ENGINEERING MANAGEMENT

General Objective

The course is designed to impart knowledge on management and emerging engineering management trends and develop skills of the students to enhance their managerial capabilities and enable them to apply in a technology-based organization.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction **(6 Hrs.)**

1.1 Management

- 1.1.1 Functions of management
- 1.1.2 Level and scope of management
- 1.1.3 Principles of management

1.2 Organization

- 1.2.1 Characteristics of organization
- 1.2.2 Types of organization: formal and informal organizations, virtual organization

1.3 Engineering Management

- 1.3.1 Importance of management in technology-driven environments
- 1.3.2 Engineering functions in organizations: product development, operations, IT systems, quality assurance and others
- 1.3.3 Roles and responsibilities of an engineering manager

Specific Objectives

To develop a foundational understanding of management, organization and engineering management

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ENGINEERING MANAGEMENT

CONTENTS:

Unit II: Planning and Organizing (6 Hrs.)

2.1 Planning

- 2.1.1 Levels of planning: strategic, tactical and operational
- 2.1.2 Steps in planning
- 2.1.3 Tools for planning
- 2.1.4 Importance of planning

2.2 Organizing

- 2.2.1 Process of organizing
- 2.2.2 Organization structure
- 2.2.3 Types of organization structure
  - 2.2.2.1 Traditional structure: line and functional
  - 2.2.2.2 Modern structure: matrix, network, hybrid

2.4 Emerging planning and organizing issues for ICT enterprises

Specific Objectives

To familiarize students with the planning and organizing and identify their emerging issues in ICT enterprises

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership (6 Hrs.)

3.1 Motivation

3.1.1 Theories of motivation: Maslow's hierarchy, Herzberg's two factor, Expectancy, Equity

3.1.2 Techniques for motivation

Specific Objectives

To enable students to analyze and address key issues in motivating and leading a technical workforce

3.2 Leadership

3.2.1 Leadership styles: autocratic, democratic, servant and transformational

3.2.2 Characteristics of learning organization in the ICT industry

3.3 Challenges and strategies for motivating and leading technical workforce

ENGINEERING MANAGEMENT

CONTENTS:

Unit IV: Human Resource Management and Control (8 Hrs.)

4.1 Human Resource Management

- 4.1.1 Functions of human resource management
- 4.1.2 Job analysis, job specification, job description
- 4.1.3 Recruitment and selection
- 4.1.4 Human resource training (on the job and off the job)
- 4.1.5 Performance appraisal and methods
- 4.1.6 Challenges in managing people in ICT workforce

4.2 Control

- 4.2.1 Importance
- 4.2.2 Process and types
- 4.2.3 Techniques
- 4.2.4 ICT tools for effective control of engineering projects and organizations.

Specific Objectives

To enhance students' knowledge of human resource management and control functions, emphasizing their practical application for managing ICT organization

ENGINEERING MANAGEMENT

CONTENTS:

Unit V: Emerging trends in engineering management (4 Hrs.)

5.1 Participative management, conflict resolution, change management, quality management, innovation management and disruption

5.2 Recent engineering management concepts for managing ICT based projects and organizations

Specific Objectives

To expose students to emerging trends in engineering management and their application in ICT driven organizations

ENGINEERING MANAGEMENT

S.N.	Tutorials
1	IT companies case studies related to management functions
2.	Students' presentation on course contents, and relevant current management issues
3.	Identification and use of recent ICT based management tools

Methods of Instruction
Lecture, Tutorials, Discussions, Assignments and Presentation

ENGINEERING MANAGEMENT

Evaluation System

External Evaluation	Marks	Internal Evaluation	Marks
Semester-End Examination	50	Class attendance and participation	10
		Case Study Discussion	5
		Quizzes/assignments and presentations	5
		Internal Term Exam	30
Total External	50	Total Internal	50
Full Marks 50+50=100			

Students' Responsibilities:
Each student must secure at least 45% marks in the internal evaluation with 80% attendance in the class to appear in the Semester End Examination. Failing to obtain such a score will be given **NOT QUALIFIED (NQ)** and the student will not be eligible to appear in the End-Term examinations. Students are advised to attend all the classes and complete all the assignments within the specified time period. Students are required to complete all the requirements defined for the completion of the course.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction **(6 Hrs.)**

1.1 Management

- 1.1.1 Functions of management
- 1.1.2 Level and scope of management
- 1.1.3 Principles of management

1.2 Organization

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- 1.3.3 Roles and responsibilities of an engineering manager

Specific Objectives

To develop a foundational understanding of management, organization and engineering management

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1 Management

- **Management** is a **process of designing and maintaining** an environment in which individuals work together in groups, efficiently and effectively to accomplish selected aims.
- **Organizations** uses human, financial, physical and information resources from the environment.
- **Managers are responsible** for combining and coordinating these various kinds of resources to achieve the organization‘s goal.
- **Thus managers are the human resources** who work with and through other people by coordinating their work activities in order to accomplish organizational goals.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction - Contd…

1.1 Management

Different writers and experts have defined management differently.

Marry Parker Follet: *—"Management is the art of getting things done through people".*

F. W. Taylor: *"Management is knowing exactly what you want people to do, and then seeing that they so it in the best and cheapest way"*

Koontz and Weihrich: *—"Management is the process of designing and maintaining an environment in which individuals, working together in groups, efficiently accomplish selected aims"*

Above definitions can be combined to define the management as:

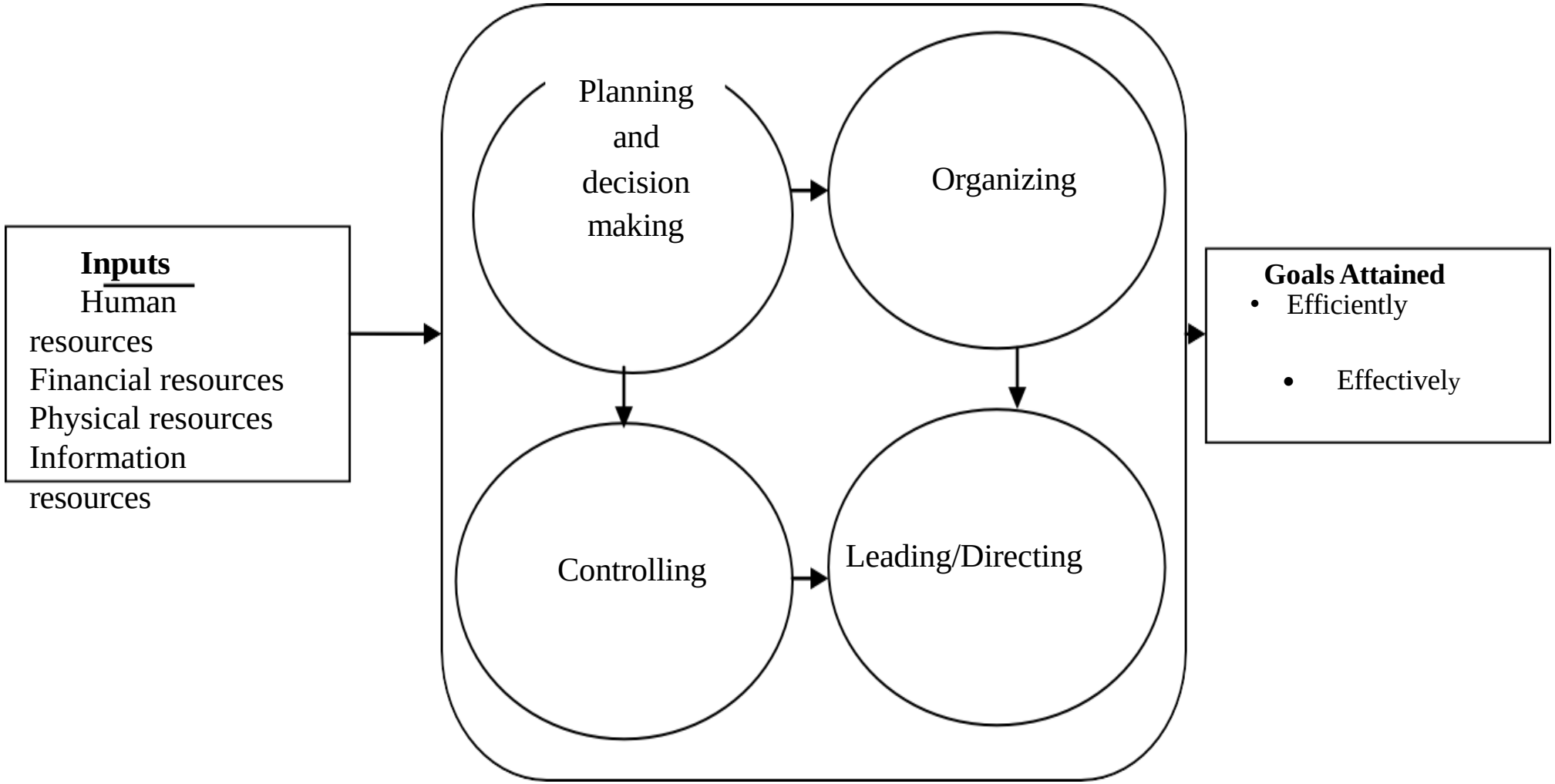
- **Management** is a process of **planning organizing, directing and controlling** for getting activities completed through and with peoples by the coordinated use of organizational resources **efficiently and effectively** to accomplish the organizational goals/objective.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction –Contd…

FIG 1.2: Management in organization



ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction ----Contd…

Thus we can summarize management as

- Getting things done by others
- Utilizing resources
- Through multi-stage processes
- To achieve organizational goals
- Management is integral to any organization and is vital for its success.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction Contd…

1.1.1 Functions of management

- **Managers are the individuals** who achieve goals through other people.
- Their activities include **making decisions, allocate resources and directing activities of others to attain goals.**
- **The major functions** that a manager completes can be categorized into four different functions known as
  - **planning,**
  - **organizing,**
  - **leading, and**
  - **controlling**.

ENGINEERING MANAGEMENT

1.1.1 **Functions of management**

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.1 Functions of management

Planning:

The first of the managerial functions is planning. In this step the **manager will create a detailed action plan aimed at some organizational goal.**

Planning is a process that includes defining goals, establishing strategy, and developing plans to coordinate activities.

Planning is an ongoing step and can be highly specialized based on organizational goals, division goals, departmental goals, and team goals. It is up to the manager to recognize which goals need to be planned within his or her individual area.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.1 Functions of management

Planning:

Objectives of planning:

Analysis *– how, in what order, with what resources*

Anticipation *– foresee potential difficulties, anticipate risk and plan to overcome them accordingly.*

Scheduling resources

Coordination and control *– provide basis for co-ordinating the work among concerned; provide a basis for predicting & controlling time and cost.*

Production of data *- to provide a framework for decision making in the event of change.*

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.1 Functions of management

Organizing

- The second of the managerial functions is organizing. Organizing involves determining what tasks are to be done, who is to do them, how the tasks are to be grouped, who reports to whom, and where decisions are to be made.
- This step requires managers to determine how he or she will distribute resources and organize employees according to the plan.
- Managers need to identify different roles and ensure that he or she assigns the right amount of employees to carry out the plan.
- Managers also need to delegate authority, assign work, and provide direction so that team can work towards their goals without having barriers in their way.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.1 Functions of management

Leading

- The third function of management is leading.
- Leading function includes motivating employees, directing others, selecting the most effective communication channels, and resolving conflicts.
- In this step, managers spend time connecting with their employees on an interpersonal level. This goes beyond simply managing tasks; rather, it involves communicating, motivating, inspiring, and encouraging employees towards a higher level of productivity.
- Not all managers are leaders. An employee will follow the directions of a manager because they have to, but an employee will voluntarily follow the directions of a leader because they believe in who he or she is as a person, what he or she stands for, and for the manner in which they are inspired by the leader.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.1 Functions of management

Controlling

- Controlling is the final function of management.
- Controlling is the **process of monitoring and evaluations activities** to ensure they are being accomplished as planned and correcting any significant deviations.
- Once a plan has been carried out the manager evaluates the results against the goals. If a goal is not being met, the manager must also take any necessary corrective actions to continue to work towards that goal.

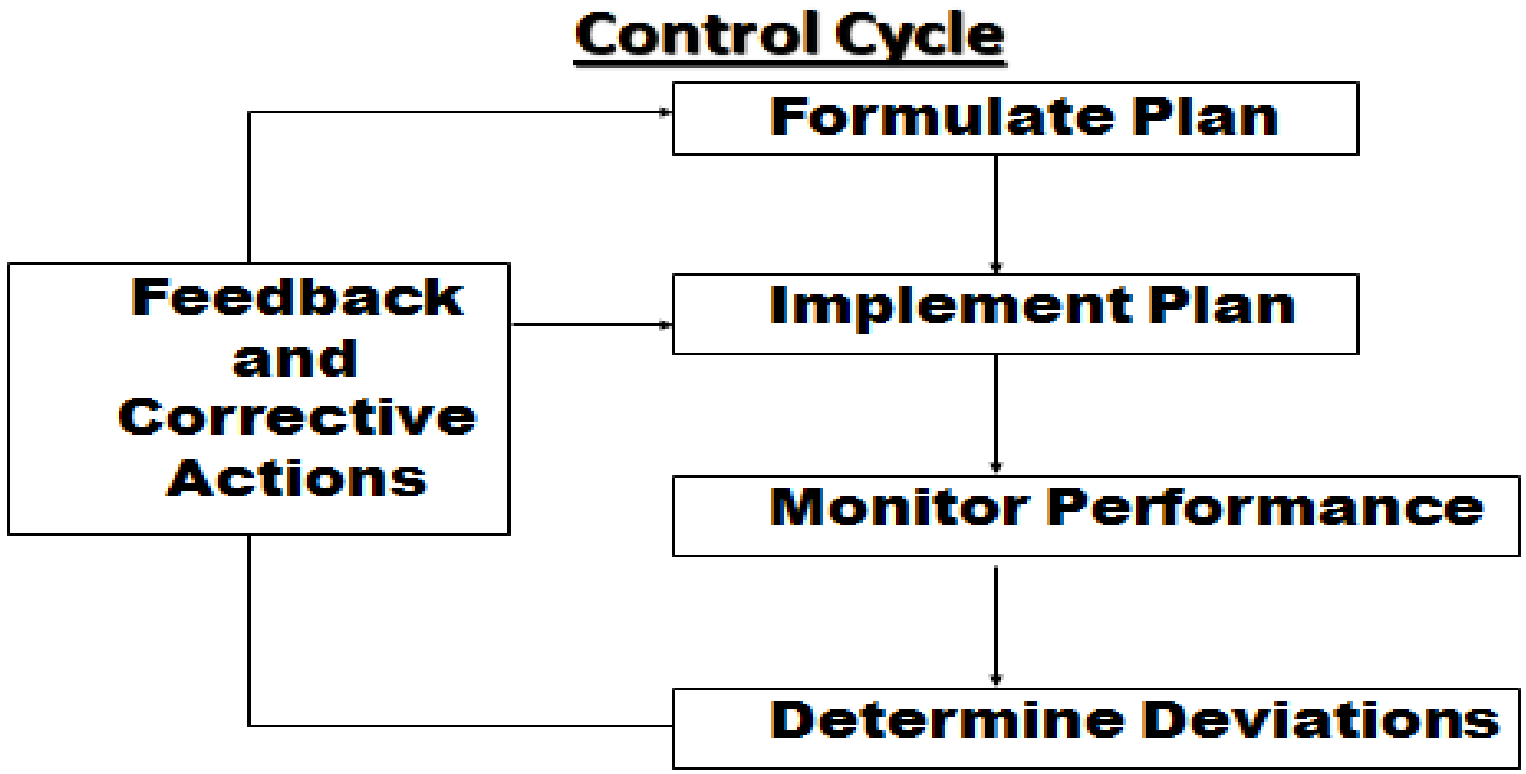
ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.1 Functions of management

Controlling



ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Level and scope of management

A typical organization has several layers of management. We can think of these layers as forming a pyramid like the one in **Figure 1.3 "Levels of Management"**

Top managers spend most of their time in planning and decision making, while first-line managers focus on day-to-day operations.

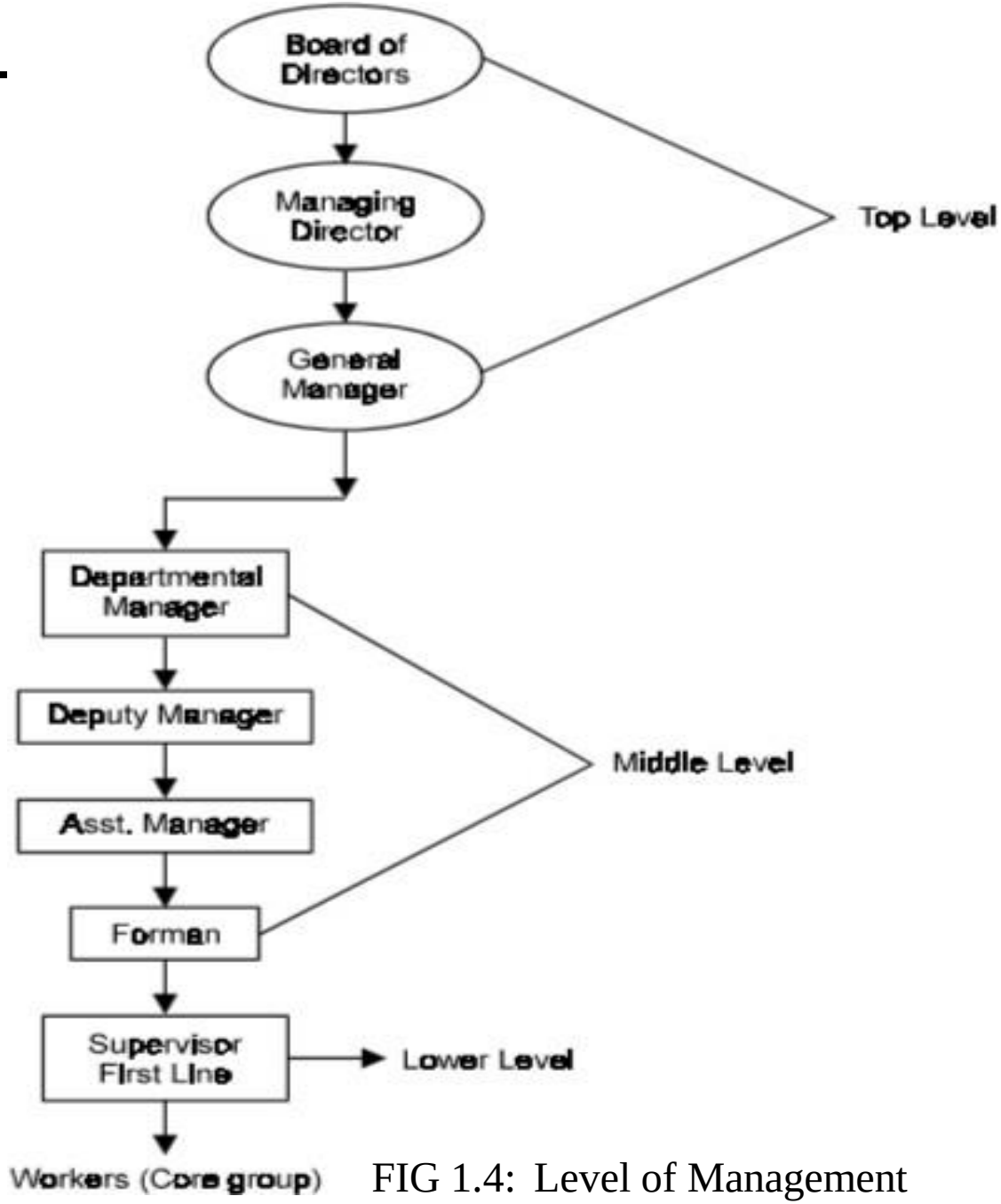


FIG 1.4: Level of Management

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Level and scope of management

Middle Level managers

This level includes largest group of managers in most organization. Middle level includes all levels of management between the supervisory level and the top level of the organization. They are primarily responsible for implementing the policies and plans developed by the top level and for supervising and coordinating the activities of lower level managers. Department or agency head, project leader, plant manager, unit chief, dean, or divisional manager represent middle level manager.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Level and scope of management

Lower Level Managers

The level of managers who are responsible for supervising, controlling and coordinating the activities of operating employees are called lower level managers. They are largely involved in handling day-to-day activities with the help of operating level staffs. These levels of manager generally hold title as supervisor, foreman, section head etc.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Scope of management

The field of management is very wide. The operational areas of business management may be classified into the following categories:

1. Production Management: Production management implies planning, organizing, directing and controlling the production function so as to produce the right goods, in right quantity, at the right time and at the right cost. It includes the following activities:

- designing the product
- location and layout of plant and building
- planning and control of factory operations
- operation of purchase and storage of materials
- repairs and maintenance
- inventory cost and quality control
- research and development etc.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Scope of management

2. Marketing Management: Marketing management refers to the identification of consumers needs and supplying them the goods and services which can satisfy these wants. It involves the following activities:

- marketing research to determine the needs and expectation of consumers
- planning and developing suitable products
- setting appropriate prices
- selecting the right channel of distribution, and
- promotional activities like advertising and salesmanship to communicate with the customers

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Scope of management

3. Financial Management: Financial management seeks to ensure the right amount and type of funds to business at the right time and at reasonable cost. It comprises the following activities:

- estimating the volume of funds required for both long-term and short-term needs of business
- selecting the appropriate source of funds
- raising the required funds at the right time
- ensuring proper utilization and allocation of raised funds so as to maintain safety and liquidity of funds and the credit- worthiness and profitability of business, and
- administration of earnings Thus, financial management involves the planning, organizing and controlling of the financial resources.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Scope of management

4. Personnel Management: Personnel management involves planning, organizing and controlling the procurement, development, compensation, maintenance and integration of human resources of an organization. It consists of the following activities:

- manpower planning
- recruitments,
- selection,
- training
- appraisal,
- promotions and transfers,
- compensation,
- employee welfare services, and
- personnel records and research, etc.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.1.2 Scope of management

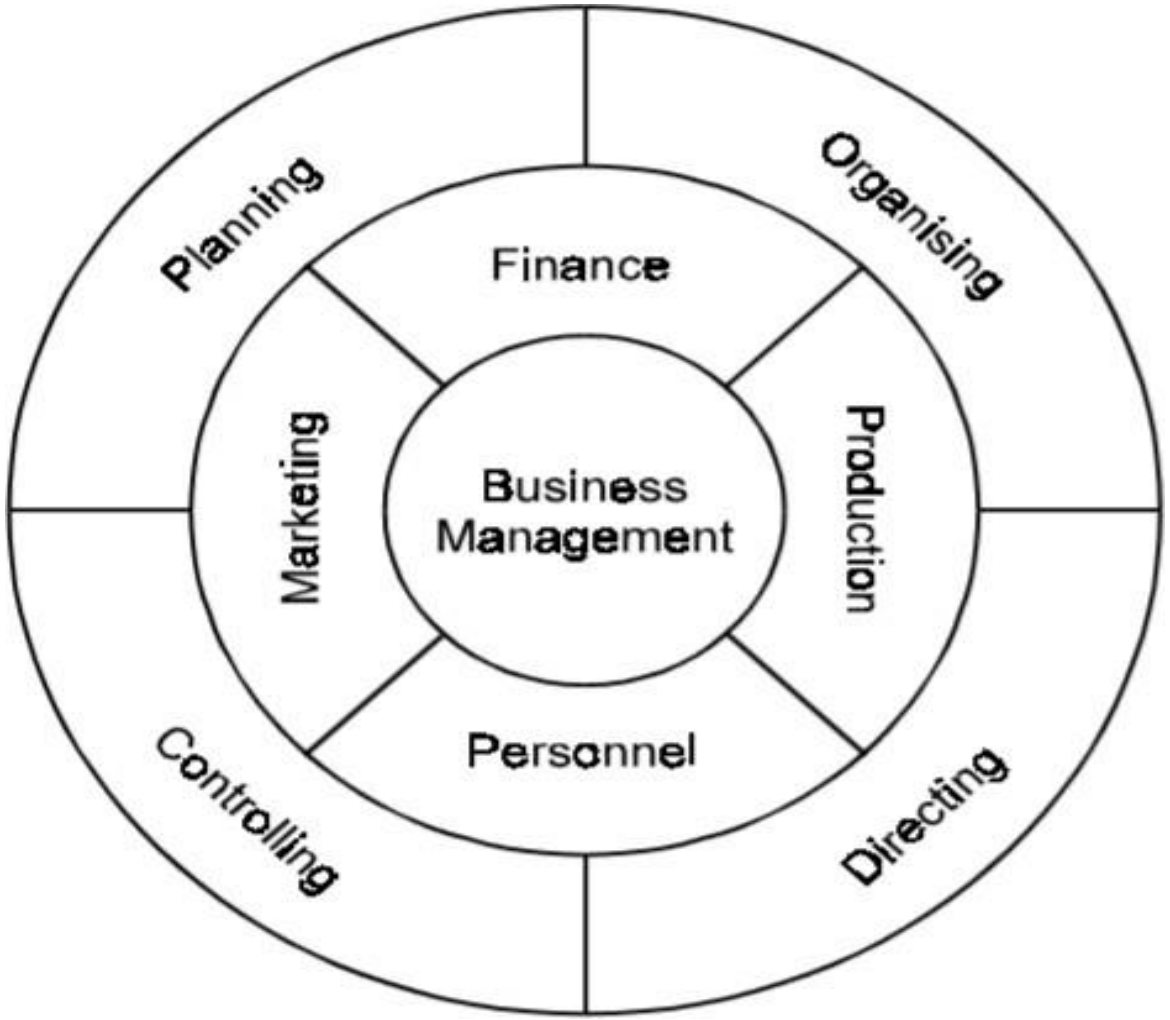


Fig1.5: Scope of management

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

Principles of management: ASSIGNMENT

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.2 Organization

- 1.2.1 Characteristics of organization
- 1.2.2 Types of organization: formal and informal organizations, virtual organization

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.2 Organization

- An organization is a social group which distributes tasks for a collective goal. Organization is the foundation upon which the whole structure of management is built.
- It is the backbone of management Organizations are human associations.
- **There are a variety of legal types of organizations, including:**
  - corporations, governments, non-governmental organizations, international organizations, armed forces, charities, not-for-profit corporations, partnerships, cooperatives, and universities.

ENGINEERING MANAGEMENT

CONTENTS:

Unit I: Introduction

1.2 Organization

Definition of Organization from……..

Robins: An organization is a consciously coordinated social unit composed of two or more people those functions on a relatively continuous basis to achieve a common goal or set of goals.

Griffin: Organization is a group of people working together in a structured and coordinated fashion to achieve a set of goals.

Chester I. Bernard: organization is a system of consciously coordinated activities of two or more persons

Amitai Etzioni: Organization is planned units, deliberately structured for the purpose of attaining specific goals

ENGINEERING MANAGEMENT

CONTENTS:

Characteristics of organization :

- There should be two or more people and perform various function
- Organizations are goal oriented. They are created to achieve common goals.
- Organizations have continuity
- Organizations use technology to transform inputs into out puts
- Organizations have structures
- Organizations are open system
- Organizations are of many types:
  - business, government, service, unions, international, political, cultural, etc.
- Organizations have several level- top, middle, lower as well as differentiated functions
- An Organization is managed by its leader

ENGINEERING MANAGEMENT

CONTENTS:

PRINCIPLES OF ORGANIZATION

Basic principles are listed below:

Division of Work – When employees are specialized, output can increase because they become increasingly skilled and efficient.

Authority – Managers must have the authority to give orders, but they must also keep in mind that with authority comes responsibility.

Discipline – Discipline must be upheld in organizations, but methods for doing so can vary.

Unity of Command – Employees should have only one direct supervisor.

Unity of Direction – Teams with the same objective should be working under the direction of one manager, using one plan. This will ensure that action is properly coordinated.

Subordination of Individual Interests to the General Interest – The interests of one employee should not be allowed to become more important than those of the group. This includes managers.

ENGINEERING MANAGEMENT

CONTENTS:

PRINCIPLES OF ORGANIZATION

Remuneration – Employee satisfaction depends on fair remuneration for everyone. This includes financial and non-financial compensation.

Centralization – This principle refers to how close employees are to the decision-making process. It is important to aim for an appropriate balance.

Scalar Chain – Employees should be aware of where they stand in the organization's hierarchy, or chain of command.

Order – The workplace facilities must be clean, tidy and safe for employees. Everything should have its place.

Equity – Managers should be fair to staff at all times, both maintaining discipline as necessary and acting with kindness where appropriate.

Stability of Tenure of Personnel – Managers should strive to minimize employee turnover. Personnel planning should be a priority.

Initiative – Employees should be given the necessary level of freedom to create and carry out plans.

ENGINEERING MANAGEMENT

CONTENTS:

1.2.2 Types of organization: formal and informal organizations, virtual organization - ASSIGNMENT

The formal Organization

- is built on certain principles, i.e. around four key pillars, namely, (a) division of labor, i.e. the whole work is divided into a number of small operations and each operation is performed by a different person so that there is maximum specialization; (b) scalar and functional processes, which implies that the Organization grows both vertically and horizontally, (c) structure, which refers to the overall arrangement ensuring proper balance between different parts of the organization and secures the execution of all operations and the achievement of organizational objectives; and (d) span of control, refers to the number of subordinates directly reporting and accountable to one superior.

ENGINEERING MANAGEMENT

CONTENTS:

1.2.2 Types of organization: formal and informal organizations, virtual organization

- **Characteristics of formal organization**
  - It is deliberately created by management
  - It is created to accomplish predetermined goals
  - It is based on division of work and job specialization
  - Authority-responsibility of every position is clearly defined
  - Communication channel is through scalar chain
  - Members are guided by formal policies, plans, rules and procedures.
  - It has long life in terms of continuity
  - Much emphasis is placed on efficiency, discipline, conformity, consistency and control
  - It is slow in adapting in environmental changes.

ENGINEERING MANAGEMENT

CONTENTS:

Criticisms of Formal Organization:

- individuals are ignored in determining the interactions, communication and accountability;
- the ideal relationship assumes that rational human beings will stick to rules and regulations but such assumption is hard to find in reality;
- Assumption that punishment or reward always brings a reaction among humans (rabble hypothesis) also fails to succeed as humans are not always motivated by rewards and punishment.;
- Rules and regulations of a formal Organization is too rigid and not sensitive to changing times and circumstances, thus becomes difficult over time to achieve the goals of the organization.

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ENGINEERING MANAGEMENT

CONTENTS:

Informal organization

- Informal organizations refers to the relationship between people in the organization based on personal attitudes, emotions, prejudices, likes, dislikes, etc.
- These relations are not developed according to procedures and regulations laid down in the formal organization structure; generally large formal groups give rise to small informal groups.
- These groups are not preplanned; rather develop automatically/spontaneously according to the organizational environment.

ENGINEERING MANAGEMENT

CONTENTS:

Informal organization

Characteristics of informal organization

- It is unplanned and spontaneous (unstructured).
- It is based on common interest, attitude and work related needs.
- It results from human interactions or social relationship.
- It has no written plans, policies, rules and procedures
- It is guided by customs, conventions culture, group norms, values and belief.
- Its membership is voluntary
- It quickly adapt the environmental change
- It has tendency to resist changes within the group.

ENGINEERING MANAGEMENT

CONTENTS:

Informal organization---Contd….

Characteristics of informal organization

- The communication is through grapevine or informal channel.
- It coexists with the formal organization
- Its primary focus is person
- It has informal system of reward and punishment
- Its goals are not well-defined and consistent
- Power in informal organization is given by group members rather than delegated by manager
- They do not have well defined tasks; nor they divided and subdivided
- The relationship is interpersonal not impersonal

ENGINEERING MANAGEMENT

CONTENTS:

Informal organization

Advantages of informal organization

- Provides sense of belonging and security to members
- Acts as a safety valve for emotional problems
- Members get help on the job from one another
- Serves as an important channel of communication
- Social control through group norms is possible
- Authority of members can be kept under check
- Reduces need for close supervision by management
- Employees reaction about proposed managerial actions can be known in advance

ENGINEERING MANAGEMENT

CONTENTS:

Informal organization

Disadvantage of informal organizations

- Resistance to change
- Rumor spreading
- Interference on management decision
- Group think philosophy
- Role conflict and sub-optimization

Reasons for emergence or need for informal organization

- To fulfill social security, affiliation, esteem, etc.
- To work in close proximity with group.
- To share view with people with similar social, cultural, economic, etc. composition
- To interacts with others.

ENGINEERING MANAGEMENT

CONTENTS:

virtual organization- ASSIGNMENT

ENGINEERING MANAGEMENT

1.3 Engineering Management

1.3.1 Importance of management in technology-driven environments

- ASSIGNMENT

1.3.2 Engineering functions in organizations: - ASSIGNMENT

- product development,
- operations,
- IT systems,
- quality assurance and
- others

1.3.3 Roles and responsibilities of an engineering manager- - ASSIGNMENT

ENGINEERING MANAGEMENT

1.3 Engineering Management

- Engineering management is a field that combines technical problem-solving abilities of engineering with organizational, administrative, legal, and planning abilities of management
- It bridges the gap between engineering and business management, ensuring that projects are completed on schedule and within budget
- Engineering managers oversee engineering projects, lead teams of engineers, and manage budgets and production plans
- Engineering management is the application of engineering methods, tools, and techniques to business management systems.
- An Engineering Manager is responsible for planning and coordinating projects, supervising teams, and researching new products.
- They develop strategies, manage budgets, and ensure successful project execution.
- They work closely with teams and collaborate with other management personnel.
- Strong analytical, communication, and organizational skills are essential.

ENGINEERING MANAGEMENT

1.3 Engineering Management

What is an Engineering Manager?

- An Engineering Manager is a professional responsible for planning and coordinating projects, supervising teams, and researching new products in the field of engineering.

What does an Engineering Manager do?

- An Engineering Manager oversees the development and execution of projects, manages budgets, and supervises multiple teams. They collaborate with other management personnel, provide instructions to engineering teams, and ensure the successful completion of projects on time and within budget. They also conduct research and development for new designs, products, and processes, while maintaining technical accuracy and coordinating work with other managers and staff.

Engineering Manager responsibilities include:

- Planning and executing strategies for completing projects on time
- Proposing and managing budgets for projects
- Supervising the work of multiple teams

ENGINEERING MANAGEMENT

1.3 Engineering Management

Engineering Manager responsibilities include:

- Research and develop designs and products
- Determine the need for training and talent development
- Hire contractors and build teams
- Ensure products have the support of upper management
- Provide clear and concise instructions to engineering teams
- Lead research and development projects that produce new designs, products, and processes.
- Check their team’s work for technical accuracy
- Coordinate work with other managers and staff

ENGINEERING MANAGEMENT

1.3 Engineering Management

What does an Engineering Manager do?

- An Engineering Manager plans and coordinates projects, supervises teams, and conducts research for new products in the field of engineering.

What are the duties and responsibilities of an Engineering Manager?

- An Engineering Manager is responsible for executing project strategies, managing budgets, supervising teams, researching and developing new products, and ensuring projects are completed on time and within budget.

What makes a good Engineering Manager?

- A good Engineering Manager possesses strong communication skills, organization, technical expertise, problem-solving abilities, and the ability to work collaboratively with teams and deliver clear instructions.

ENGINEERING MANAGEMENT

1.3 Engineering Management

Who does an Engineering Manager work with?

An Engineering Manager collaborates with other management personnel, engineers specializing in different areas, and various teams across the organization.

What skills should an Engineering Manager have?

An Engineering Manager should have analytical skills, communication skills, attention to detail, math skills, organizational skills, and relevant training and certifications in engineering management

ENGINEERING MANAGEMENT

CONTENTS:

Unit II: Planning and Organizing (6 Hrs.)

2.1 Planning

2.1.1 Levels of planning: strategic, tactical and operational

2.1.2 Steps in planning

2.1.3 Tools for planning

2.1.4 Importance of planning

2.2 Organizing

2.2.1 Process of organizing

2.2.2 Organization structure

2.2.3 Types of organization structure

2.2.2.1 Traditional structure: line and functional

2.2.2.2 Modern structure: matrix, network, hybrid

2.4 Emerging planning and organizing issues for ICT enterprises

Specific Objectives

To familiarize students with the planning and organizing and identify their emerging issues in ICT enterprises

ENGINEERING MANAGEMENT

CONTENTS:

Unit II: Planning and Organizing (6 Hrs.)

2.1 Planning

- The first of the managerial **1st functions** is planning.
- In this step the manager will create a **detailed action plan** aimed at some organizational goal.
- Planning is a process that includes defining goals, establishing strategy, and developing plans to coordinate activities.

Organizing

- The second of the managerial **2nd functions** is organizing.
- Organizing involves determining what tasks are to be done, who is to do them, how the tasks are to be grouped, who reports to whom, and where decisions are to be made.

ENGINEERING MANAGEMENT

CONTENTS:

Unit II: Planning and Organizing

2.1.1 Levels of planning:

- **strategic, tactical and operational**

2.1.2 Steps in planning

2.1.3 Tools for planning

2.1.4 Importance of planning

ENGINEERING MANAGEMENT

Levels of planning:

ENGINEERING MANAGEMENT

Levels of planning:

Main characteristics of strategic planning

- **Comprehensive vision:** Strategic planning involves a global view of the organization, considering its mission, vision, values, and long-term objectives.
- **Executive responsibility:** The responsibility for formulating and implementing strategic planning falls on the company's senior management and key executives.
- **Long-term:** Strategic planning covers broader time horizons, usually five to ten years, allowing the organization to set and achieve long-term goals and adapt to changes in the external environment.

Senior management and key executives are responsible for leading the strategic planning process; ensuring that the strategies adopted are aligned with the organization's long-term vision and the conditions of the external environment.

ENGINEERING MANAGEMENT

Levels of planning:

Main characteristics of tactical planning

Specificity: Tactical actions are detailed and directed towards specific areas of the organization.

Departmental responsibility: Each department or functional unit develops and implements its tactical strategies.

Short and medium term: Tactical planning generally covers one to three years, adapting to changes and demands in the business environment.

Middle managers are primarily responsible for executing tactical planning, ensuring that daily operations are aligned with the company's short- and medium-term objectives.

ENGINEERING MANAGEMENT

Levels of planning:

Main characteristics of operational planning

Execution responsibility: The responsibility for implementing operational planning falls on supervisors, team managers, and operational staff who carry out the company's daily activities.

Short-term: Operational planning generally covers a short-term time horizon, ranging from weeks to a year, focusing on immediate actions and day-to-day operations.

Specificity and detail: The actions outlined in operational planning are particular and detailed, aiming to optimize processes and resources to achieve short-term goals.

Supervisors and line managers are primarily responsible for executing operational planning, ensuring that daily activities align with the company's immediate operational objectives and that resources are efficiently allocated to meet daily demands.

ENGINEERING MANAGEMENT

How do strategic, operational, and tactical planning differ?

Strategic, operational, and tactical planning differ in scope, time frame, and purpose:

Strategic Planning:

- **Scope:** Organization-wide, long-term goals and direction.
- **Time Frame:** Long-term (3 to 5 years or more).
- **Purpose:** Sets the vision, mission, and overarching goals.

Operational Planning:

- **Scope:** Specific departments or functions, short-term goals.
- **Time Frame:** Short-term (typically one year).
- **Purpose:** Details the actions and resources needed to achieve strategic goals.

Tactical Planning:

- **Scope:** Specific projects or initiatives, medium-term goals.
- **Time Frame:** Medium-term (months to a year).
- **Purpose:** Bridges the gap between strategic and operational plans by outlining specific tactics to achieve operational goals.

2.1.2 Steps in planning

ENGINEERING MANAGEMENT

Planning Process

The planning function of management is one of the most crucial ones. It involves setting the goals of the company and then managing the resources to achieve such goals. As you can imagine it is a systematic process involving eight well thought out steps. Let us take a look at the planning process.

2.1.3 Tools for planning

2.1.4 Importance of planning

2.1.2 Steps in planning

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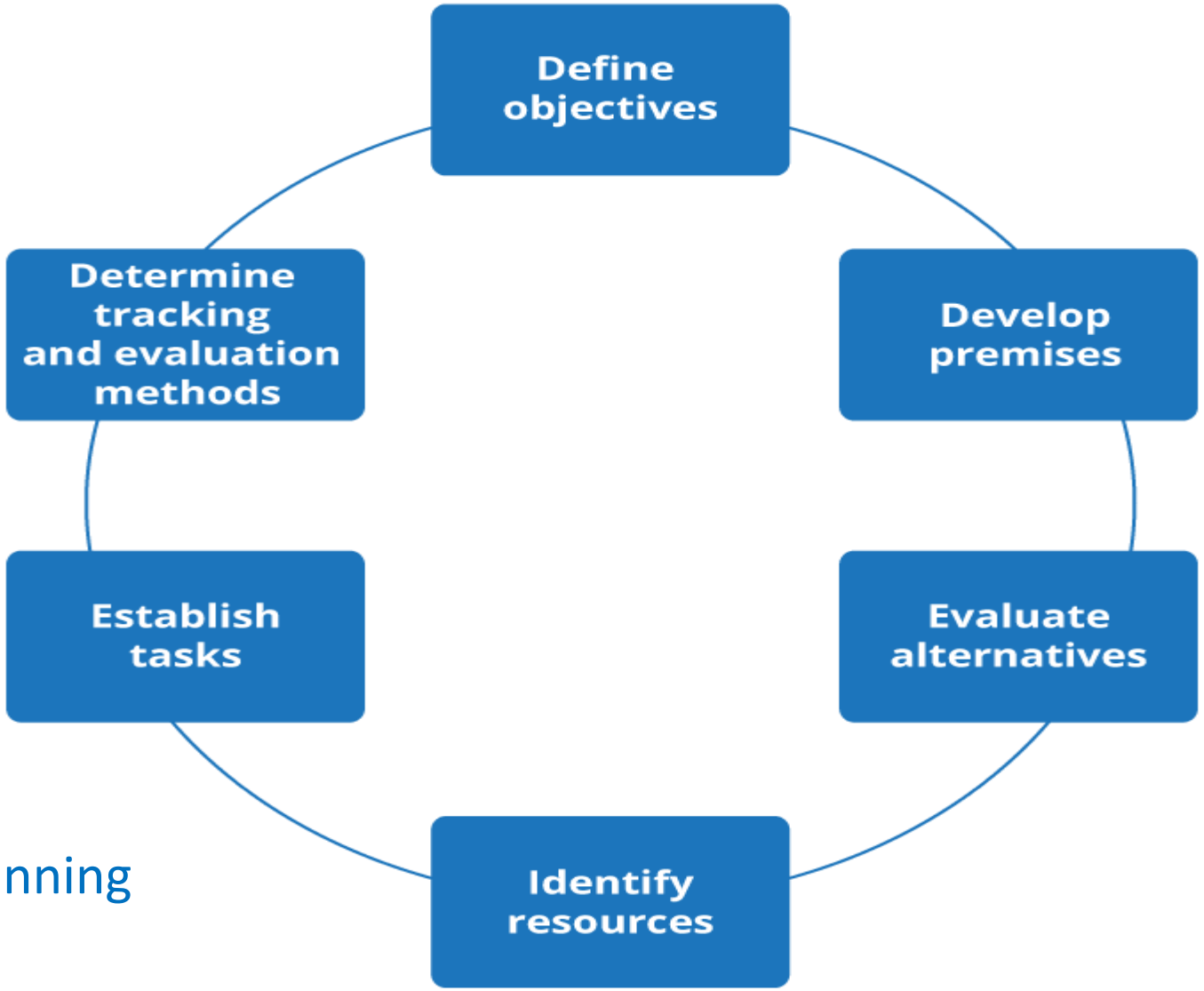

2.1.3 Tools for planning

2.1.4 Importance of planning

2.1.2 Steps in planning

ENGINEERING MANAGEMENT

Planning Process

As planning is an activity, there are certain reasonable measures for every manager to follow:

(1) Setting Objectives

•This is the primary step in the process of planning which specifies the objective of an organisation, i.e. what an organization wants to achieve.

•The planning process begins with the setting of objectives.

•Objectives are end results which the management wants to achieve by its operations.

•Objectives are specific and are measurable in terms of units.

•Objectives are set for the organization as a whole for all departments, and then departments set their own objectives within the framework of organizational objectives.

Example:

A mobile phone company sets the objective to sell 2,00,000 units next year, which is double the current sales.

2.1.3 Tools for planning

2.1.4 Importance of planning

ENGINEERING MANAGEMENT

(2) Developing Planning Premises

Planning is essentially focused on the future, and there are certain events which are expected to affect the policy formation.

Such events are external in nature and affect the planning adversely if ignored.

Their understanding and fair assessment are necessary for effective planning.

Such events are the assumptions on the basis of which plans are drawn and are known as planning premises.

Example:

The mobile phone company has set the objective of 2,00,000 units sale on the basis of forecast done on the premises of favorable Government policies towards digitization of transactions.

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(3) Identifying Alternative Courses of Action

Once objectives are set, assumptions are made.

Then the next step is to act upon them.

There may be many ways to act and achieve objectives.

All the alternative courses of action should be identified.

Example:

The mobile company has many alternatives like reducing price, increasing advertising and promotion, after sale service etc.

2.1.3 Tools for planning

Assignment

2.1.4 Importance of planning

Assignment

ENGINEERING MANAGEMENT

(4) Evaluating Alternative Course of Action

In this step, the positive and negative aspects of each alternative need to be evaluated in the light of objectives to be achieved.

Every alternative is evaluated in terms of lower cost, lower risks, and higher returns, within the planning premises and within the availability of capital.

Example:

The mobile phone company will evaluate all the alternatives and check its pros and cons.

(5) Selecting One Best Alternative

The best plan, which is the most profitable plan and with minimum negative effects, is adopted and implemented.

In such cases, the manager's experience and judgement play an important role in selecting the best alternative.

Example:

Mobile phone company selects more T.V advertisements and online marketing with great after sales service.

(6) Implementing the Plan

This is the step where other managerial functions come into the picture.

This step is concerned with "DOING WHAT IS REQUIRED".

In this step, managers communicate the plan to the employees clearly to help convert the plans into action.

This step involves allocating the resources, organizing for labor and purchase of machinery.

Example:

Mobile phone company hires salesmen on a large scale, creates T.V advertisement, starts online marketing activities and sets up service workshops.

(7) Follow Up Action

Monitoring the plan constantly and taking feedback at regular intervals is called follow-up.

Monitoring of plans is very important to ensure that the plans are being implemented according to the schedule.

Regular checks and comparisons of the results with set standards are done to ensure that objectives are achieved.

Example:*A proper feedback mechanism was developed by the mobile phone company throughout its branches so that the actual customer response, revenue collection, employee response, etc. could be known.*

2.1.2 Steps in planning

ENGINEERING MANAGEMENT

2.2 Organizing

- 2.2.1 Process of organizing
- 2.2.2 Organization structure
- 2.2.3 Types of organization structure
- 2.2.2.1 Traditional structure: line and functional
- 2.2.2.2 Modern structure: matrix, network, hybrid

2.4 Emerging planning and organizing issues for ICT enterprises

2.1.2 Steps in planning

ENGINEERING MANAGEMENT

2.2 Organizing

- **The second of the managerial functions** is organizing. Organizing involves determining what tasks are to be done, who is to do them, how the tasks are to be grouped, who reports to whom, and where decisions are to be made.

- Organizing refers to grouping elements of an organization in the most effective way. To accomplish an organization's goals efficiently and effectively, all its resources must be integrated and coordinated to define the essential relationships between people, tasks, and activities.

    2.2.1 Process of organizing
    2.2.2 Organization structure
    2.2.3 Types of organization structure
    2.2.2.1 Traditional structure: line and functional
    2.2.2.2 Modern structure: matrix, network, hybrid

2.4 Emerging planning and organizing issues for ICT enterprises

2.1.2 Steps in planning

ENGINEERING MANAGEMENT

2.2.1 Process of organizing

- The process of organizing is complex. It requires a thorough understanding of organizational policies, plans, and strategies.
- **Following are the steps involved in organizing**

1.Defining the objectives
2.Identifying and grouping activities Identification of activities
3.Responsibilities and duties are assigned
4.Authority delegation
5.Coordination of activities
6.Identifying positions and distinguishing them
7.Reorganizing and reviewing

ENGINEERING MANAGEMENT

2.2.1 Process of organizing

a) Defining the objectives: Organizations are established to accomplish certain goals. As a result, an **organization's long- and short-term objectives** are essential. Long-term objectives should be supported by short-term objectives. It is important to set measurable, realistic, achievable, and attainable objectives.

b) Identifying and grouping activities Identification of activities: Identifying all organizational activities is the first step in organizing. Depending on the size and nature of the organization, organizational activities may vary. ***Among them are finance and accounting, production and operation, marketing and sales, human resources, and research and development.*** It is called departmentalization when related activities are combined and grouped into units or departments.

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2.2.1 Process of organizing

c) Responsibilities and duties are assigned: Different individuals are assigned ***responsibilities and duties according to their skill, knowledge, abilities, and aptitudes in this step.*** Everyone has a clear understanding of their responsibilities. The goal is to avoid duplication of effort and overlapping of work. Individuals are assigned specific jobs based on their qualifications and made responsible for their accomplishments.

d) Authority delegation: Each individual is delegated authority to perform the assigned duties effectively after duties have been assigned. You should delegate authority in proportion to the responsibilities you have been assigned.
From the top of the structure down, delegation of authority establishes a clear hierarchy of authority.

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2.2.1 Process of organizing

e) Coordination of activities: Coordinating activities is part of organizing. In order to achieve a common goal, activities are arranged in an orderly manner. This ensures harmony and synchronization between different departments and groups. *It is necessary to coordinate activities in order to prevent conflicts between employees and departments, duplication of work, and time and effort waste.*

f) Identifying positions and distinguishing them: It is also important to differentiate between **line and staff positions** when organizing. Line positions are those in the direct **chain of command.** Achieving organizational goals is its responsibility. Alternatively, staff positions provide line managers with expertise, advice, and support.

g) Reorganizing and reviewing: As internal and external factors change, the organizing process must be continuously reviewed and appraised in order to adjust or modify the organization structure.

ENGINEERING MANAGEMENT

2.2.2 Organization structure

- *An organizational structure is the grouping of resources at different levels depending on their responsibilities, power, and position.* It helps various departments in a company exchange data, coordinate, and work together to achieve business goals.

- An **organizational structure** consists of activities such as task allocation, coordination and supervision, which are directed towards the achievement of organizational aims. It can also be considered as the viewing glass or perspective through which individuals see their organization and its environment.

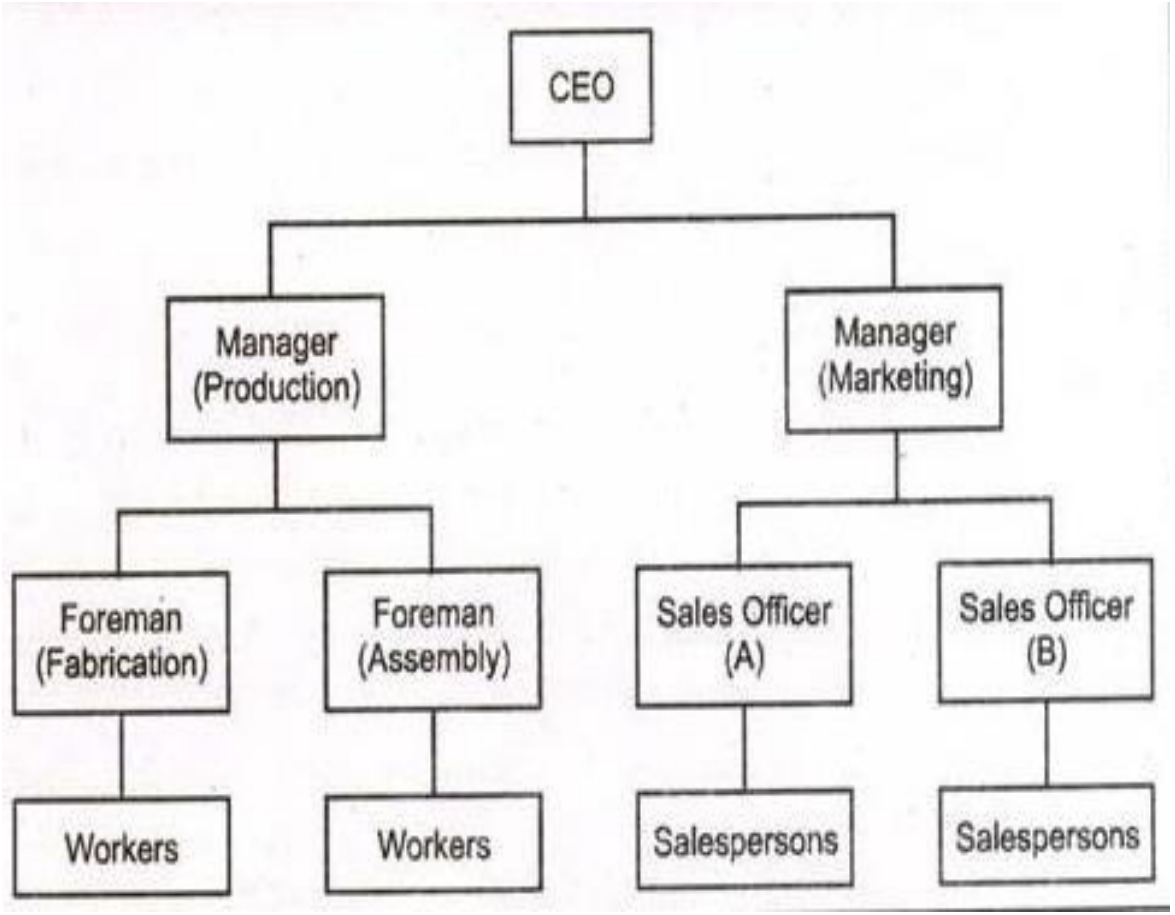
- **According to Stoner-** ***—organizational structure is the way in which an organization‘s activities are divided, organized and coordinated‖. An organization can be structured in many different ways, depending on their objectives***

ENGINEERING MANAGEMENT

2.2.3 Types of organization structure

I. **Line organization/scalar structure/military organization Characteristics:**

- Oldest form of organization
- There is direct and fixed line of authority between superior and subordinate
- Authority flows from top to down in the organizational hierarchy
- It entitles a manager to direct the work of subordinates
- one employee has only one boss



ENGINEERING MANAGEMENT

2.2.3 Types of organization structure

Merits of Line organization

- Simple to design and easy to understand
- Authority-responsibility relationships are clear and definite
- Unity of command
- Managers can make prompt decision within the limits of their authority
- This structure is less expensive because staff specialists are not required
- More flexible on such environment change
- Easy to fix responsibility to each staff

Demerits of Line organization

- Tends to be rigid and inflexible
- Centralization of authority at the top can lead to autocratic behavior
- Superiors are overburdened with diverse jobs
- Nepotism and favoritism prevail due to control of activities
- Generally one way communication from top to bottom
- Lack of expert advice can lead to waste of resources
- Sub optimization emerges because every department works for its own interests.

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2.2.3 Types of organization structure

I. **Line and staff organization Characteristics**

- Line and staff organization is characterized by both line and staff position.
- A line portion is a position in the direct chain of command that is responsible for the achievement of an organization‘s goal.
- Line functions directly contribute to goal accomplishment. It contains the power to make and execute decision.
- A staff position is intended to provide expertise, advice and support for line positions. Staff functions contribute indirectly to goal accomplishment.

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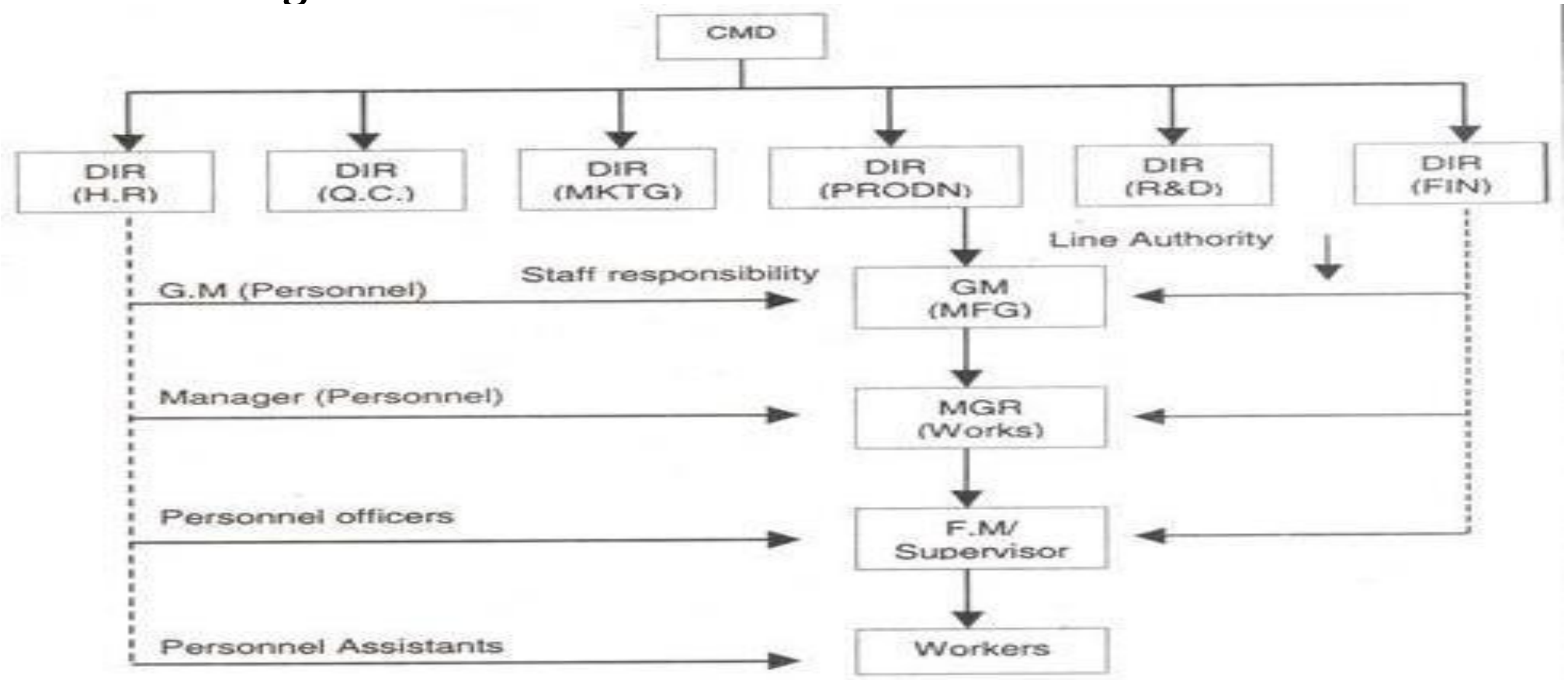
I. **Line and staff organization Characteristics**



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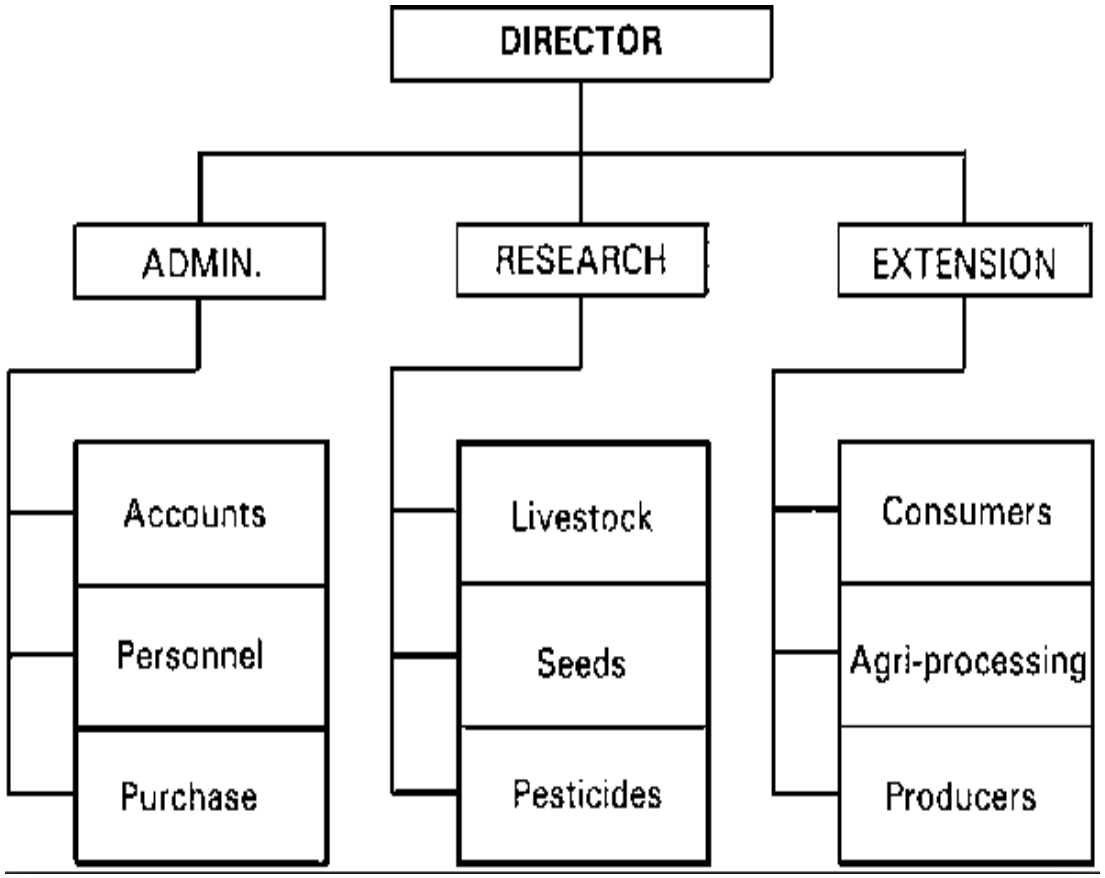
I. II . Functional organization

- Functional organization is a type of organizational structure that ***uses the principle of specialization based on function or role.*** It allows decisions to be decentralized since issues are delegated to specialized persons or units, leaving them the responsibility of implementing, evaluating, or controlling the given procedures or goals. *Thus a functional organization, in which everyone engaged in one functional activity such as marketing or finance, is grouped into one unit.*
- **F. W. Taylor-father of scientific management-originally** developed the concept of functional structure. It is most commonly used by **small size organization.**

ENGINEERING MANAGEMENT

I. III . Functional organization



Characteristics of functional organization

- Organizational members are grouped into functional departments
- It focuses on specialization as every manger concentrates on a particular function
- Establish definite relationship between divided units
- It focuses only on organizational functions such as marketing, finance, rather than the basic managerial functions such as planning or controlling
- A subordinate refers to multiple bossed for different functions

ENGINEERING MANAGEMENT

Merits of Functional organization

- It facilitates work specialization
- It allows coordination within function
- Specialists mangers increase efficiency
- increase in operational efficiency
- It makes supervision easier since

  each manager must be expert in only

  a narrow range of skills
- Makes easier to mobilize specialized skills and bring them
- to bear where they are most needed
- Facilitates career progression within functional areas
- Overburden of work is reduced

Demerits of Functional organization

- It can be difficult to get quick decision because functional manager has to report to top authority
- problems and difficulties of multiple command
- It is often harder to determine accountability and judge performance because a subordinate is related to his functions in all department
- It is more complicated in operation
- lack of well-defined responsibility
- There can be self-centered narrow departmental focus

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III. Matrix Structure

- A matrix structure ***provides for reporting levels both horizontally as well as vertically.*** Employees may be part of a functional group but may serve on a team that supports new product development.
- *This kind of structure may have members of different groups working together to develop a new product line.*
- The advantage of a matrix organizational structure is that employees have responsibility not only for their department but for organizational projects.
- **A challenge** with this type of structure presents itself when employees are given direction from two different managers and they need to prioritize their work responsibilities.

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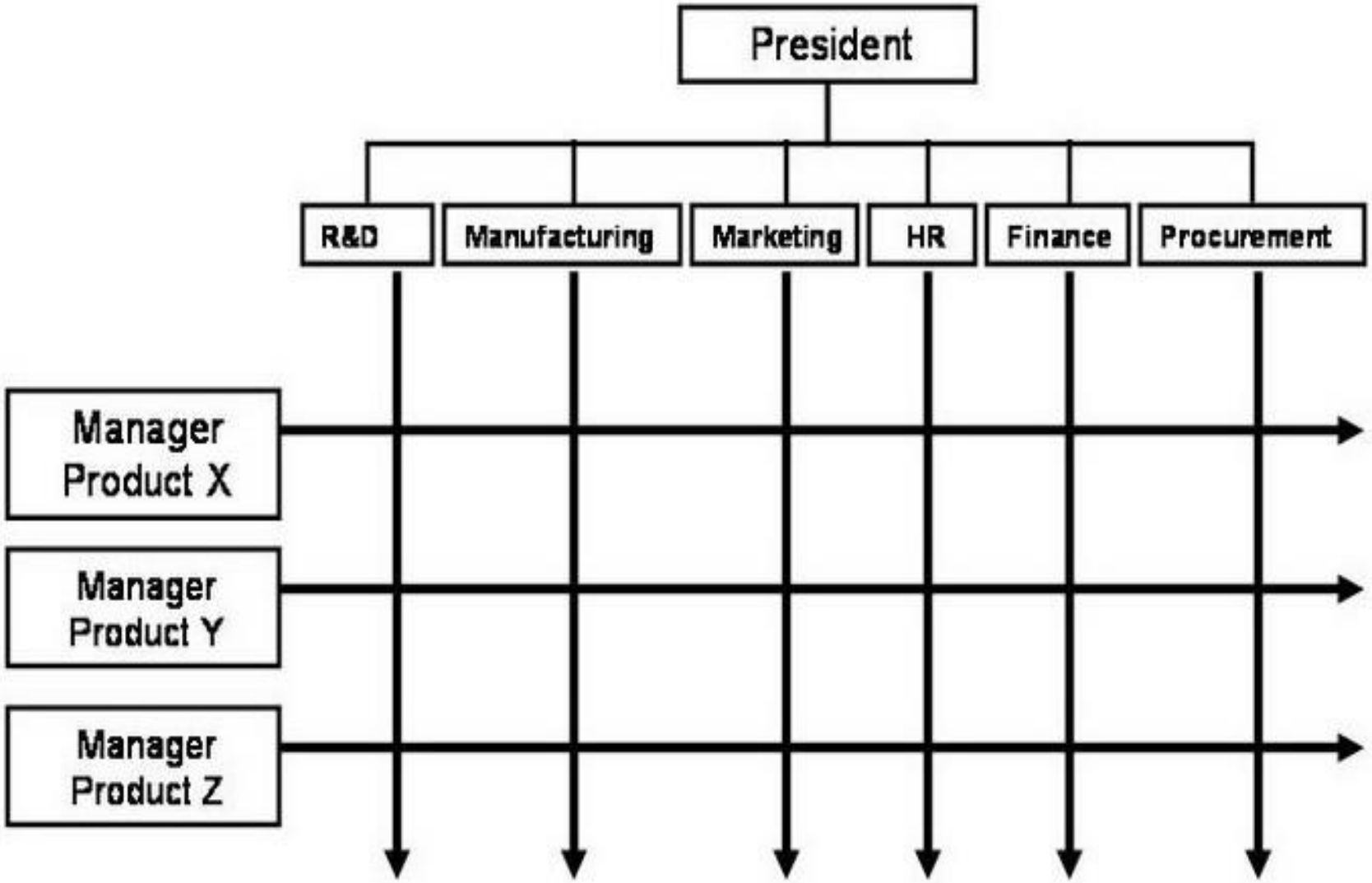
IV. Matrix Structure



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IV. Matrix Structure

Advantages:

- Decentralized decision making.
- Strong product/project co-ordination.
- Improved environmental monitoring.
- Fast response to change.
- Flexible use of resources.
- Efficient use of support systems.

Disadvantages:

- High administration cost.
- Potential confusion over authority and responsibility.
- High prospects of conflict.
- Overemphasis on group decision making.
- Excessive focus on internal relations.

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IV. Matrix Structure

- This type of organization is often used when the firm has to be ***highly responsive to a rapidly changing external environment.*** In matrix structures, there are functional managers and product (or project or business group) managers. Functional manager are in charge of specialized resources such as
- production, quality control, inventories, scheduling and marketing.
- *Product or business group managers are Incharge of one or more products and are authorized to prepare product strategies or business group strategies and call on the various functional managers for the necessary resources.*

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IV. Matrix Structure

- The problem with this structure is the ***negative effects of dual authority*** similar to that of project organization. The functional managers may lose some of their authority because product managers are given the budgets to purchase internal resources.
- In a matrix organization, the product or business group managers and functional managers have **somewhat equal power.**
- ***There is possibility of conflict and frustration but the opportunity for prompt and efficient accomplishment is quite high.***

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2.2.2.2 Modern structure: matrix, network, hybrid

- **"Hybrid"** means combining two different things. A hybrid organizational structure combines elements of both traditional hierarchical and modern flat structures, integrating functional, divisional, and matrix models. This approach allows for flexibility, better resource allocation, and enhanced communication across various departments and projects.
- **A real-life example of a hybrid organizational structure is Google,** which blends functional departments like engineering and marketing with project-based teams for specific products. This structure allows Google to innovate quickly while maintaining efficient operations.

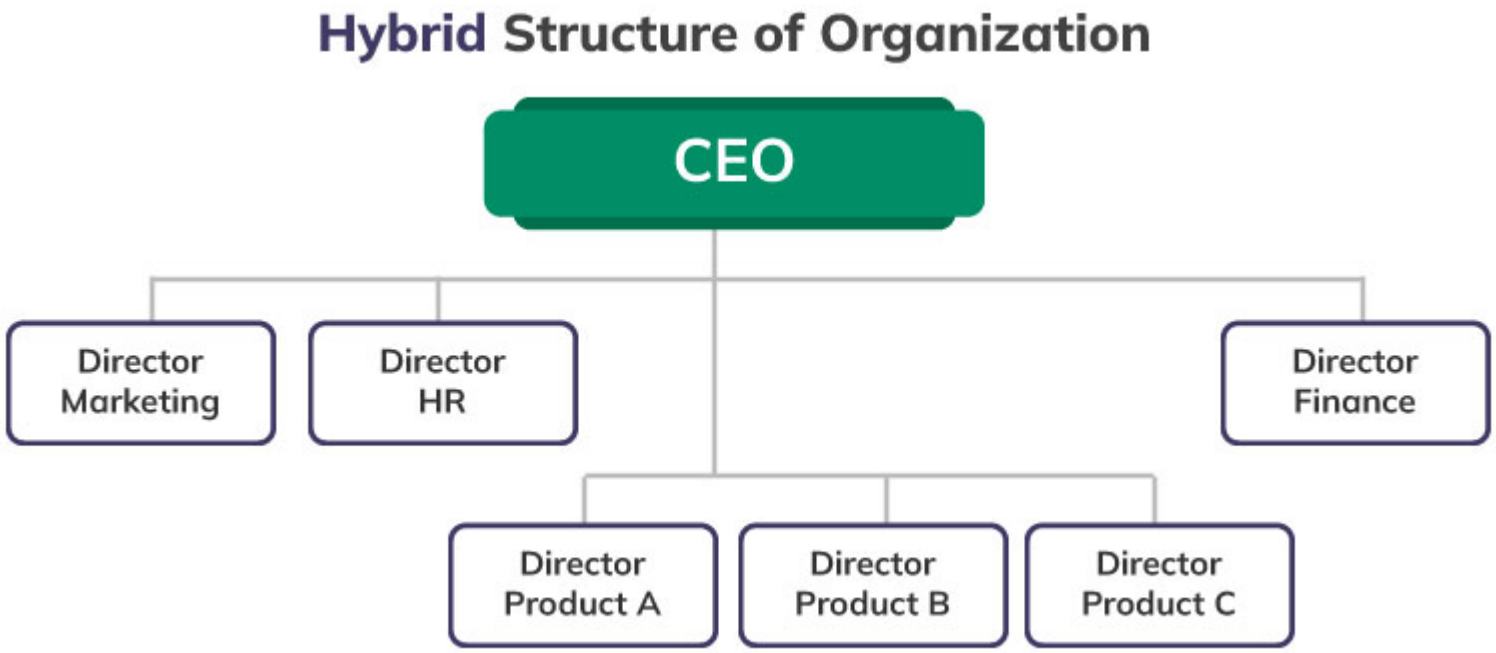
What are the benefits of a hybrid organizational structure?

- **Efficient resource use**
- **Empowerment and job satisfaction**
- **Responsibility and social engagement**
- **Effective communication and collaboration**
- **Development of cross-functional skills**
- **Specialized and collaborative teams**
- **Scalability and growth**
- **Flexibility**

ENGINEERING MANAGEMENT

2.2.2.2 Modern structure: matrix, network, hybrid

- **“Hybrid”**



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2.2.2.2 Modern structure: matrix, network, hybrid

What Are the Disadvantages of a Hybrid Structure?

Conflicts between departments and divisions and confusion about the line of authority are a few potential drawbacks of a hybrid organizational structure.

Network organization:

- A network organization is a **decentralized company** structure that operates as a network of autonomous businesses or business units as opposed to a traditional centralized, hierarchical structure.
- ***Each unit is responsible for its own profit and losses,*** and all units share a common goal of maximizing the value of the network as a whole.
- ***Units can share resources and collaborate*** where it makes sense to do so commercially. Units can be under the same consumer brand or operate under independent brands.

ENGINEERING MANAGEMENT

2.2.2.2 Modern structure: matrix, network, hybrid

Network organization:

Network organizations can be described as a structure in which individuals are connected through a series of relationships. These relationships can be categorized into various types:

- **Vertical:** Refers to status relationships (boss/employee)
- **Horizontal:** Refers to task relationships (colleague/co-worker)
- **Initiative/Assignment based**: Refers to forming and adjourning teams that only exist for a specific purpose and then disbands
- **3rd party relationships**: Relationships with vendors or sub-contractors that are not permanent members of the organization
- **Partnerships:** Collaborating with other organizations or sharing resources to the benefit of both parties.

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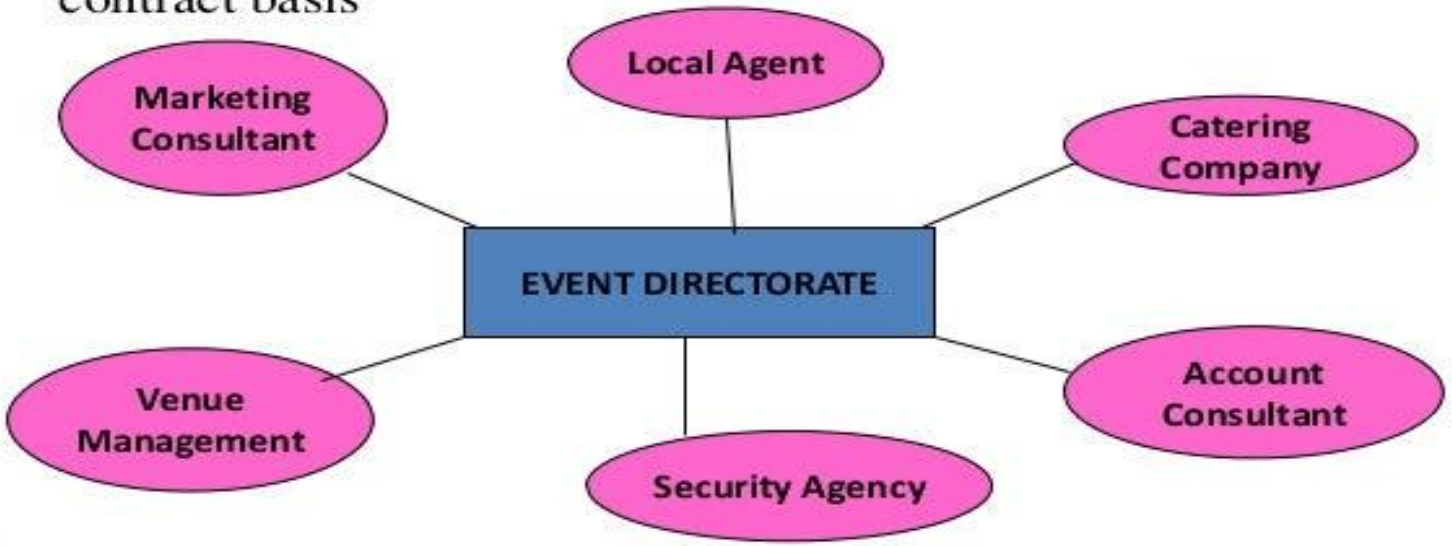
2.2.2.2 Modern structure: matrix, network, hybrid

Netwo

3. Network Structure

- These are defined as a small centralised organisation that relies on other organisations to perform its business function on contract basis



ENGINEERING MANAGEMENT

2.2.2.2 Modern structure: matrix, network, hybrid

Network organization:

Advantages of a network structure

- This type of structure has a number of advantages, chief among them flexibility and scalability.
- Since teams can be created and disbanded as needed, a network organization is very flexible and can easily adapt to changes in the market or the business landscape. And because teams are interconnected, new employees can be quickly integrated into the organization without having to go through a lengthy onboarding process.
- Another benefit of a network organization is that it is scalable. The network can easily be expanded when the company grows to accommodate the additional employees. And if the company needs to downsize, the network can be shrunk to fit the new, smaller workforce.
- A network organization is an ideal structure for constantly changing and evolving companies. It is also a good choice for companies that are growing rapidly or that have a large workforce.

ENGINEERING MANAGEMENT

2.4 Emerging planning and organizing issues for ICT enterprises - ASSIGNMENT

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership (6 Hrs.)

3.1 Motivation

3.1.1 Theories of motivation: Maslow's hierarchy, Herzberg's two factor, Expectancy, Equity

3.1.2 Techniques for motivation

Specific Objectives

To enable students to analyze and address key issues in motivating and leading a technical workforce

3.2 Leadership

3.2.1 Leadership styles: autocratic, democratic, servant and transformational

3.2.2 Characteristics of learning organization in the ICT industry

3.3 Challenges and strategies for motivating and leading technical workforce

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership - PDF

3.3 Challenges and strategies for motivating and leading technical workforce

1. Preparing For The Post-Pandemic Workplace

The biggest challenge is to execute current operations at the same pace for the next two to three years. The remote infrastructure and work-from-home environments were set up during the lockdown. Getting back to completely normal operations before the third wave ends is a huge challenge before us. The final arrangement will likely be somewhere in the middle and include partial work from home. - Bhagvan Kommadi, Value Momentum

2. Keeping Up With New Tech Developments

Across the globe, the theme is clear: We are time-strapped. At the same time we are looking to achieve better balance, there is an increasing demand for our time and attention. With more content available than we can consume, the biggest challenge for tech teams is carving out time for skilling. As tech continues to evolve, we must ensure teams are keeping pace with learning and development. - Shaheen Yazdani, Intercept

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership - PDF

3.3 Challenges and strategies for motivating and leading technical workforce

3. Finding Enough Skilled Team Members

A lack of digital skills is the biggest challenge that tech teams are facing. We have boundless technology with unfettered access to innovative solutions; however, we simply don't have enough skilled people to realize the potential. This does not have a quick fix. We must invest in reskilling, promote new talent and reward a continual learning culture. It will take focus to overcome this. - Nick Herbert, Fujitsu

4. Retaining Top Talent

The biggest challenge facing tech teams right now is securing and retaining top talent. With hashtags such as #greatreshuffle trending on social media, it's certainly a candidates' market. Tech leaders need to clearly articulate their organization's purpose, values and employee value proposition to attract like-minded individuals who will stick around for more than a paycheck. - Andrea Davey, Scout Talent Group

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership - PDF

3.3 Challenges and strategies for motivating and leading technical workforce

5. Ensuring Both Agility And Productivity

A big challenge is the diversity of available technology choices. We need to ensure that decision making is as decentralized as possible to drive agility while also ensuring that there is a defined stack and set of tools to ensure productivity. This can be achieved through blending clear data and tech stack governance principles with an organizational structure that has well-defined roles. - Manoj Narayanan, Real Chemistry

6. Managing Cybersecurity

As companies head back to the office or embrace hybrid working, security will be one of the most important challenges. Leaders should never assume their cybersecurity controls are complete. Cybersecurity should be managed in the same way as a product development lifecycle—it is never finished, and it needs constant iteration. Cybercriminals are always changing and evolving, so security controls need to do the same. - Pete Hanlon, Moneypenny

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership - PDF

3.3 Challenges and strategies for motivating and leading technical workforce

7. Understanding What Resources To Use And When

The complexity in today's IT environment is further exacerbated by multiple cloud environments and data centers. This complexity can be bridged, but it requires a commitment to removing the cognitive load from tech teams by guiding them to the right resources—and the right locations for these resources—without compromising security and agility. - Rick Kilcoyne, CloudBolt Software

8. Enabling Cross-Functional Collaboration

Tech leaders must ensure collaboration among cross-functional departments. Tech and digital transformation teams are forced into digital exploration phases to ensure knowledge transfer and needs are properly assessed. Appoint an appropriate product manager to do a full gap analysis and assessment to eliminate the burden on day-to-day resources and develop virtual demos for multiple stakeholders. - Amanda Dorenberg, COMMB

ENGINEERING MANAGEMENT

CONTENTS:

Unit III: Motivation and Leadership - PDF

3.3 Challenges and strategies for motivating and leading technical workforce

9. Prioritizing Multiple Tasks For Smaller Teams

The complexity of tech today almost defies description, and the result is rampant burnout. There is so much to be done, whether it's improving cybersecurity features or rewriting team norms to enable distributed work—and there aren't enough hours in the day. Until teams are fully staffed to manage the load, CIOs must get comfortable with ruthless prioritization of tasks for their teams. - Kim Huffman, Elastic

10. Motivating And Challenging Tech Talent

A big challenge is attracting and keeping the best people in a market where there are shortages of talent. Our people are our most important asset—without them, innovations that make products attractive and deliver profitable growth don't happen. Offer the chance to work on cutting-edge products, invest in their road of continuous learning and give a clear career path that motivates them. - Alex Cresswell, Thales Group

ENGINEERING MANAGEMENT

CONTENTS:

Unit IV: Human Resource Management and Control (8 Hrs.)

4.1 Human Resource Management

- 4.1.1 Functions of human resource management
- 4.1.2 Job analysis, job specification, job description
- 4.1.3 Recruitment and selection
- 4.1.4 Human resource training (on the job and off the job)
- 4.1.5 Performance appraisal and methods
- 4.1.6 Challenges in managing people in ICT workforce

4.2 Control

- 4.2.1 Importance
- 4.2.2 Process and types
- 4.2.3 Techniques
- 4.2.4 ICT tools for effective control of engineering projects and organizations.

Specific Objectives

To enhance students' knowledge of human resource management and control functions, emphasizing their practical application for managing ICT organization