Introduction

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

6 Hours

1.1 Management

Management is the process of designing and maintaining an environment in which individuals, working together in groups, efficiently accomplish selected aims.

This designing and basic definition needs to be expanded:

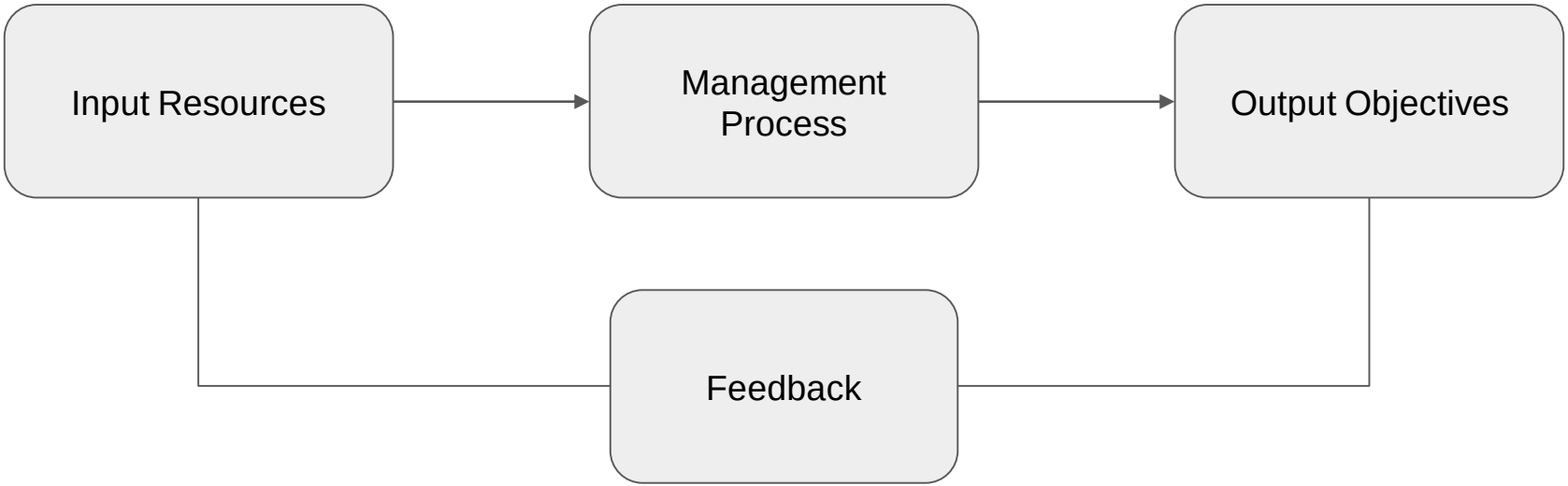
- As managers, people carry out the managerial functions of planning, organizing staffing, leading, and controlling.
- Management applies to any kind of organization.
- It applies to managers at all organizational levels.
- The aim of all managers is the same: to create a surplus. (Profit)
- Managing is concerned with productivity, which implies effectiveness and efficiency.

- Management is the process of designing a controlled environment by planning activities and events, organizing, staffing, and leading a group of individuals to accomplish selected aims and goals while increasing productivity, efficiency and surplus in the process (Swostika)

1.1.1 Functions of Management

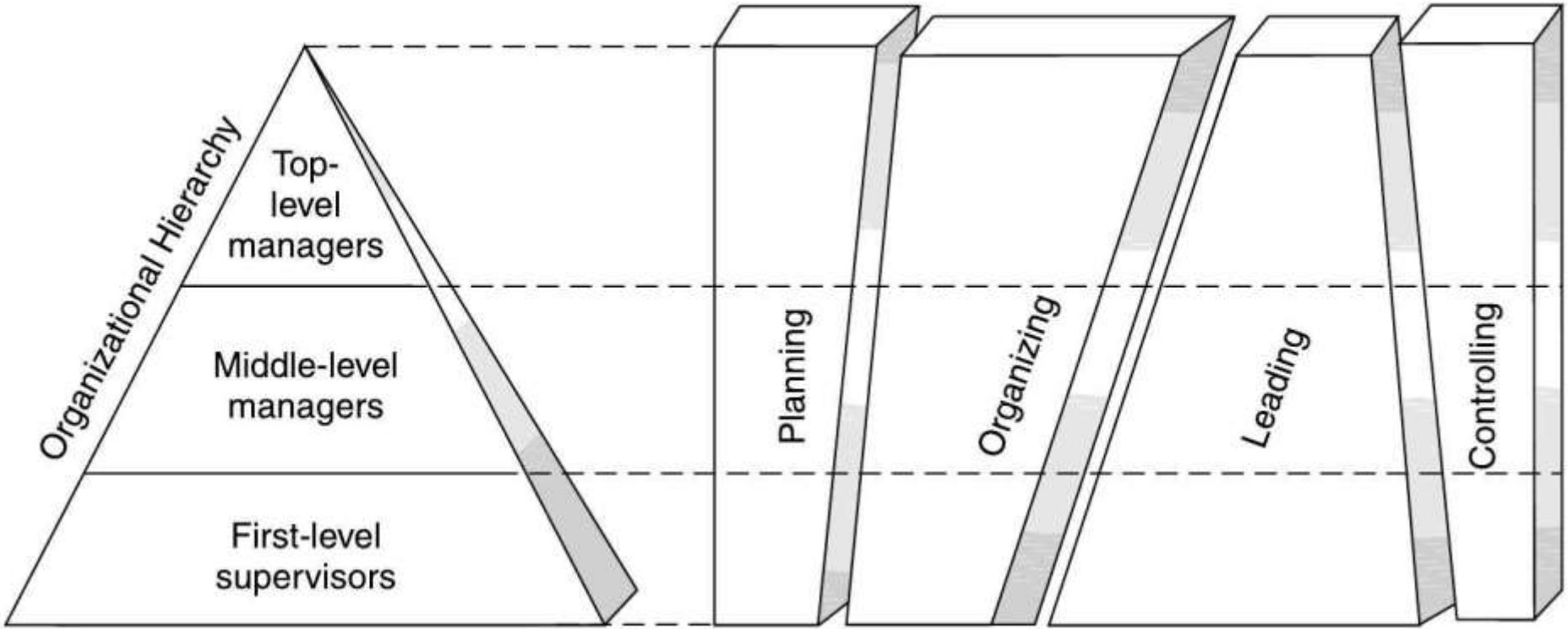
- Five managerial functions—planning, organizing, staffing, leading, and controlling—around which the knowledge that underlies those functions can be organized.
- These functions are affected by external factors such as political, economic, social, technological, ethical, legal
- There are internal factors of strength and weakness that affects management functions
- Management is an essential for any organization or enterprise

1.1.1 Functions of Management



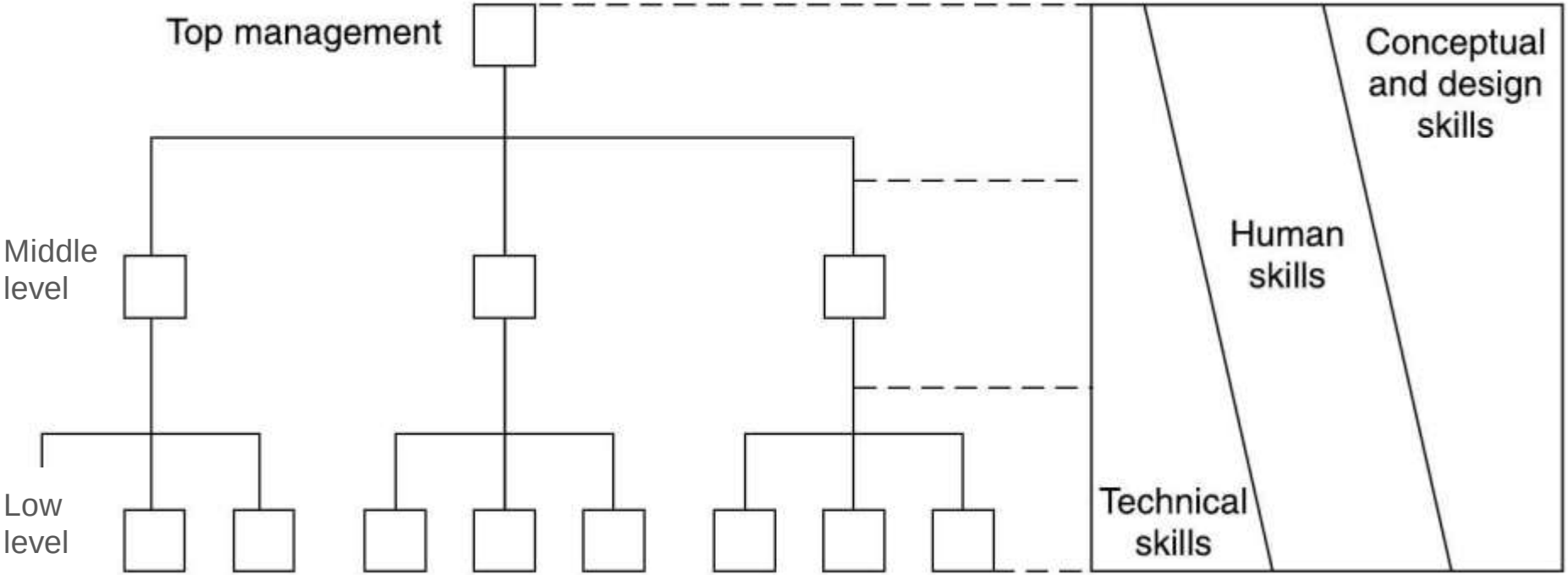
1.1.2 Level and scope of management

Time Spent in Carrying out Managerial Functions



1.1.2 Level and scope of management

Skills and Managerial Levels



1.1.3 Principles of Management

- Fundamentals truth of general guidelines with universal acceptance
- Principles are evolving so manger’s need is to become adaptive
- Some of the key principles are:
- Management by Objectives
- Division of work
- Substitution of resources
- Span of control
- Unity of functions
- Unity of command
- Delegation of authority
- Management by exception
- Shortest Decision path

Evolution of Management Thought

Learning Objectives:

- Understand how management theories developed over time
- Identify major contributors and their impact
- Connect historical theories to modern engineering management practices

Classical Management Theories

1. Scientific Management
2. Modern Operational Management Theory
3. Behavioral Sciences Approach
4. Systems Theory
5. Modern Management Thinkers

Scientific Management


Frederick W. Taylor
(1856–1915)

Frederick W. Taylor

- Father of Scientific Management
- Works: Shop Management (1903), Principles of Scientific Management (1911)
- Focused on efficiency, productivity, and incentive-based pay

Henry L. Gantt:

- Developed Gantt Chart
- Emphasized worker selection, cooperation, and training

Frank & Lillian Gilbreth:

- Time-and-motion studies
- Lillian focused on psychology and human factors

Key Principles:

- Efficiency through standardization
- Clear division of labor
- Scientific approach to management decisions

Modern Operational Management Theory

Henri Fayol:

- Father of modern management theory
- Work: Administration Industrielle et Générale (1916)
- Identified 6 groups of industrial activities
- Proposed 14 principles of management

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

No.	Principle	Brief Description
1	Division of Work	Specialization boosts efficiency and productivity.
2	Authority	Right to give orders with accountability for outcomes.
3	Discipline	Adherence to rules and respect for agreements.
4	Unity of Command	Each worker should have only one direct supervisor.
5	Unity of Direction	One leader, one plan for activities with the same objective.
6	Subordination of Interest	Organization’s interests take precedence over individual interests.
7	Remuneration	Fair and satisfactory payment for work performed.

No	Principle	Brief Description
8	Centralization	Balance authority between top and lower levels of the organization.
9	Scalar Chain	Clear line of authority from top to bottom (hierarchy).
10	Order	Right people and materials in right place at right time.
11	Equity	Fairness, kindness, and justice in treatment of employees.
12	Stability of Tenure	Long-term employment promotes efficiency and loyalty.
13	Initiative	Encourage employees to take initiative and contribute ideas.
14	Esprit de Corps	Foster morale, harmony, and team spirit among staff.

Behavioral Sciences Approach

Hugo Münsterberg:

- Applied psychology to industry and management

Walter Dill Scott:

- Applied psychology to advertising and personnel

Elton Mayo & F. J. Roethlisberger:

- Hawthorne Studies: Social relationships influence performance

Chester Barnard:

- The Functions of the Executive (1938)
- Emphasized communication and cooperation

Max Weber:

- Developed theory of bureaucracy

Vilfredo Pareto:

- Pareto Principle; sociological contributions

Systems Theory Approach

- Management as a cooperative system
  - Emphasizes relationships among subsystems
  - Focus on organization as a whole
  - Supports social systems approach to managing

Modern Management Thinkers

Peter Drucker (1974):

- Decentralization, innovation, effectiveness

W. Edwards Deming:

- Quality control, continuous improvement

Laurence Peter (1969):

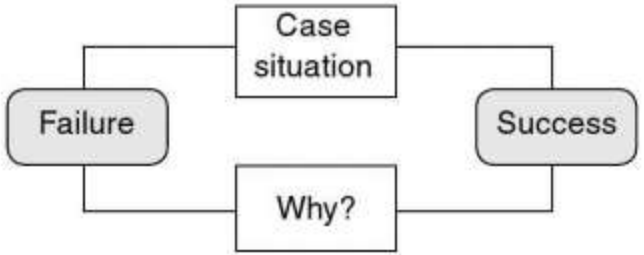
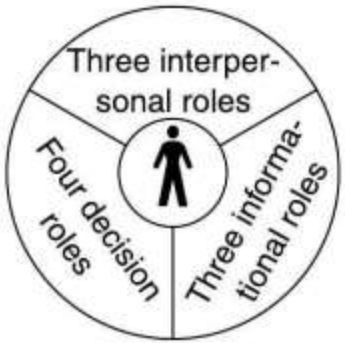
- Peter Principle (incompetence at highest position)

William Ouchi (1981):

- Theory Z (Japanese-American hybrid)

Peters & Waterman (1982):

- In Search of Excellence
- Characteristics of successful companies

Characteristics/ Contributions	Limitations	Illustration
EMPIRICAL OR CASE APPROACH		
Studies experience through cases. Identifies successes and failures.	Situations are all different. No attempt to identify principles. Limited value for developing management theory.	
MANAGERIAL ROLES APPROACH		
Original study consisted of observations of five chief executives. On the basis of this study, ten managerial roles were identified and grouped into interpersonal, informational, and decision roles.	Original sample was very small. Some activities are not managerial. Many activities are evidence of planning, organizing, staffing, leading, and controlling. Some important managerial activities are left out (e.g., appraising managers).	Roles of managers 

Interpersonal roles

1. The figurehead role (performing ceremonial and social duties as the organization's representative)
2. The leader role
3. The liaison role (particularly with outsiders)

Informational roles

4. The recipient role (receiving information about the operation of an enterprise)
5. The disseminator role (passing information to subordinates)
6. The spokesperson role (transmitting information to those outside the organization)

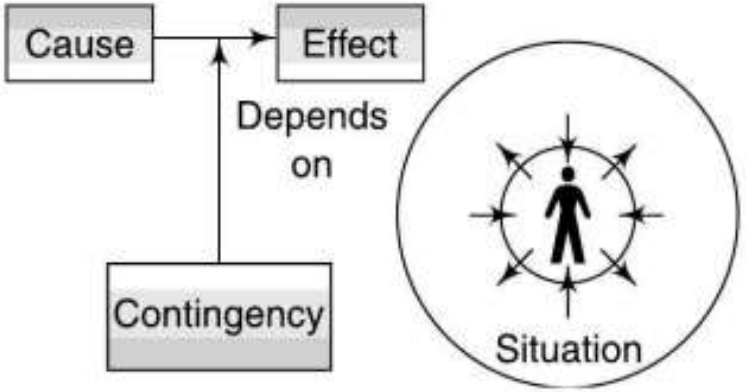
Decision roles

7. The entrepreneurial role
8. The disturbance-handler role
9. The resource-allocator role
10. The negotiator role (dealing with various persons and groups of persons)

CONTINGENCY OR SITUATIONAL APPROACH

Managerial practice depends on circumstances (i.e., a contingency or a situation). Contingency theory recognizes the influence of given solutions on organizational behavior patterns.

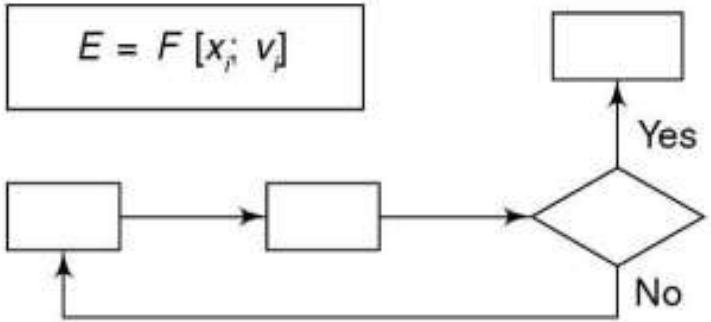
Managers have long realized that there is no one best way to do things. Difficult to determine all relevant contingency factors and to show their relationships. Can be very complex.



MATHEMATICAL OR "MANAGEMENT SCIENCE" APPROACH

Sees managing as mathematical processes, concepts, symbols, and models. Looks at management as a purely logical process, expressed in mathematical symbols and relationships.

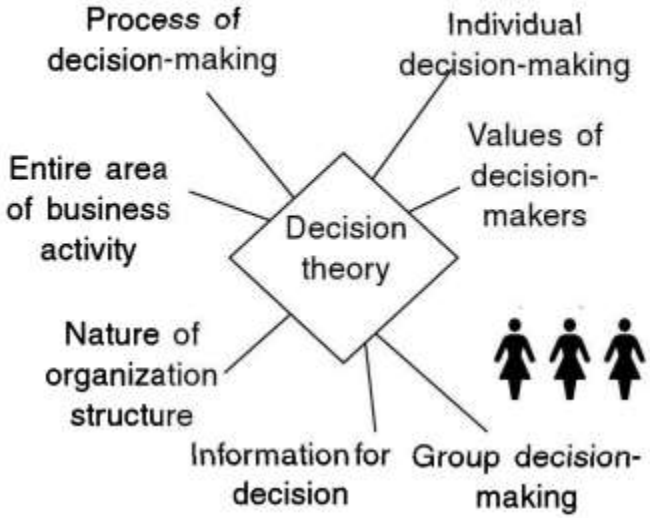
Preoccupation with mathematical models. Many aspects in managing cannot be modeled. Mathematics is a useful tool, but hardly a school or an approach to management.



DECISION THEORY APPROACH

Focuses on the making of decisions, persons or groups making decisions, and the decision-making process. Some theorists use decision-making as a springboard to study all enterprise activities. The boundaries of study are no longer clearly defined.

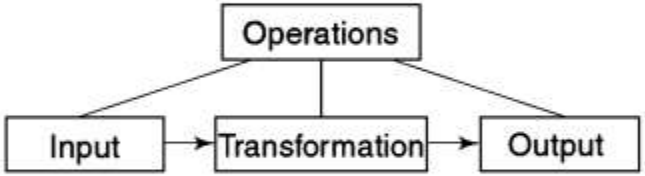
There is more to managing than making decisions. The focus is at the same time too narrow and too wide.



REENGINEERING APPROACH

Concerned with fundamental rethinking, process analysis, radical redesign, and dramatic results.

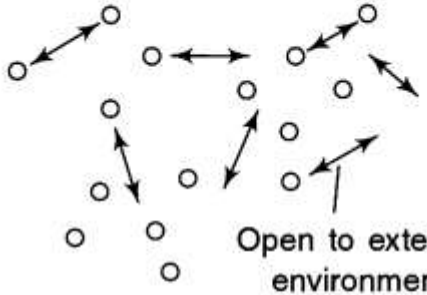
Neglects external environment. Possibly ignores customers' needs. Neglects human needs. Ignores total management system, unlike the management process, or operational approach.



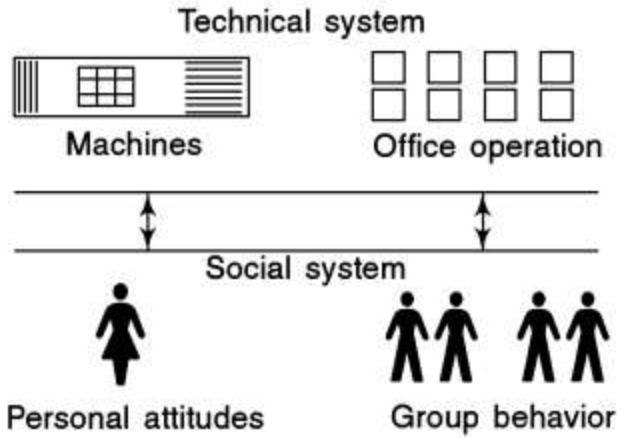
SYSTEMS APPROACH

Systems concepts have broad applicability. Systems have boundaries, but they also interact with the external environment; that means organizations are open systems. Recognizes the importance of studying interrelatedness of planning, organizing, and controlling in an organization as well as in the many subsystems.

Can hardly be considered a new approach to management, as claimed by some proponents of this approach.



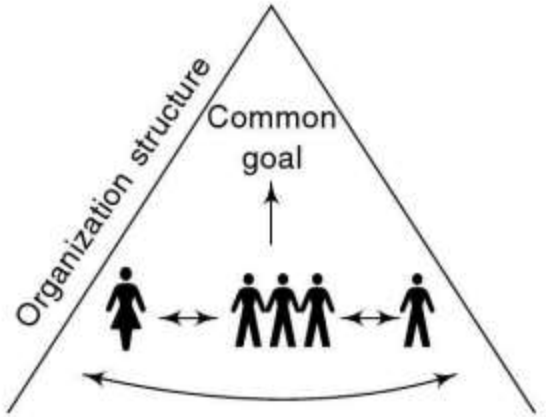
(*Contd.*)

Characteristics/ Contributions	Limitations	Illustration
SOCIOTECHNICAL SYSTEMS APPROACH		
Technical system has a great effect on social system (personal attitudes, group behavior). Focuses on production, office operations, and other areas with close relationships between the technical system and people.	Emphasizes only blue-collar and lower-level office work. Ignores much of other managerial knowledge.	

COOPERATIVE SOCIAL SYSTEMS APPROACH

Concerned with both interpersonal and group behavioral aspects leading to a system of cooperation. Expanded concept includes any cooperative group with a clear purpose.

Too broad a field for the study of management. At the same time, it overlooks many managerial concepts, principles, and techniques.



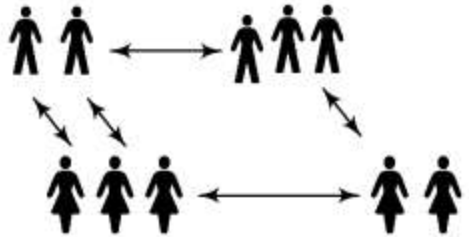
GROUP BEHAVIOR APPROACH

Emphasizes behavior of people in groups. Based on sociology and social psychology. Primarily studies group behavior patterns. The study of large groups is often called organizational behavior.

Often not integrated with management concepts, principles, theory, and techniques. Need for closer integration with organizational structure design, staffing, planning, and controlling.

Study of a group

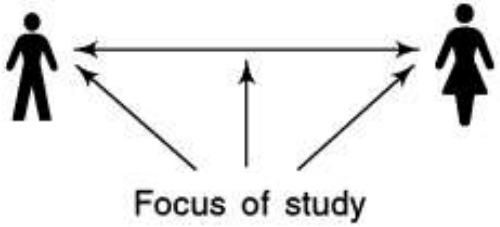
Study of groups interacting with each other



INTERPERSONAL BEHAVIOR APPROACH

Focuses on interpersonal behavior, human relations, leadership, and motivation. Based on individual psychology.

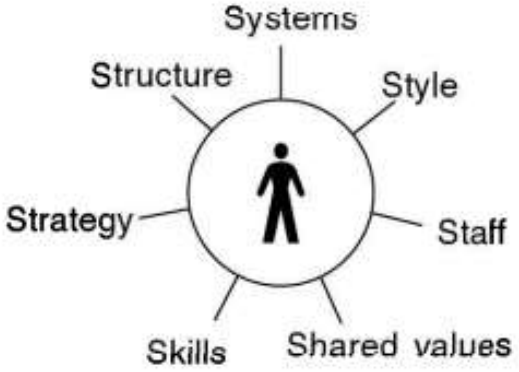
Ignores planning, organizing, and controlling. Psychological training is not enough for becoming an effective manager.

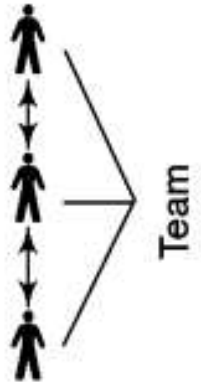


McKINSEY's 7-S FRAMEWORK

The seven S's are
(1) strategy,
(2) structure,
(3) systems, (4) style,
(5) staff, (6) shared values, and (7) skills.

Although this experienced consulting firm uses a framework similar to that found useful by Koontz and colleagues since 1955 and confirms its practicality, the terms used are not precise and topics are not discussed in depth.

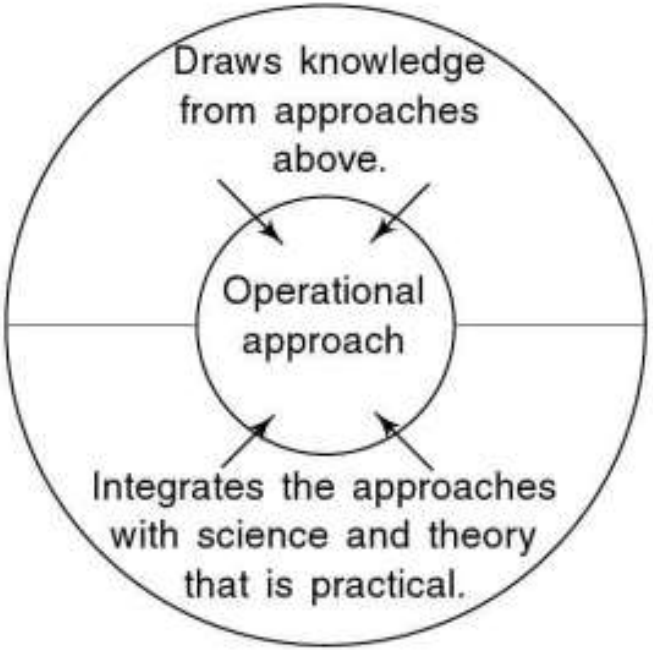


TOTAL QUALITY MANAGEMENT APPROACH			
Focuses on providing dependable, satisfying products and services (Deming) or products or services that are fit for use (Juran), as well as conforming to quality requirements (Crosby). The general concepts are continuous improvement, attention to details, teamwork, and quality education.	No complete agreement on what total quality management is.		*Focus:* Customer needs: Quality Products and Services Concern for quality and cost

MANAGEMENT PROCESS OR OPERATIONAL APPROACH

Draws together concepts, principles, techniques, and knowledge from other fields and managerial approaches. The attempt is to develop science and theory with practical application. Distinguishes between managerial and nonmanagerial knowledge. Develops a classification system built around the managerial functions of planning, organizing, staffing, leading, and controlling.

Does not, as some authors do, identify representing or coordination as a separate function. Coordination, for example, is the essence of managership and is the purpose of managing.



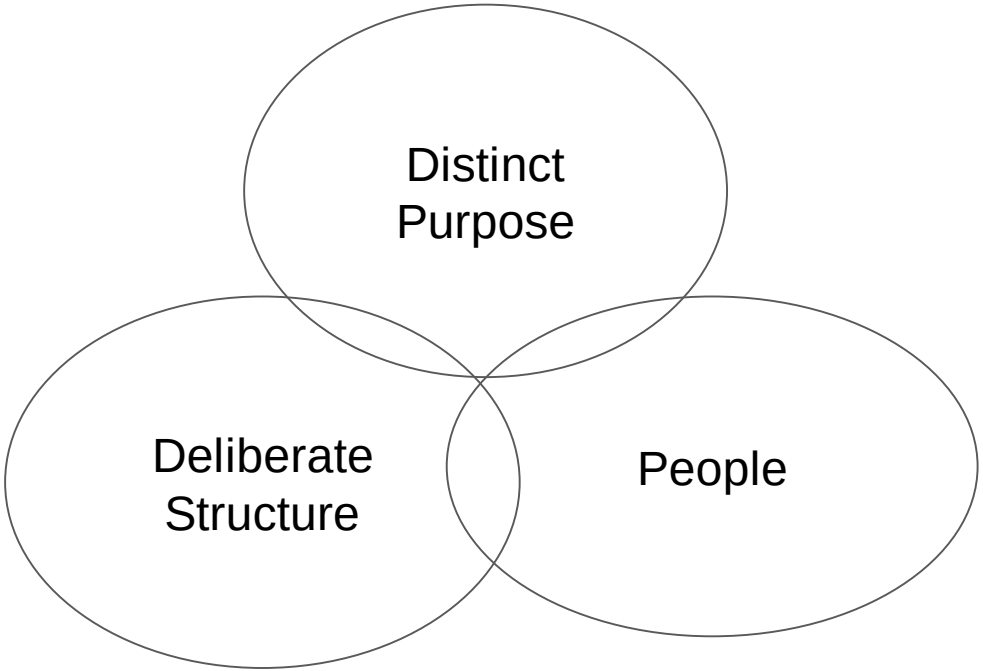
1.2 Organization

- Organization is a localized intentional structure of roles or problems
- The result of organizing is organization
- Organizing involves:
  - the identification and classification of required activities
  - the grouping of activities necessary for attaining objectives
  - the assignment of each group to a manager with the authority (delegation) necessary to supervise it
  - the provision for coordination horizontally (on the same or a similar organizational level) and vertically (e.g., between corporate headquarters, division, and department) in the organization structure

Principles of organizing

- Clarity about objectives
- Division of work
- Unity of command
- Scalar chain
- Span of control
- Departmentation
- Decentralization
- Separation of line and staff functions
- Authority and Responsibility
- Simplicity
- Flexibility

1.2.1 Characteristics of Organization

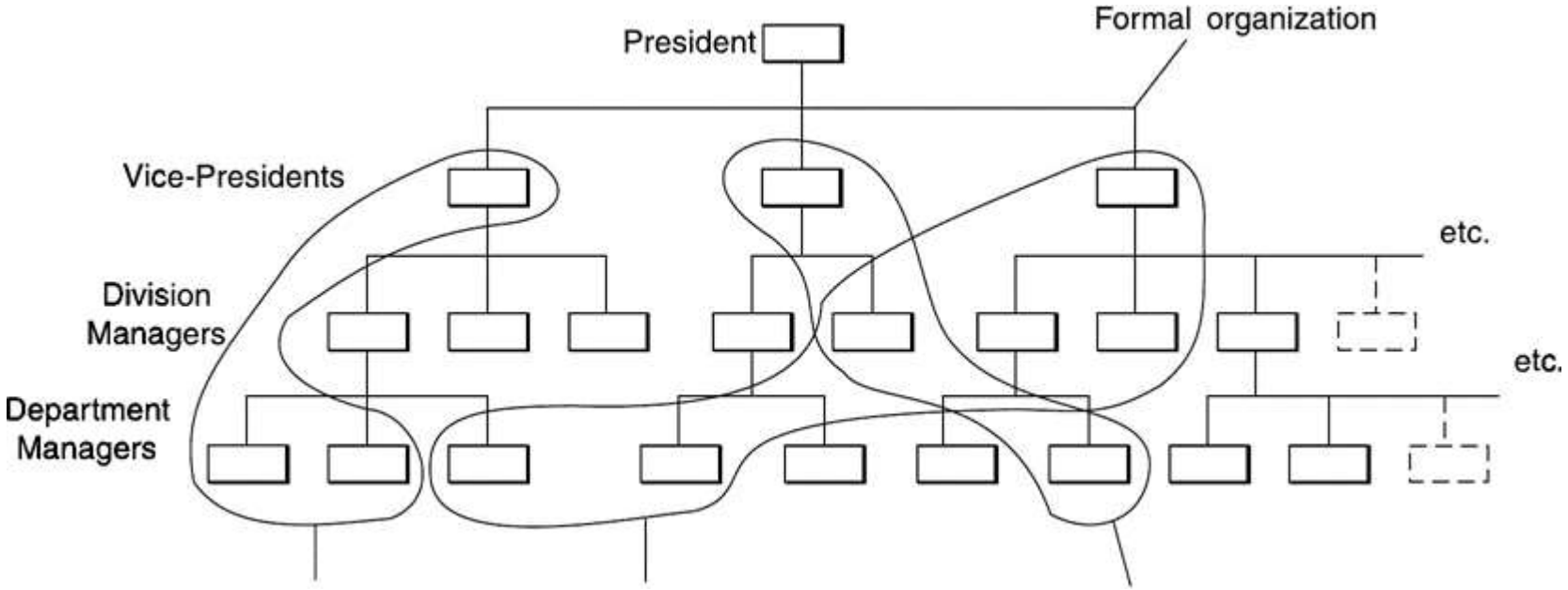


Source: Robbins

Eight characteristics of excellent enterprises

1. were oriented toward action
2. learned about the needs of their customers
3. promoted managerial autonomy and entrepreneurship
4. achieved productivity by paying close attention to the needs of their people
5. were driven by a company philosophy often based on the values of their leaders
6. focused on the business they knew best
7. had a simple organization structure with a lean staff
8. were centralized as well as decentralized, depending on appropriateness

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



Informal Organization

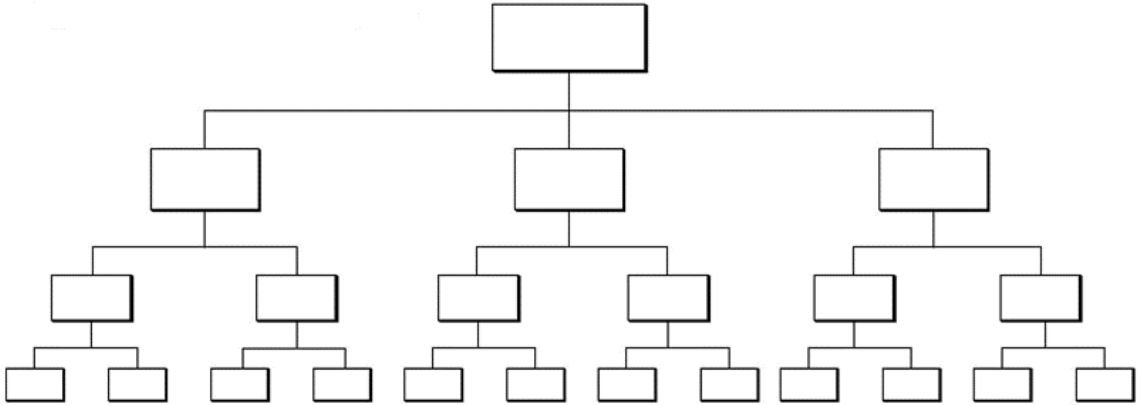
- The informal organization is a network of interpersonal relationships that arise when people associate with each other
- Thus, informal organizations relationships not appearing on an organization chart might include:
  - the machine shop group,
  - the sixth floor crowd,
  - the Friday evening bowling gang,
  - the morning coffee “regulars

Virtual Organization

- Also called network organizations
- Essence of these kinds of organization is to outsource managers business functions
- Highly centralized
- Practically no departmentalization

These organizations create a network of relationships that allow them to contract out almost all managerial functions, distribution, marketing, account-keeping, staff management and other functions

Organization with Narrow span



Advantages

Close supervision

Close control

Fast communication between subordinates and superiors

Disadvantages

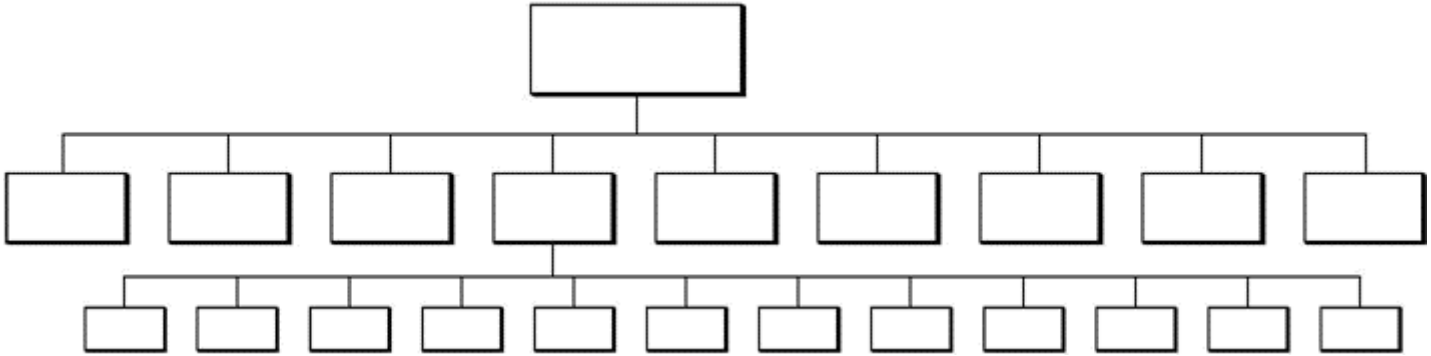
Superiors tend to get too involved in subordinates' work

Many levels of management

High costs due to many levels

Excessive distance between lowest level and top level

Organization with wide span



Advantages

Superiors are forced to delegate

Clear policies must be made

Subordinates must be carefully selected

Disadvantages

Tendency of overloaded superiors to become decision bottlenecks

Danger of superiors loss of control

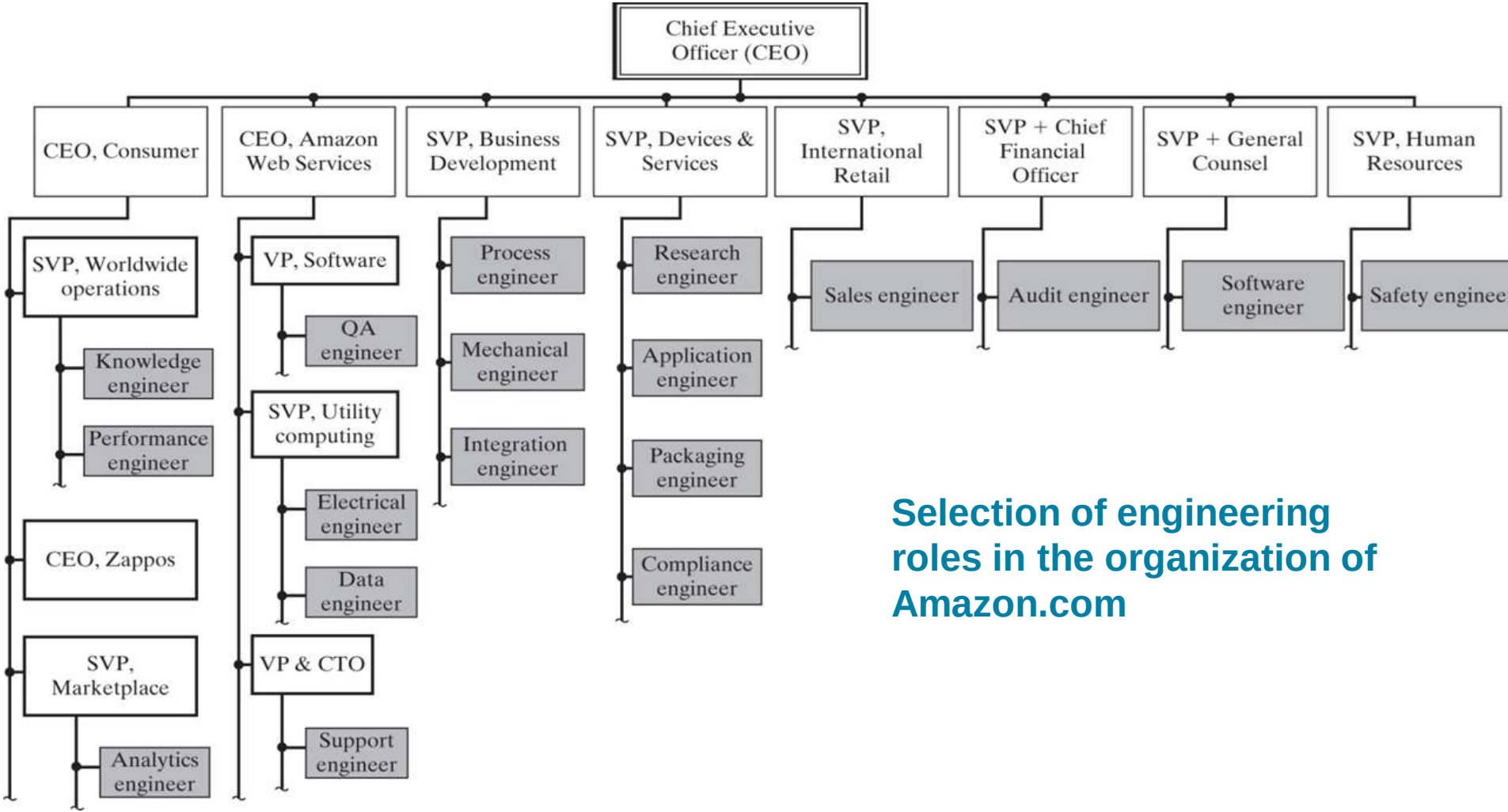
Requires exceptional quality of managers

Engineering Management and its importance in technology driven environment

Aspect	Importance
Innovation & R&D	Helps in managing innovation pipelines, promoting product development, and sustaining competitive advantage.
Strategic Planning	Aligns technological capabilities with business strategies in fast-changing markets.
Efficient Resource Use	Optimizes time, talent, and budget in complex, high-tech environments.
Cross-Disciplinary Coordination	Integrates efforts of engineers, designers, marketers, and operations teams for unified execution.

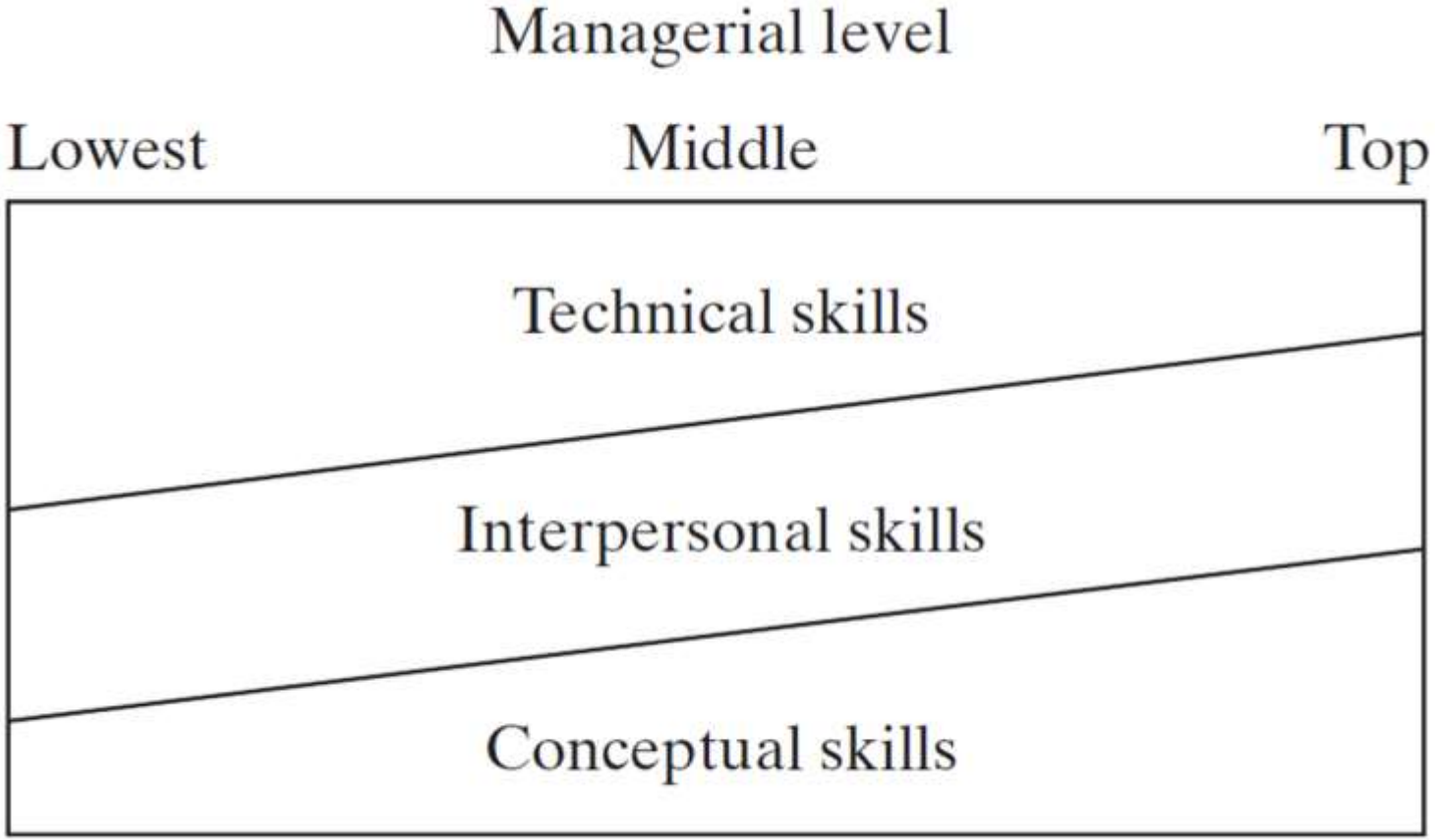
Engineering Management and its importance in technology driven environment

Aspect	Importance
Change Management	Supports smooth adoption of new technologies and digital transformation initiatives.
Risk Management	Identifies and mitigates technical, operational, and market risks in tech projects.
Quality & Compliance	Ensures systems meet performance standards, safety norms, and regulatory requirements.
Leadership in Tech Teams	Develops engineering talent, fosters collaboration, and boosts productivity in technical teams.

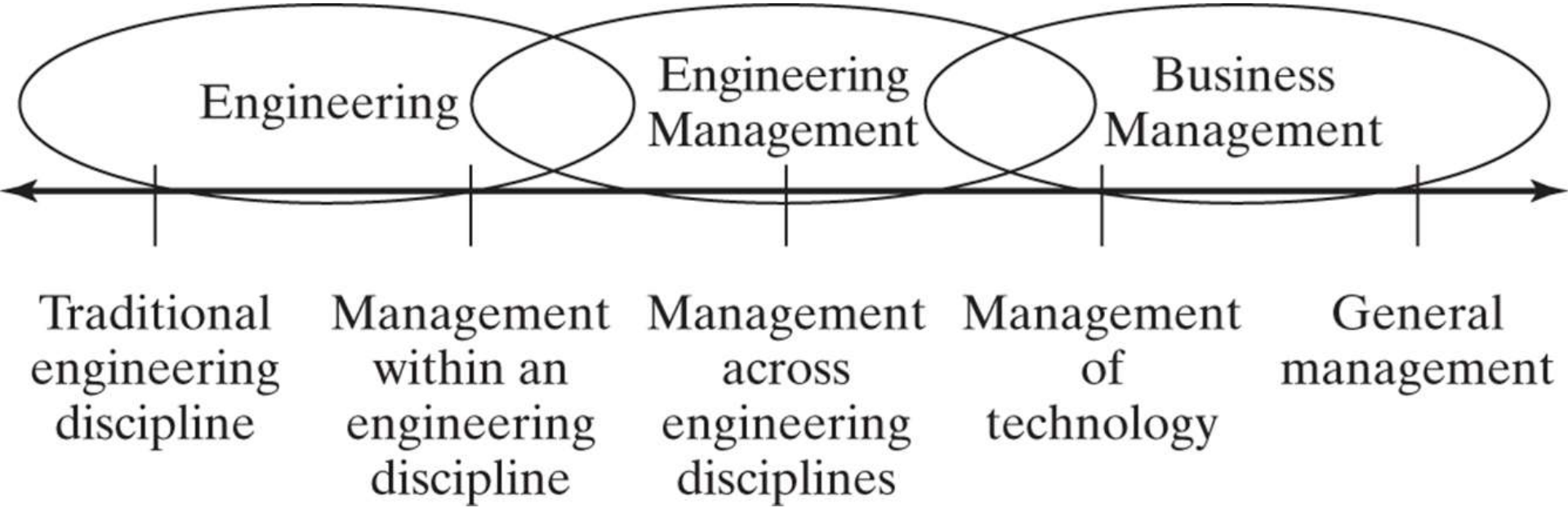


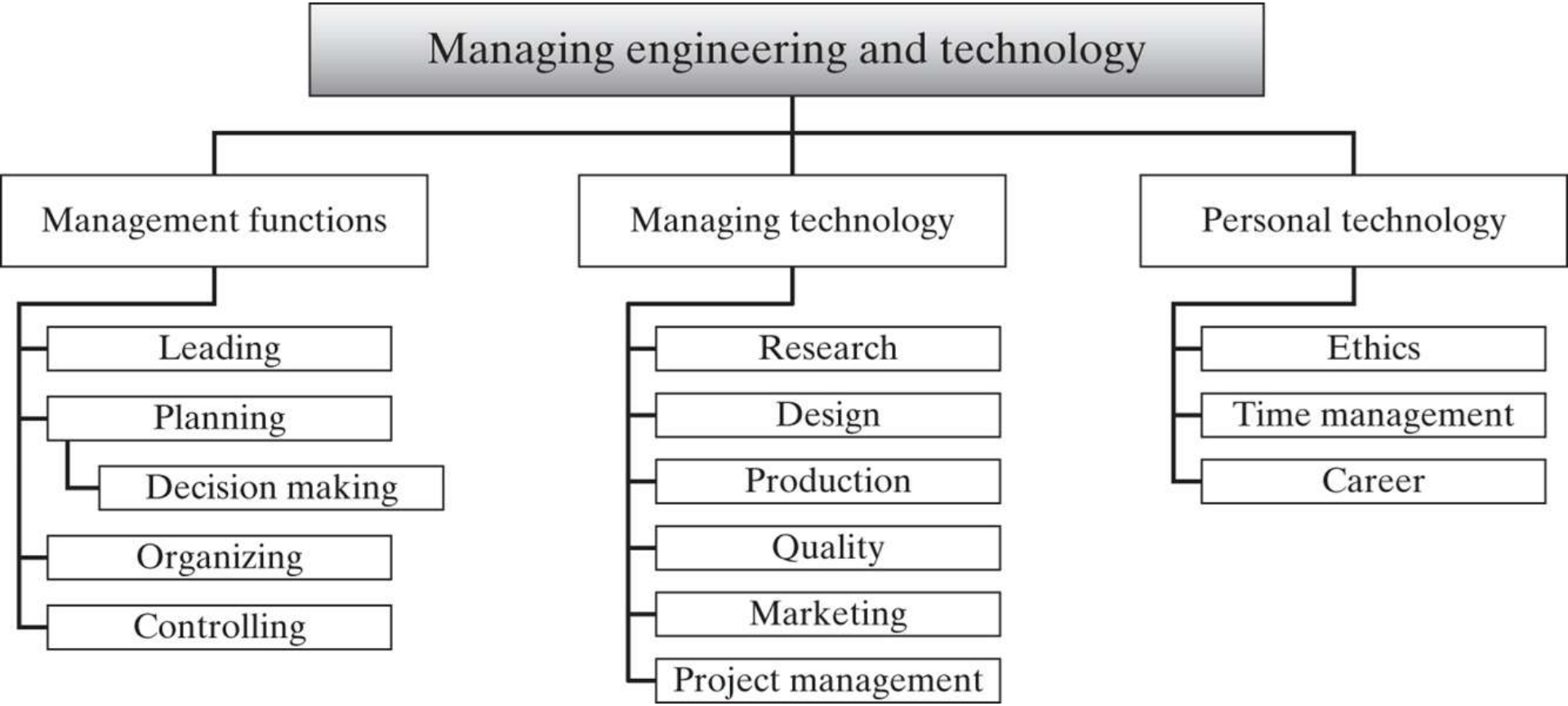
Selection of engineering roles in the organization of Amazon.com

Blend of skills required at various levels



The field of Engineering Management




Managing engineering and technology
Management functions
Leading
Planning
Decision making
Organizing
Controlling
Managing technology
Research
Design
Production
Quality
Marketing
Project management
Personal technology
Ethics
Time management
Career

Engineering functions in organizations:

- Product development
- Operations
- IT systems
- Quality assurance
- Others

Roles and responsibilities of an engineering manager

1. **Leader** – Guides and motivates the engineering team toward project and organizational goals.

2. **Planner** – Develops strategic plans for product development, resources, and timelines.

3. **Coordinator** – Aligns engineering activities with other departments like marketing, design, and production.

4. **Decision Maker** – Makes informed technical and managerial decisions for problem-solving.

Roles and responsibilities of an engineering manager

5. **Communicator –** Acts as a bridge between technical teams and stakeholders or upper management.
6. **Mentor** – Coaches and develops the skills of engineers and technical staff.
7. **Resource Allocator** – Manages budgeting, tools, and personnel for effective project execution.
8. **Evaluator** – Monitors performance, conducts reviews, and ensures quality output.

Responsibilities of an Engineering Manager

Area	Responsibilities
Team Management	Hiring, training, mentoring, and performance evaluations
Project Oversight	Planning, scheduling, and delivering engineering projects
Technical Guidance	Providing technical support and reviewing solutions/architecture
Process Improvement	Implementing best practices, Agile/Scrum, and quality assurance processes

Responsibilities of an Engineering Manager

Area	Responsibilities
Budgeting	Estimating costs, controlling expenses, and optimizing resources
Stakeholder Communication	Reporting progress, handling feedback, and aligning with business goals
Risk Management	Identifying potential risks and implementing mitigation strategies
Compliance	Ensuring projects meet industry standards, laws, and safety regulations