data scientists, security experts etc.
- skill gaps within teams affect productivity.

4. Remote & Hybrid work management.

- managing distributed teams across time zones.
- Communication gaps and lack of team bonding.

5. High Work Pressure & Burnout.

- Tight deadlines and long working hours.
- Mental health issues and reduced work life balance.

6. Communication & Coordination Issues.

- Technical and non-technical staff may struggle to understand each other.

7. Performance Measurement Difficulties.

- Output quality is often harder to measure than quantity.

8. Security & Ethical challenges.

- Risk of data breaches and misuse of sensitive information.

→ Managing ethical use of technology.

9. Cultural & Generational Difference.

→ multicultural and multi generational workforce.

→ Different work styles, expectations and communication preferences.

10. Leadership & soft skills Gap.

→ Need for leadership who understand both technology and human behavior.

Control :

Control is monitoring organizational progress toward goal achievement.

Importance of Control (Purposes of Control)

Control helps organizations to increase effectiveness through:

1. Environmental Adaptation: Control scans changes in the environment. Control helps to anticipate, monitor and respond to changing environment.
2. Complexity Management: The diversity and growth in size increase organizational complexity. Control is needed to manage complexity.
3. Decentralization: An effective system of control facilitates decentralization through delegation of decision making authority.
4. Performance Monitoring: Control enables managers to monitor the performance of their subordinates. It improve accountability.

5. Mistakes Correction: Control identifies and corrects the mistakes. Control limits the accumulation of errors.
6. Efficiency: Control helps eliminate waste and duplication of efforts. Resources get efficiently utilized. Costs get minimized.
7. Reward: Control helps to recognize and reward good work. Rewards can be based on superior performance.

The process of Control (Elements of Control):
Control is a cyclical process. It involves four steps.

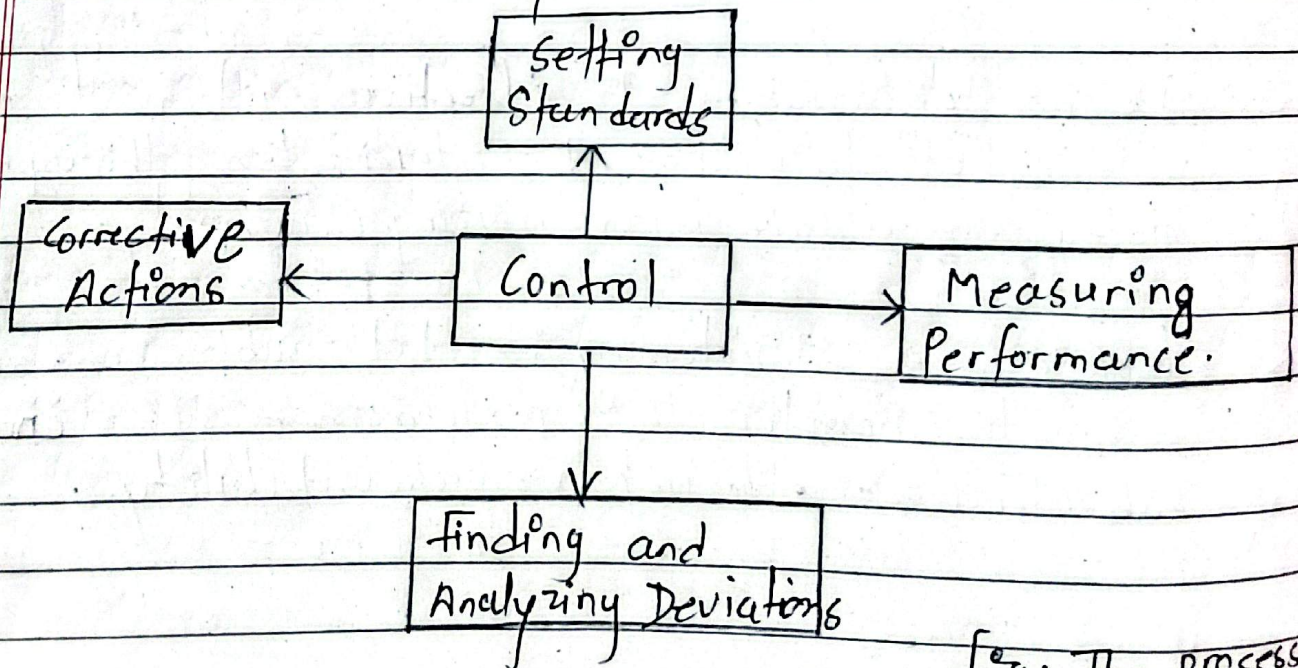


fig: The process of Control.

1. Setting Standards:

- Standards are benchmarks or targets.
- They define what performance is expected.
- Standards should be clear, measurable, reasonable and attainable.
- Example: Completing a project in 30 days, maintaining 95% quality.

2. Measuring Performance:

- Actual performance is measured and recorded.
- Measurement should be continuous and accurate.
- Data can be collected through reports, observation or statistics.
- Example: Tracking daily progress of work.

3. Finding and Analyzing Deviations:

- Compare actual performance with set standards.
- Identify difference (deviations).
- Analyze reasons for deviations (delay, lack of resources, errors).
- Example: project taking 35 days instead of 30 days.

4. Corrective Actions:

- Steps are taken to remove deviations.
- May involve training employees, changing plans or improving methods.
- Ensures future performance meets standards.

→ Example: Hiring more staff or improving workflow.

Types of Control System:

Control system can be of three types:

1. Pre-Control (Feedforward Control)

→ Stage:

Input stage.

→ focus:

- Anticipated or expected problems
- preventing errors before they occur.

Pre Control is exercised before the actual work begins. Management tries to predict possible problems and takes preventive actions in advance.

2. Concurrent Control

→ Stage: Transformation (process) stage.

→ focus:

- correcting problems as they arise
- Real time control.

Concurrent Control is applied during the execution of work. It allows immediate correction when deviations occur.

3. Post Control (Feedback Control)

→ Stage: Output stage.

→ focus:

- Correction of problems after they occur
- Improving future performance.

Post Control is applied after the activity is completed. Actual results are compared with standards, and feedback is used for future planning.

Control Techniques :-

Control techniques are the tools and methods used by managers to measure, evaluate, and regulate performance so that organizational goals are achieved.

Traditional Control Techniques:

a) Budgetary Control

- Uses budgets as standard for control.
- Actual performance is compared with budgeted figures.
- Examples: sales budget, production budget, cash budget.

b) Statistical Reports.

- Performance is shown using statistics, charts and graphs.
- Example: sales charts, production graphs.

c) Standard Costing.

- Predetermined costs are compared with actual costs.
- Example: Material cost variance, labor cost variance.

d) Personal Observation :

- Managers directly observe employees and operations.

→ Example: Supervisor inspecting work on the shop floor.

e. Internal Audit.

→ Systematic review of records and operations.

→ Example: financial and operational audits.

Modern Control Techniques:

a) Management by Objectives (MBO)

→ Objectives are set jointly by managers and employees.

b) PERT and CPM

→ Used for planning and controlling projects.

c) Management Information System (MIS)

→ Uses computer based information for control.

d) Ratio Analysis:

→ Uses financial ratios to analyze performance

→ Example: profitability ratio.

e) Responsibility Accounting.

→ Performance is evaluated for each responsibility center.

→ Example: Cost and profit center.

f.) Break Even Analysis.

→ Determines the level of sales where no profit or loss occurs.

#. ICT tools for effective control of engineering projects and organizations.

ICT Tools helps in planning, monitoring, coordination, decision-making, and control engineering projects.

1. Project Management tools

→ Tools like MS project, Primavera are used for scheduling, resource allocation, and progress tracking.

2. Communication Tools.

→ Email, video Conferencing, and Collaboration tools. (Teams, Zoom) improve coordination and information flow.

3. Management Information System (MIS)
 - provide accurate and timely information for managerial decision-making and performance control.
4. Enterprise Resource Planning (ERP)
 - Integrates finance, HR, inventory, and production for efficient organizational control.
5. Document Management System (DMS)
 - used for secure storage, version control, and sharing of project documents.
6. Financial & Cost Control tools.
 - Software like Tally, Excel helps in budgeting, cost monitoring, and financial reporting.
7. Design & Engineering Software.
 - Tools like AutoCAD, MATLAB improve design accuracy and reduce errors.
8. Risk Management tools
 - used to identify, analyze, and control project risks.
9. Cloud and Data Analytics Tools
 - Enable real time monitoring, data analysis, and faster decision-making.

Unit - 5:

Emerging trends in Engineering Management

#. Participative Management:

- Involves employees in decision making.
- Uses ICT tools like collaboration platforms, online surveys, dashboards.
- Benefits:
Higher motivation, better decision, improved productivity.

#. Conflict Resolution:

- Managing disagreements using structured methods.
- ICT Support: Email records, virtual meeting, HR management systems.
- Outcome:
Reduced dispute, improved teamwork.

#. Change Management:

- Managing organizational changes due to technology market or policy.
- ICT tools: ERP systems, cloud platforms, communication tools.
- Benefits:
Smooth transition, reduced resistance to change.

#. Quality Management:

- Ensuring products/ services meet standards.
- ICT tools:
 - Quality Management System (QMS)
 - Statistical process Control (SPC) software.
- Benefits:
 - Reduced defects, improved customer satisfaction.

#. Innovation Management.

- Managing ideas, creativity and new product development.
- ICT tools:
 - AI tools.
 - R&D software
 - Knowledge management systems.
- Benefits: Competitive advantage, continuous improvement.

#. Disruption:

- Impact of emerging technologies like AI, IoT, automation.
- ICT tools: Enables organizations to adapt and innovate quickly.
- Example:
 - Digital transformation replacing traditional processes.

4. Recent Engineering Management Concepts for managing ICT Based projects and organization.

1. Agile & Lean Management
 - flexible and iterative project management.
 - Supported by ICT tools like Jira, Trello.
 - faster delivery and adaptability.
2. Enterprise Resource Planning (ERP)
 - Integrates finance, HR, inventory and operations.
 - Example: SAP, Oracle, Odoo.
 - Improves organizational control and efficiency.
3. Cloud Computing:
 - Centralized data access and scalability.
 - Supports remote work and real time monitoring.
4. Data Analytics and Decision Support Systems.
 - Uses big data for informed decision making.
 - Tools: Power BI, Tableau.
5. Virtual and Distributed Project Management
 - Team work remotely using ICT.
 - Tools: Zoom, Teams, Slack.
 - Enables global collaboration.