

MANAGEMENT SCIENCE

Third Edition



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MANAGEMENT SCIENCE

Third Edition

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Director

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Hyderabad*



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Dedicated to my Living Gods
My Parents

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY



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FOREWORD

It is a common sight today that many Indian companies are turning global and many foreign companies are entering Indian soil. Opportunities are galore, both for organisations and employees of all cadres. What determines the success of an enterprise in a competitive environment? You may have resources including HR, but how do you ensure that they are optimally utilised?

'Management' is the answer. As a leader and manager, you should know how to manage your resources. Organisations need only those who are good at 'managing'. To be able to 'manage' well, one should have loads of commonsense coupled with strong conceptual base of what management is. Also, one should be aware of the contemporary management practices. This will facilitate our *style* of getting things done. The subject of *Management Science* has been in integral part of the engineering curriculum all through.

I congratulate Dr. A. Ramachandra Aryasri, my colleague in the University, on writing this book according to the syllabus of this university. I find this book a good addition to the existing titles of management. I am sure this will be a good source of information to the management students in general and engineering students of this university in particular. I find the book user-friendly, very easy to understand and relatively exhaustive in terms of content.

I wish Dr. Aryasri many more academic achievements in the years to come. I wish him best of luck.

Dt. 24.11.2007

Dr K Rajagopal

Preface to the Third Edition

I am overwhelmed with satisfaction and with the reception accorded to the second edition of Management Science, both by faculty and students. Considering the moderate revision in the Management Science syllabus of JNT University, I am happy to place a revised edition of this book in your hands. The new topics added in this book include:

- (a) Virtual organisation, cellular organisation, team structure, boundaryless organisation, inverted pyramid structure and lean and flat organisation structure (Chapter 4)
- (b) Leadership styles (Chapter 5)
- (c) Deming's contribution to quality (Chapter 9)
- (d) Contemporary management practices (New Chapter 20)

In addition, every chapter contains multiple choice questions also. As the syllabus for this subject shows eight units, the following table shows the chapters given unit wise.

Units	Chapters Numbers with Titles
I.	1. The Concepts of Management, Administration and Organisation. 2. Functions of Management 3. The Evolution of Management Thought 4. Managerial Objectives
II.	5. Basic Issues in Organisation
III.	6. Plant Location and Plant Layout 7. Productivity and Production 8. Work Study 9. Statistical Quality Control
IV.	10. Materials Management 11. Marketing: Concepts and Functions
V.	12. Human Resource Management 13. Functions of HR/Personnel Manager I 14. Functions of HR/Personnel Manager II
VI.	15. Project Management I: Programme Evaluation and Review Technique (PERT) & Critical Path Method (CPM) 16. Project Management II: Cost Analysis and Project Crashing
VII.	17. Corporate Planning Process 18. Environmental Scanning and SWOT Analysis 19. Strategy Formulation and Implementation
VIII.	20. Contemporary Management Practices

Besides, four question papers of previous batch are given for guidance.

I welcome your feedback and suggestions. I will be very happy to acknowledge them.

A. Ramachandra Aryasri
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Preface to the First Edition

Management is an evergreen field expanding boundlessly. It has been the area of interest for many and, of late, more to engineering students. With the growing number of multinationals operating in India and Indian companies turning multinationals, the opportunities for the present generation are vast.

An engineer with a management background is in demand all over. He is the professional most sought after as he is the embodiment of right mix of the skills of rationality and decision making. That is why he is paid very well, in terms of salary, globally.

Every one is a manager in one way or the other. We manage day-in and day-out to achieve our personal goals. The same management skills are applied in the organisational context to achieve organisational goals. In this process, it is necessary to coordinate men, materials, money, and machines against the background of several controllable and non-controllable factors such as technology, competition, and so on. This makes management a complex job and the primary key for such a complex job lies in careful understanding of the basic concepts of management.

This book has 19 chapters.

Chapters 1 to 5 give a brief introduction to the Concepts, Functions, and Evolution of Management; Organisation Structure; and Managerial Objectives.

Chapters 6 to 8 explain the basic concepts and the process of Corporate Planning, Environmental Analysis including SWOT Analysis, and Strategy Formulation and Implementation.

Chapters 9 and 10 deal with Plant Location and Layout, and Statistical Quality Control respectively.

Chapters 11 to 13 are devoted to the concepts of Human Resource Management and Functions of a Human Resource Manager.

Chapters 14 to 17 deal with Materials Management, Productivity and Production, Work Study, and Introduction to Marketing respectively.

Chapters 18 and 19 cover the concepts of Project Management with particular reference to Programme Evaluation Review Technique (PERT) / Critical Path Method (CPM) and Project Crashing respectively.

One annexure at the end of the Chapter 10 and two at the end of Chapter 17 have been added to provide a brief outline of the developments in quality control, including Total Quality Management (TQM), ISO 9000-2000 series and so on.

I have great pleasure in placing this book before you. This has been written considering the academic requirements of engineering students, particularly those of JNTU B.Tech. Adequate care has been taken in identifying the most relevant and up-to-date information and presenting the same in a logical sequence and lucid style. As a part of providing conceptual clarity, this book follows a new pedagogical approach by starting each chapter with learning objectives, providing 'Situation Analysis' (to facilitate an understanding of the theoretical concepts), exhibits (to present recent business developments/practices), figures, charts at the appropriate places in each chapter, chapter-end summary, and chapter-wise list of review questions, including objective questions.

I am sure this book would be a good source of reference. One of the main objectives of writing this book is to suggest what can be taught under this syllabus and also make the same available from a single source. The managers of both public and private sectors who have no formal background in management also may find this book interesting to refer to.

Finally, I take full responsibility for any mistake or error appearing in this book. I welcome suggestions and constructive criticism from the academic community. Any suggestion to enhance the utility of this book is most welcome and will be thankfully acknowledged.

A Ramachandra Aryasri

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

MANAGEMENT SCIENCE

(Common to all Branches)

Syllabus

Unit I	<p><i>Introduction to Management:</i> Concepts of Management and organization- Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.</p>
Unit II	<p><i>Designing Organisational Structures:</i> Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.</p>
Unit III	<p><i>Operations Management:</i> Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.</p>
Unit IV	<p><i>A) Materials Management:</i> Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records - Supply Chain Management <i>B) Marketing:</i> Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle., Channels of distribution.</p>
Unit V	<p><i>Human Resources Management (HRM):</i> Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs.PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.</p>
Unit VI	<p><i>Project Management (PERT/CPM):</i> Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)</p>

Unit VII	<i>Strategic Management:</i> Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.
Unit VIII	<i>Contemporary Management Practices:</i> Basic concepts of Management Information System (MIS), End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Value Chain Analysis, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering, Bench Marking and Balanced Score Card.

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Preface to the Fourth Edition

I am very happy to place the fourth edition of the book in your hands. I thank the faculty for extending patronage to this title since its first edition.

Management is an ever-growing field. It has been attracting many engineering students, since engineers with a management background are in demand all over. This book has been written considering the academic requirements of engineering students, particularly those of JNTU B. Tech. It continues to follow the time-tested pedagogical approach by starting each chapter with Learning Objectives, providing Situation Analysis to facilitate understanding of the theoretical concepts, Exhibits to present recent development practices, Figures, Charts at the appropriate places in each chapter, chapter-end Summary, and chapter-wise list of Review Questions, including Objective Type Questions.

Recent question papers have been added, along with hints to answers.

I thank the McGraw-Hill team for bringing out the fourth edition in such a short span of time.

Like always, I invite suggestions for improving the quality of presentation and for making this book more useful.

A. Ramachandra Aryasri
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UNIT I

Chapter 1: The Concepts of Management, Administration and Organisation

Chapter 2: Functions of Management

Chapter 3: The Evolution of Management Thought

Chapter 4: Managerial Objectives

1

THE CONCEPTS OF MANAGEMENT, ADMINISTRATION AND ORGANISATION

Learning Objectives

By the time you study this chapter, you should be able to

- understand the concepts of management, administration, and organisation
- relate these with the organisations around us
- identify the differences among the definitions given by different experts in management
- formulate your own definition on management

INTRODUCTION

Management is as old as man himself. As civilisation grew, human life became more and more organised. As industrialisation picked up, business activity increased globally by leaps and bounds.

It had been a common sight that all those who were in business were not successful. Similarly those who were on the top once, are today no where.* On the other hand, those who were novice once upon a time are today on the pinnacles of success. Why does this happen? One right decision will push you up in life, more so in business, and vice versa. Also, we find that certain business houses, as old as a century, continue to be successful irrespective of the changes in their business environment. How could they ensure to be sucessful? Perhaps they managed their enterprises better. Their management skills and practices ensured their success.

This chapter outlines the concepts of management, administration, and organisation and their importance.

CONCEPT OF MANAGEMENT

Management is what managers do. It also refers to people at the top level, in the organisation, concerned with decision-making. Though it also implies trickery or deceit, this connotation should not be considered in the present context. It is often viewed as manoeuvering, that is, doing something cleverly to change a situation and make things happen the way you want them to. However, these statements do not clearly explain the nature or the concept of management.

*One third of Fortune's Global 500 listing for the year 1970 had dropped out of sight by 1983. By 1990, a full 300 had vanished.

Definition

Different experts have expressed their views on what management is. The following explain the concept and nature of management:

*Henri Fayol*¹ (1916) “To manage is to forecast and plan, to organise, to command, to coordinate and control.”

*Peter F Drucker*² (1955) “Management is concerned with the systematic organisation of economic resources and its task is to make these resources productive.”

*E F L Brech*³ (1957) “Management is a social process . . . the process consists of . . . planning, control, coordination, and motivation.”

*W F Glueck*⁴ (1977) “Management is effective utilisation of human and material resources to achieve the enterprise objectives.”

*Koontz and O'Donnell*⁵ (1984) “Management is an operational process that can be dissected into five essential managerial functions. They are: planning, organising, staffing, directing and leading, and controlling.”

*Koontz and Weihrich*⁶ (1988) “Management is the process of designing and maintaining an environment in which individuals, working together in groups, accomplish efficiently selected aims.”

*Peters, T*⁷ (1988) He feels that management holds a solution to the day-to-day problems in our chaotic world. According to Tom Peters, management explains

- (a) how effectively managers can respond to customers' requirements
- (b) how innovation can be constantly pursued in all areas of the firm
- (c) how the people in an organisation can participate as partners in progress
- (d) how leaders adopt better to changes than fighting against them, instill, and share an inspiring vision
- (e) how activities in an organisation can be controlled through simple support systems

Inferences An analysis of the above views reveals that

- (a) the view of Fayol has been comprehensive and outlines all the functions of management.
- (b) there is only change in the emphasis in the definitions given by Brech, and Koontz and O'Donnell. There is no change in the principles of management as such. The word ‘command’ is replaced by motivation (Brech) or directing and leading (Koontz and O'Donnell).
- (c) Tom Peters does not define management here. On the other hand, he attempts to prescribe what a manager should do to get out of the stress and strain of management. Participation, leadership, and control are the strategies that he suggests to deal with chaos and to get more ‘competitive’.
- (d) the definitions proposed by Glueck and Koontz and Weihrich focus on achieving the given results.
- (e) Drucker's definition highlights that the task of a manager is to use the economic resources productively.

Against this background, management can be considered as a social process of planning, organising, coordinating, commanding and controlling for the purpose of achieving organisational goals, by using limited resources effectively and efficiently, and by working with and through people.

This definition covers four important aspects of management. They are:

- Management is a social process of all functions—planning, organising, commanding, coordinating, and controlling (as defined by Fayol)

- Its ultimate purpose is to achieve organisational goals
- These goals are achieved using limited resources efficiently and effectively
- And by working with and through people

Nature and Features

The following describe the nature and features of management:

- (a) *Management is a social process* Social process refers to the series of activities that are performed in the Society. These activities are carried out by administrators, politicians, economists, housewives, parents, doctors, lawyers and so on. Management is an integral part of social process. Management helps everyone to carryout the activities in the society effectively. To refer to an institution which is very well run, it is said that, the *management* of this institution is said to be very good. Here management is viewed as a function. In other words, management is a process of certain managerial functions in every organisation. It is a social process in particular because managers, at all levels, work with and through people.
- (b) *Management also denotes a 'body of people' involved in decision-making* When an institution is very well run, it is said that the management of that institution takes personal interest in the institution. Here, management denotes a body of people involved in decision-making.
- (c) *Management is omnipresent and universal* Successful organisations show that management principles apply to every kind of organisation and also to every level in it. Hence, it is called omnipresent and universal.
- (d) *It is an inexact science* Management principles are not like those in science or maths where things are fairly clear or exact. Hence, they cannot be generalised precisely.
- (e) *It is complex* Management functions are complex. They call for a fairly professional approach to manage a given situation or organisation.
- (f) *Management is situational in nature* The same style of management cannot work for the same situation every time. The change in the situation may call for a change in the style of functioning of the manager. Similarly, at different points of time also, the style of functioning can be different.

SITUATION ANALYSIS

Gold or equivalent goods free

A leading super market launched a novel scheme. Under this scheme, the customer who buys goods worth Rs. 500 will be given a coupon. If he collects 20 coupons, he can collect one gram of gold or equivalent goods free from the super market. The scheme was a grand success. The sales of the company multiplied within a record time.

This attracted the attention of all the competitors. Some of them started this scheme in their respective business units but could not make any headway.

Finally, all of them shelved the scheme.

The same scheme delivered astounding results for some and for others it did not make any difference. Why was it so?

- (g) *Management is an art and also a science* There is considerable discussion on whether management is an art or science. An art is personal skill or deftful handling of business affairs. Art is characterised by

practical knowledge, personal creativity, and skill. The more one practices an art, the more professional one becomes. Management can be considered as an art because it satisfies all these criteria of an art. The management skills are highly individual-oriented and can be sharpened with more training and practice. There is a lot of scope to apply creativity in the context of managing the affairs of a business organisation. Thus, management is an art.

A science is a systematised body of knowledge of facts. It can establish cause-and-effect relationships among various factors. It involves basic principles, which are capable of universal application. It also helps to predict the future events. Management satisfies all these criteria to be considered as a ‘science’. It is a systematic body of knowledge, its principles are universally acceptable, it stands for logical reasoning, scientific testing and inquiry. It also establishes cause-and-effect relationship between the given factors. It explains what happens if the employees are not paid salaries on time.

Thus, science and art are not mutually exclusive but are complementary to each other. Science and art are two sides of the same coin. Those who learn management principles and contemporary practices in an organised way, will have a far better opportunity to design a feasible solution to a given managerial problem.

Mere knowledge of science will not assure results because one must know how to apply them. Here comes the role of art or skill. Hence, management is considered more as both an art and a science.

- (h) *Management is a profession* Profession refers to a vocation or a branch of advanced learning such as engineering or medicine. Management helps to carry out every profession in a scientific manner. The managers are professional in their approach and are governed by code of ethics. If the manager violates the code of conduct, he can be dismissed from the organisation.
- (i) *Management is inter-disciplinary* The subject of management is heavily dependent on other disciplines, and the techniques of management are built around the techniques drawn from these subjects. The manager uses extensively for instance, the theories of consumption and production from *Economics*; linear programming, PERT and CPM from *Operations Research*; probability theories, correlation and regression techniques from *Statistics*; theories of group behaviour from *Sociology*; theories of individual behaviour from *Psychology*; the tools of decision-making such as matrices, calculus, integration, and differentiation from *Mathematics*.
- (j) *Manager has four types of resources—the Four M's* Men, money, materials, and machines are the four types of resources the manager has to manage. However, this list is only inclusive.

Importance

Management is viewed as a very significant tool for the following reasons:

- (a) *It facilitates the achievement of goals through limited resources* An organisation, if well managed, can accomplish its goals even though its resources are limited. The resources are scarce, and hence, they have to be effectively allocated and utilised in an optimum manner. This is possible only through management.
- (b) *It ensures smooth sailing in case of difficulties* Manager guides the organisation, especially in trouble. As long as things go normal, that is, everybody is doing his/her own function diligently, they may not feel the need for a manager. In case of a crisis, it is the manager who ensures a smooth sailing. How does he do this? He anticipates and makes necessary changes in the organisation to achieve the targeted results.
- (c) *It ensures continuity in the organisation* Continuity is very important in the organisations. Where there are no proper guidelines for decision-making continuity cannot be guaranteed. It is quite natural that new people join while some others retire or leave the organisation. It is only management that

keeps the organisation continuing. Modern organisations are based on systems and procedures. Thus, continuity is ensured. Organisations do not just collapse when some key people leave them. Yes, there could be a change in the focus or priorities in the organisation.

SITUATION ANALYSIS

'Manage' by oneself

One of your neighbours is impressed with your performance in the engineering entrance examination. He wants you to guide his son who is studying in class XII. But the son refuses to see you. He tells his father that he can 'manage' for himself.

What does the son mean by 'manage'?

- (d) *It ensures economy and efficiency* Without managers, it may be difficult to get the job performed efficiently. It is the manager who plans, coordinates, and monitors the progress of work and suggests whether the work is satisfactorily done or not. In case of shortfall, it is the manager who helps the employees to perform better. Thus, organisational costs can be minimised through sound management practices.
- (e) *It focuses on group efforts* If each individual is allowed to plan and organise independently of what others are doing, there will be nothing but chaos. Therefore, management is needed to guide and direct group efforts.
- (f) *It is the key to the economic growth* Efficient management is equally important for the nation in terms of social and economic development. The economic development of a country largely depends on the quality of management of its resources. Capital investment or latest technology alone cannot lead the nation to economic growth. The wealth and production resources in the country also have to be managed efficiently. By producing wealth, managers facilitate the increase in national income, and thus, the living standard of the people. Management is, thus, the key to the economic growth.

Challenges to Management

Managers may have to face many challenges in the years to come in doing their job. These challenges involve complex issues to deal with. The following is an inclusive list of the challenges the manager has to face.

- Increasing opportunities as a result of all round globalisation, privatisation, and liberalisation
- The changing lifestyles and changing values

SITUATION ANALYSIS

Challenges for the Indian states

The following states in India are vying for the first slot in information technology:
Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra, Delhi, and Bihar.

Some of the multinationals arriving in India are very clear in their choice about the state for their operations. This is making the remaining states to do some soul-searching on their strengths and weaknesses.

What do you think are the challenges for any given state in this direction?

- Increasing life expectancy
- More expectations of customers and employees, in particular, and society as a whole, in general
- Conflicting interests among different segments of the society
- Eroding business ethics
- Depleting financial and non-financial resources
- Changing technology
- Bottlenecks in the basic infrastructure
- Environmental degradation, through pollution

All these challenges directly and indirectly point out that the manager has to be creative and competent to continue to be more effective in his job. In fact, these enhance the relevance of a manager in the work front.

The Millennium Manager

The profile of a millennium manager should be drastically different from that of a conventional one. But what will differentiate the two? Look here.

The manager in the new millennium must

- make use of technology to the maximum advantage
- take every decision that maximises the shareholder value
- predict uncertain events more accurately
- use the speed of response to the advantage
- be aware of the global trends in the business procedures, culture and so on
- continue to be patient, committed to the cause of the organisation
- be unconventional and creative
- maintain the competitive edge
- conduct the affairs of the organisation in a transparent manner
- fulfil his responsibility towards the society in general and the underprivileged in particular

SITUATION ANALYSIS

Can the countries manage themselves better?

The percentage change in the Gross National Product (GNP) is one of the parameters for determining the growth rate of an economy. Based on this percentage over the years 1990–98, the economies are classified into five categories:

1. The 'go-go' growers (for these countries, the percentage change in the GNP ranges from 12 to 6). The countries under this category include China, Singapore, Malta, and so on.

(Contd.)

2. The 'fast' growers (for these countries, the percentage change in the GNP ranges from 6 to 4). The countries under this category include India, Australia, Argentina, Chile, Mauritius, Sri Lanka, and others.
3. The growers (for these countries, the percentage change in the GNP ranges from 4 to 2). The countries under this category include Canada, USA, Austria, Mexico, and so on.
4. The 'slow' growers (for these countries, the percentage change in the GNP ranges from 2 to 0.1). The countries under this category include Sweden, Japan, Switzerland, Italy, UAE, Bulgaria, Algeria, and others.
5. The 'no' growers (for these countries, the percentage change in the GNP ranges from $(0.1 < 1)$). In other words, the growth is negative here. The countries under this category include Czech Republic, Russian Federation, Romania, Kazakhstan, Ukraine, and so on.

Some countries are improving by 12 per cent per annum. Some countries are deteriorating by an almost equal percentage.

What do you think are the probable reasons? How can they manage better?

Source: *Human Development Report 2000*, United Nations Development Programme (UNDP) P. 204

Is Management an Important Subject?

The lecturers in management are often told by former students who are professional managers now: 'When I was studying my engineering, I considered management as a relatively unimportant subject; but when I started working, I realised that it is management that comes first than any thing else.' Such feedback holds the answer to this question.

SITUATION ANALYSIS

Administration or management?

What do you find among the following ... administration or management? And why?

- Your home
- Your college
- Students association
- Government office
- Political party
- A private company

CONCEPT OF ADMINISTRATION

There are three schools of thought to explain what administration means in relation to management.

The **first school** of thought (pioneered by Oliver Sheldon, Florence and Tead, Spreigel and Lansburgh) says that administration and management are two different functions.

According to this school of thought, administration is concerned with (a) formulation of corporate policy (b) the coordination of other functional areas such as finance, production, and so on (c) placing the organisation under the ultimate control of the chief executive. And, management is concerned with (a) the execution of a policy, within the limits set up by the administration (b) creating an organisation to achieve the given objectives.

In other words, administration is here viewed as a broader function and management is a subset of administration.

The **second school** of thought (led by Brech) says that management is broader and it includes administration. According to Brech, management constitutes the entire executive control. Administration is that part of management which deals with (a) formulation of policies and procedures (b) carrying out these procedures and (c) measurement of performance as against the plans.

In other words, management is here viewed as a broader function to include administration as its sub-system.

The **third school** of thought (led by Henri Fayol) explains that the terms management and administration are both one and the same, and hence, are interchangeable. When Fayol's work was translated, the French word 'administration' was translated into English as 'management'.

It is common to find that the term 'administration' is used to refer to higher executive function in Government circles, while the term 'management' is used for the same functions in the business world. For the last fifty years, the term 'management' is understood as encompassing much more than 'administration'. Administration was identified with the narrower process of performance of or carrying out the assigned duties. Developing and maintaining procedures is an incidental activity that supplements the management process. Administration is similar to 'organising' in management functions.

CONCEPT OF ORGANISATION

'Organisation' refers to a social group designed to achieve certain goals. Organisation involves creating a structure of relationships among people working for the desired results.

The following definitions give more insight into the concept of organisation.

*Argyris*⁸ (1960) "Organisations are intricate human strategies designed to achieve certain objectives."

*Brech*⁹ (1965) "Organisation is the framework of the management process."

*Simon*¹⁰ (1976) "Organisations are systems of behaviour created for better results. So organisation form must be a joint function of human characteristics and the nature of the task environment."

*Pugh*¹¹ (1990) "Organisations are systems of interdependent human beings."

*Stewart*¹² (1994) Organisations facilitate cohesive performance directed towards achievement of goals. Organisations are more known for their complexity.

Organisation can be viewed in different ways. It can be seen as a social entity or as a process. Organisation as a process is discussed later. Here, the concept of organisation as a social entity is discussed.

These views reveal that

- (a) organisation is a social group designed to achieve certain goals
- (b) people form the backbone of the organisation. The human needs must be considered first before the organisational issues such as structure, authority levels, and so on
- (c) it is run through a defined structure, supported by organisation charts and organisation manuals

- (d) organisations have to consider a wide variety of both internal and external factors to strike a balanced strategy to achieve their goals. The internal factors include formal and informal organisations, span of control, degree of centralisation or decentralisation, and so on. The external factors include competitors, government, creditors, impact of technology, and others.

Significance of Organisation

- (a) *It facilitates administration* When organisation structures are created, organisational procedures are developed, lines of communications are established, the task of administration is made easier. In other words, the top management decisions can be put into practice with ease.
- (b) *It facilitates growth and diversification* The business house can grow and diversify only when their internal organisation is strong and result-oriented.
- (c) *It ensures effective utilisation of manpower* The organisation structure forms the basis to identify, recruit and effectively utilise the manpower at different levels in the organisation.
- (d) *It stimulates creativity* One of the main features of organisation is flexibility. Progressive organisations do not block the creativity of their managers through organisation structure. On the other hand, they grant full freedom to its staff to be more creative and enterprising. Organisations emerge stronger when their people are highly productive, independent and empowered. The leading infotech companies such as Infosys, Wipro, Satyam Computers, Visualsoft, and others, stand a monumental evidence for this.
- (e) *It ensures optimum utilisation of resources* Organisations are well thought outfits which deploy resources, strategically to achieve the given goals in an optimum manner.

SUMMARY

- ◆ The term ‘management’ is viewed as a function, a process, or a body of people at the top level in the organisation. As a function, it covers all the activities that the manager does. As a process, it covers designing and maintaining an environment that is helpful to accomplish the given results. As a body, it refers to the people at the helm of affairs that set the direction and goals for the organisation.
- ◆ Management is defined as a social process of planning, organising, coordinating, commanding, and controlling for the purpose of achieving organisational goals by using limited resources effectively and efficiently, by working with and through people.
- ◆ Management is important because it enables the practicing managers to achieve results in a complex environment. It is useful not only at the individual and organisational level but also at the national level.
- ◆ The nature of management is varied and diverse. It requires an interdisciplinary approach for the study of management. It is not exact like science. The principles of management are applied everywhere. It is situational in nature. It is not only an art but also a science.
- ◆ Administration and management are closely related. There are different opinions about the scope of each of these terms.
- ◆ The organisation refers to the framework of an establishment in which the managers perform their management functions. It involves a structure of relationships among people working for the desired results.

- ◆ Organisations have a significant role to play. They facilitate administration, growth, diversification and stimulate creativity besides ensuring optimum utilisation of resources.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Which of the following implies 'the effective utilisation of human and material resources to achieve the enterprise objectives'?
 - (a) Management
 - (b) Planning
 - (c) Requirements
 - (d) Control
2. Who said this—'To manage is to forecast and plan, to command, to coordinate and control'.
 - (a) E.L.F. Brech
 - (b) W.F.G Glueck
 - (c) Henri Fayol
 - (d) Peters.T
3. 'Management is concerned with the systematic organization of economic resources and its task is to make these resources productive'. Who said this?
 - (a) Koontz & Weihrich
 - (b) Peter F. Drucker
 - (c) Koontz & O'Donnell
 - (d) Henri Fayol
4. Management is a _____ process.
 - (a) Structural
 - (b) Organisational
 - (c) Operational
 - (d) Motivation
5. According to Tom Peters, which of the following *does not* refer to management?
 - (a) How effectively managers do not respond to customers' requirements.
 - (b) How the people in an organisation can participate as partners in progress
 - (c) How innovation can be constantly pursued in all areas of the firm
 - (d) How activities in an organisation can be controlled through simple support system
6. Which of the following does management *not* refer to?
 - (a) Social process
 - (b) Exact science
 - (c) Omnipresent and universal
 - (d) Situational in nature
7. The term management does *not* connote which of the following?
 - (a) Inter-disciplinary in nature
 - (b) Profession
 - (c) 'Body of people' involved in decision making
 - (d) Omniscient

8. Management is viewed as a very significant tool for one of the following reasons. What is that?
 - (a) Ensures discontinuity in the organisation
 - (b) Focuses on group efforts
 - (c) Ensures economy and efficiency
 - (d) Key to the economic growth
9. Which of the following is *not* a challenge faced by the managers?
 - (a) Changing values
 - (b) Changing technology
 - (c) Decreasing life expectancy
 - (d) Increasing opportunities
10. Which of the following is a challenge faced by the managers?
 - (a) Sticking on to business ethics
 - (b) Good basic infrastructure
 - (c) Decreasing opportunities as a result of all round liberalisation, privatisation and globalisation
 - (d) Depleting financial and non-financial resources.
11. Which of the following characteristics should a manager in the new millennium possess?
 - (a) Maintain the competitive edge
 - (b) Be conventional
 - (c) Conduct the affairs of the organisation in an opaque manner
 - (d) Take a decision that minimises the share holder value
12. Which of the following is not a concern of administration?
 - (a) Formulation of corporate policy
 - (b) Placing the organisation under the ultimate control of the chief executive
 - (c) Formulation of corporate gains
 - (d) Coordination of other functional areas
13. Administration is that part of management which does not deal with
 - (a) Creating an organisation to achieve the given objective
 - (b) Formulation of policies and procedures
 - (c) Carrying out these procedures
 - (d) Measurement of performance as against plans
14. Which of the following refers to 'creation of a structure of relationships among people working for the desired results'?
 - (a) Management
 - (b) Administration
 - (c) Organisation
 - (d) Leading
15. 'Organisations are systems of inter-dependent human beings'. Who said this?
 - (a) Pugh
 - (b) Simon
 - (c) Brech
 - (d) Stewart
16. Who of the following are internal stakeholders of the organisation?
 - (a) Competitors
 - (b) Government

- (c) Span of Control
 - (d) Creditors
17. Which one of the following is an external stakeholder of the organization?
- (a) Informal Organisation
 - (b) Degree of centralisation
 - (c) Formal Organisation
 - (d) Impact of technology
18. Which one of the following is not a significant objective of the organisation?
- (a) Stimulates creativity
 - (b) Ensures maximum utilisation of resources
 - (c) Facilitates administration
 - (d) Facilitates growth & diversification
19. Management is a ———— process.
- (a) social
 - (b) economic
 - (c) environmental
 - (d) psychic
20. Which one of the following is not covered by the 4 M's of management?
- (a) Money
 - (b) Materials
 - (c) Manager
 - (d) Machines

Question II: Fill in the Blanks

1. Management is the art of through formally organised groups.
2. Management is both and
3. The functions of management, as given by Henri Fayol include to forecast and plan, to organise,, to coordinate and to control.
4. The functions of management as outlined by Koontz are: planning, organising, staffing,, and controlling.
5. Tom Peters' view of management centres around what managers should do to get more in the present dynamic business environment.
6. The three strategies suggested by Tom Peters to deal with chaos are,, and
7. Management is an inexact science because
8. The 4 M's of management may be identified as (a), (b), (c), and (d)
9. Two challenges to management may be cited as (a) and (b)
10. One reason why management is important could be that
11. According to Brech, is a broader term to include
12. The function in the industry concerned with formulation of corporate policy, as suggested by Oliver Sheldon, is called

13. The school of thought that supports the interchangeability of the terms ‘administration’ and ‘management’ is pioneered by
14. The framework of an establishment is called
15. It is in, management functions are performed.
16. Organisation involves a structure of among people working for the desired results.
17. Management is necessary to ensure
18. Two examples for internal variables of an organisation are (a) (b)
19. It needs organisations to provide maximum to enable them to be creative.
20. The organisations can consider the proposals for growth and diversification only when their is strong and result-oriented.

Question III: Short-answer Questions (in not more than six lines each):

1. Define management as a process.
2. What does a modern manager need to know, in the words of Tom Peters, for better management?
3. Mention any four features of management.
4. Why is management important?
5. Name at least six challenges to management.
6. If administration is considered as the top function in the organisation, what shall it refer to?
7. Define organisation.
8. Name at least six variables that make the organisation a balanced one.
9. Name any three points that explain the significance of organisation.
10. Why is management considered both an art and science?

Question IV: Essay Type Questions

1. Define management. Explain its nature and features.
2. Along with successful and professionally managed companies, we also find such business organisations which refuse to give good service to customers and still thrive. What do you suggest to get these organisations more professionalised?
3. Explain the importance of management. Are management and administration similar? Discuss.
4. Define organisation. Is it necessary to create an organisation?
5. Discuss the challenges to management in the new millennium.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. a | 2. c | 3. b | 4. c | 5. a |
| 6. b | 7. d | 8. a | 9. c | 10. d |
| 11. a | 12. c | 13. a | 14. c | 15. a |
| 16. c | 17. d | 18. b | 19. a | 20. c |

Answers to Question II

1. getting things done
2. art and science
3. to command
4. directing and leading
5. competitive
6. participation, leadership, and control
7. its principles are not as exact as science
8. money, materials, machines, and men
9. depleting resources and environmental pollution
10. enables organisations to achieve their goals
11. management and administration
12. administration
13. Henri Fayol
14. organisation
15. organisation
16. relationships
17. continuity in organisations
18. efficiency and degree of control of authority or span of control
19. freedom
20. internal organisation

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2

FUNCTIONS OF MANAGEMENT

Learning Objectives

By the time you complete this chapter, you should be able to understand

- the functions of management and how the manager functions
- management from different approaches including systems approach
- different levels in management and their respective functions

INTRODUCTION

This chapter focuses on what managers do. The functions of manager are, more or less, the same irrespective of the nature and size of the organisation. Though there is no consensus on the list of the functions of the manager, the content of the management functions has remained the same. It is necessary to understand and practise the management functions to become professional in one's own right.

MANAGEMENT FUNCTIONS: DIFFERENT VIEWPOINTS

The process of management encompasses certain functions to be performed in a logical sequence. While Koontz identified planning, organising, staffing, directing and leading, and controlling as major functions, other management thinkers suggested more or less the same with slight changes.

For instance, Luther Gullick coined a new term ‘POSDCORB’ indicating P-Planning, O-Organising, S-Staffing, D-Directing, CO-Coordinating, R-Reporting and B-Budgeting. Gullick laid emphasis on two additional functions — reporting (a manager has to report to his boss, and hence, reporting dynamics have to be considered) and budgeting (every manager has to prepare a budget for the department, and hence, it is also a major function).

Observing that reporting and budgeting are covered as elements of controlling and planning respectively, other classical thinkers on management suggested two additional functions — innovation and representation. Innovation is the essence of the manager’s prime attention and that the manager is the representative of the organisation. The focus is on creativity and innovation; and development of human resources.

Henri Fayol lists five functions as elements of management process — planning, organising, commanding, coordinating, and controlling.

Other behavioural scientists such as Elton Mayo, Douglas McGregor, Chester I Barnard considered motivation, leadership, and communication respectively as indispensable functions of the manager.

From this, it can be generalised that functions of manager are planning, organising, staffing, directing (which includes leadership, motivation, communication, and coordination), and controlling. These are discussed below:

Planning

It refers to deciding now what is to be done in the future. It bridges the gap between the present and the future. The corporate goals set the direction for planning function.

SITUATION ANALYSIS

Management functions in common

What are the common functions in the roles played by the following?

- Mother
- Father
- Students' representative
- Lecturer
- Principal
- Political leader
- IAS officer
- Entrepreneur

Planning involves essentially four stages: (a) identifying the goal to be achieved, (b) exploring the courses of action available to reach this goal, (c) evaluating each course of action on merits, and (d) finally selecting the best course of action for implementation. In other words, *planning ends with selection or decision-making*.

Planning is also referred to as the process of *determining the best course of action to achieve the given goals*. If activities in an organisation are not planned properly, it is quite unlikely that the given goals would be achieved. The complexity of business environment adds fuel to the fire. In other words, it makes the function of planning more vital. The future is so uncertain that no plan at times may really come to the rescue of the manager! To protect the organisation from such an uncertainty, plans should be more *flexible* to consider the contingencies. The planning function is performed all through the organisation at all levels, and hence, it is said to be *all-pervasive*.

In planning, a line of action is identified from stage to stage. The main idea is to turn out the most uncertain things to happen with fair degree of certainty. Thus, planning function helps to assess in advance what is going to happen for the organisation in the future. The best form of seeking performance from people in the organisation is to ensure that they know the plans drawn to achieve the targets.

Elements of planning From the plans, managers develop the following so that they can be useful to carry out their plans:

- *Forecasts* These are predictions of what is going to happen in the future based on the past and present data. The process of preparing forecasts is called forecasting.
- *Objectives* Objectives are set for every individual and department in the organisation. Every one works to achieve the given objectives. The performance of an individual or a department can be reviewed or evaluated considering whether the objectives are achieved or not.

- *Policies* These specify what can be done or what cannot be done to achieve the given objectives.
- *Strategies* These refer to the course of action to be followed and how the resources are to be deployed to achieve the given objectives.
- *Programmes* These specify what is to be done.
- *Procedures* These outline how a task is to be carried out.
- *Schedules* These indicate what is to be done at a given point of time.
- *Budgets* These are the plans expressed in quantifiable details such as sales budget, expense budget, and so on.

■ SITUATION ANALYSIS ■

Can lottery schemes pull and retain customers?

Ashok and Kamal run the business of the same type in a residential area. Over a period of time all the customers of Kamal shifted to Ashok. To retain the old customers and also to attract new customers, Kamal announced a lottery scheme. Even then, Kamal could not even make minimum sales. This led to the closure of Kamal's business totally.

What could have gone wrong with Kamal? What could have happened?

Organising

Organising refers to the process of grouping the related activities and assigning them to a manager with authority to supervise it. Organising is an essential function that makes the plans operational by identifying and classifying necessary activities. Responsibility is fixed on every manager for the achievement of the given plans. Fayol explains organisation as a structure of relationships. It explains superior-subordinate relationships. Organising shows how the tasks can be achieved with the given resources. It paves way for formal communication.

Organising makes the organisational environment more conducive for group effectiveness. The well-defined authority and responsibility are used as tools to evaluate one's performance at work. The function of organising provides the manager enough flexibility in the organisation to create higher managerial positions that the employees would cherish to reach!

Staffing

Ascertain how many positions are there in the organisation and at what level. Once this information is available, the next task is to collect details such as what type of candidates are required for each position, and accordingly, fill up these positions with the right people. Staffing is a process which includes recruitment, selection, training, placement, appraisal, promotion, and career planning. In small organisations, all these are taken care of by the manager himself. But in larger organisations, a separate department called Personnel Department looks after these functions and this is headed by a qualified professional manager called Personnel Manager. The functions of personnel manager are discussed in detail in Chapters 12 and 13 of this book.

Directing

After filling the positions in the organisation with the right kind of people, the next task is to guide and enable them to achieve the common goals. Directing is a process of issuing orders and instructions to guide and teach

the subordinates the proper methods of work and ensuring that they perform their jobs as planned. The role of a manager is simplified if the goals and objectives of his subordinates match with those of the organisation. In the process of directing the efforts of the members of the group, the manager has to lead them, motivate them, communicate to them effectively, and coordinate their efforts to achieve the corporate goals. In other words, the manager has to perform the following functions while directing the members of his group:

- (a) *Leading* It is a decisive function of the management in which the workers/employees are led and directed so that the objectives of the organisation will be successfully achieved. It is quite likely that the workers willingly and enthusiastically perform their job, if they like their leader. The leader's style of function has a profound impact on the morale and performance of the group. An effective manager should also be an effective leader. The leader, to be effective, should necessarily understand his/her followers, and accordingly, assume an appropriate style of functioning: authoritarian* or democratic. The success stories reveal that such democratic leaders who involve their subordinates in the decision-making process are more successful in achieving their goals.

■ SITUATION ANALYSIS ■

Functional styles in management

What differences do you find in the functional styles of an authoritarian leader and a democratic leader? Also,

- Can you think of the factors that determine the success of each style?
- What examples do you have for each style?

- (b) *Motivating* The process of stimulating the employees to perform more effectively using their abilities and full potential is called *motivation*. The employee gets stimulated when his social and psychological needs are met, in the process of contributing to the organisational goals. In setting the plans and executing them, the managers have to gain the commitment of their employees. The factors of motivation are not the same for all the employees. The factors of motivation can be broadly categorised into two types: (a) financial and (b) non-financial. The following are some of the prominent factors motivating the employees in the work front.

Stock Option as a Tool for Motivation

Stock option is a recent form of compensation system that enables employees to purchase shares of their company at current prices, gaining from possible price rises. Most of the IT companies such as Infosys, HCL, Wipro, and others follow this technique. This has been considered as a tremendous motivator because the performance of the employees is straightaway linked to the market place. It is one way of retaining the best employees by inculcating a sense of ownership and responsibility among them.

Financial factors include competitive salary package, which includes monthly/annual salary, perquisites, bonus, overtime, allowances, reimbursement of medical and telephone bills, and so on.

* Authoritarian leader is one who dictates to his subordinates as to how they should carry out their jobs. A democratic leader is one who gives his followers an opportunity to participate in decision making.

Non-financial factors include appreciation from the top, congenial work environment, career growth, minimal supervision, flexible working hours, opportunity to work on live projects (as in the case of R&D and software companies), team building and self-managed work teams.

The success of a manager lies in identifying the right mix of both financial and non-financial incentives that will motivate the employees. The fact that the motivational levels of the employees always keep changing, complicates this issue further.

- (c) *Communicating* It is the process of creating, transmitting, and interpreting messages, ideas, facts, opinions, and feelings. The vital function of the manager is to communicate to his staff as to what they should do through orders, meetings, circulars, and notices. The employees also will report the manager about their progress in completing the tasks. This implies that communication is always a two-way process. An important part of the communication process is feedback.

■ SITUATION ANALYSIS ■

Communication gaps?

Organisations use different methods of communication such as meetings, minutes, notices, circulars, invitation cards, letters, phones, fax, internet, and so on to keep informed both the insiders such as shareholders, employees, and outsiders such as creditors, and the like. But when it comes to the question of compliance of a particular rule/provision, most of the people say that 'I don't know' and make excuses.

Why is there such a communication gap? How can it be minimised and eliminated?

It is necessary to overcome the usual barriers (resulting from status differences, fear, emotions, bias, lack of trust, and so on) to communication by ensuring free flow of information through reports, memos, instructions, personal briefings, and the like. Employee productivity is often affected adversely when the management fails to communicate its expectations to the employees. Absence of free flow of information leaves the employees misunderstood, disappointed, frustrated, and finally separated from the organisation.

■ SITUATION ANALYSIS ■

What agencies do you rope in and coordinate?

Identify which agencies need to be coordinated in the following cases for a hassle-free life and reduced disorder in the society.

- Public distribution system
- Sanitation programme
- Road widening programme
- Family planning programmes
- Literacy campaigns
- National calamities such as famines, floods or drought

- (d) *Coordinating* Organisation structure provides for division of labour. This calls for linking the different parts of the organisation in terms of their performance to help achieve the given goals. Coordination

refers to the process of arranging group efforts in such a way that the common purpose is achieved effectively and efficiently.

As and when an employee is elevated to managerial position in the organisation, he is no more involved in doing the work by himself. His job is more concerned with coordinating the people and resources under his command. Excellent results come from the best skills of coordination. The job of coordinator is often compared with that of the music director who oversees that each of the members of his orchestra is involved in rendering a pleasant musical masterpiece. One can imagine what happens if there is no music director to guide the orchestra! What the manager does, day in and day out, is to synchronise the personal and organisational goals to ensure the best both for the individual employee and the organisation. This could be the reason why coordination is also viewed as the essence of management.

Controlling

It is the process of measuring the current performance of the employee and assess whether the given objectives are achieved or not. It involves (a) measuring the actual performance of the employee, (b) comparing it with the target, and (c) taking follow up action, that is, corrective or remedial action for improving the performance, if necessary.

■ SITUATION ANALYSIS ■

Systems and procedures for financial discipline

Generally, most of the sole trader organisations run their vast business empires through their relatives or paid employees. In one of the cases, the employer could notice fraud in accounts and embezzlement of cash by an employee to the tune of rupees ten lakh!

Why do such things happen? What mechanism should be evolved to prevent such a case?

APPROACHES TO THE STUDY OF MANAGEMENT

There are several approaches to understand what management is. We can understand how managers take decisions through the *decision-making approach*. *Empirical or case study approach* helps us to know what management is through the experiences of various successful managers. Even the failure stories unfold certain mystery and this forms a part of management lessons.

Contingency or situational approach explains the managerial practices in the event of a contingency or situation. *Socio-technical system* approach explains that every organisation has a social and a technical dimension. It is important to design managerial roles considering the technical and social dimensions in the organisation. Mere technology cannot make the organisations successful. This approach states that the aspirations of the individual employees and also of the society at large needs to be considered. *Systems approach* considers that functions of management are sub-systems and the organisation is a system where all these functions are interrelated. This approach is explained further here.

Systems Approach To Management

One of the modern approaches to understand management is the systems approach. Here, the organisation is viewed as a system. Every department of the organisation is considered as a sub-system. It is also possible that every department can be viewed as a system and every section in the department can be viewed as a

sub-system. Thus, systems approach helps to study the basic features and functions of the organisation to its minutest detail.

A system, by concept, is a collection of interrelated parts called sub-systems, which constitute one whole unit. Systems approach facilitates the study of each of these parts in detail to have a close understanding of the whole system. Human body is often cited as the best example for a system. In human body we have different sub-systems such as digestive system, central nervous system, and so on. Every part of the body such as the eyes, brain, heart, and so forth, can also be viewed as a sub-system. A study of each of the parts of the body is necessary to understand the whole body.

From the systems point of view, the functions of management are:

- (a) interlinked
- (b) interdependent
- (c) complex and intertwined that each function of management can be found in other functions

Figures 2.1, 2.2, and 2.3 illustrate these features of the management functions.

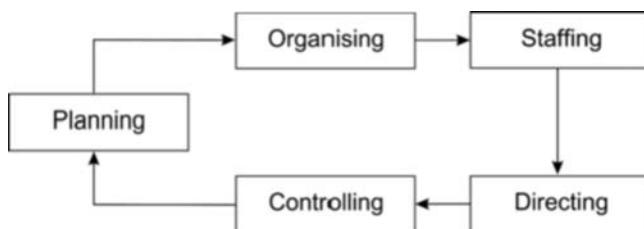


FIGURE 2.1 *The functions of management are interlinked*

Figure 2.1 shows how the functions of management are linked to each other. These functions together constitute the management process or cycle.

Figure 2.2 explains the feature of interdependence among the functions of management. Though, in the chart, it is shown that planning is the first function and control is the last function, in reality, there is no such starting and ending function. The first task is the identification of managerial problem and the last one is reaching the solution for a given problem. The dotted line represents feedback line. In the process of control, if there is any deviation from the plans or targets, it can be corrected by verifying each of the earlier functions and identifying where things could have gone wrong.

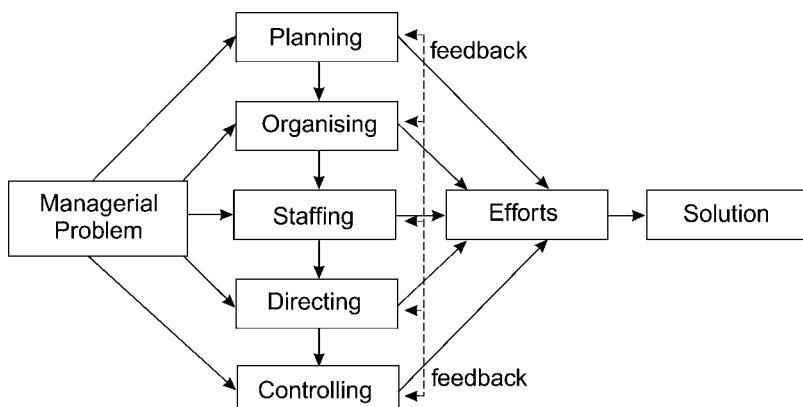


FIGURE 2.2 *Management functions are interdependent*

In Figure 2.3, the letters P (planning), O (organising), S (staffing), D (directing), and C (controlling) represent the functions of the manager. It shows that in the planning function (shown horizontally across or vertically down), there are other functions of management such as organising, staffing, directing, and controlling. The letter X shows the overlapping area, and hence, it is to be ignored. Figure 2.3 shows that each of the management functions can be found in the other functions also.

	P	O	S	D	C
P	X				
O		X			
S			X		
D				X	
C					X

FIGURE 2.3 Management functions are complex and intertwined

For instance, the planning and control functions are inseparable. Any attempt to control without plans is meaningless. It is because, plans form the basis for control. In other words, there is ‘planning in control’ and there is also ‘control in planning’. Similarly, there is ‘organising in planning’, and also, vice versa. With the result, the manager cannot say, ‘Yes, the planning function is over, now I can start the organising function’. The manager has to carry out some of the functions simultaneously while keeping track of other functions.

LEVELS OF MANAGEMENT AND THEIR FUNCTIONS

In most business organisations, three broad levels of management can be identified. These are often termed as the management pyramid as shown in Figure 2.4.

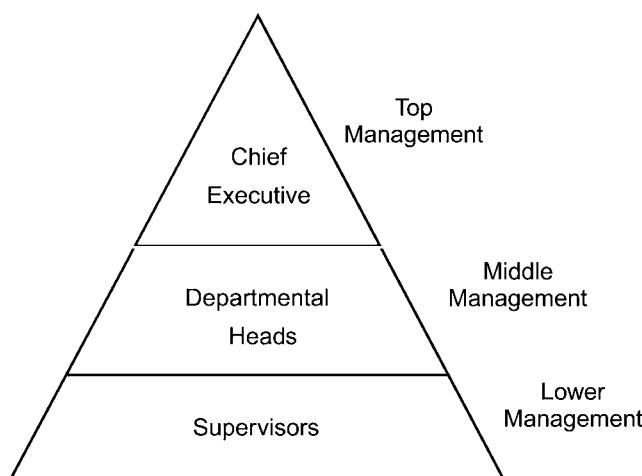


FIGURE 2.4 Management pyramid

The top level management constitutes the chief executive and the directors. At this level, the mission, goals, and corporate strategies are formulated. Long term plans are made. Major policy decisions are taken. Basic organisation structure (this explains number of departments in the organisation, number of people at each level, authority relationships, and so on) is outlined. The employees are adequately motivated to strive for meeting organisational objectives. The performance of the middle level managers is evaluated and controlled by the top management.

The time horizon for this level of management is often 5–10 years. In business organisations, the top management is solely responsible to the shareholders for the conduct of the business and also for the welfare of all employees.

Middle level management is responsible for carrying out the decisions and policies made by the top management. It includes departmental managers, functional managers such as marketing manager, production manager, and others. Here, the managers *plan, organise, direct, and control* for the activities within their respective departments only. The time horizon for this level of management is commonly one year. They are responsible to their superiors for the operations of their department or unit only.

Lower level management is also called operational level, which includes foremen, supervisors, and the like. Managers at the operational level supervise their workers in their day-to-day tasks. As a part of this, they *plan* (make targets and schedules), *organise* (allocate task and time to meet daily targets), *direct* (instruct and motivate the employees to do the job better), and *control* (ensure that the work is completed satisfactorily according to the schedules). The time horizon for this group may vary accordingly: between a week and a month. They are responsible for the work of all the employees under them.

To summarise, the functions of management are performed all through the levels and across the organisation. All these management functions are being carried out at every level of management. For instance, at higher levels of management, time spent for planning and organising is high where as for lower levels, it is low. The top level management spends relatively less time on other functions such as directing, communicating, coordinating, and controlling because these are essentially taken care of by the other levels in management.

As management functions are performed in the entire organisation and at all the levels, management is considered *ubiquitous** in nature. The nature and size of the organisation does not matter. In other words, it makes no difference whether the organisations are profit making or non-profit making, corporate or non-corporate bodies, political or non-political organisations, and so on. The functions of the managers in all these organisations remains the same.

Further, the logical sequence of the functions cannot be subordinated by even one function. It is because every function has its own logical significance. The manager, at one level, would be performing more than one function at a time. In other words, he may have to plan, direct, and also control. The principal of a college will plan the logistics for the college, direct the Heads of Department (HODs), and also control or monitor whether the class work is going as required or not.

A close understanding of management functions would help to identify the bottlenecks in real life organisations. Consider an organisation where the finance manager raises large funds, the production manager goes on producing but the sales manager finds it difficult to sell the goods. What is the problem here? It is evident that it is the sales problem. This implies that the general manager is not effectively coordinating the efforts of the sales manager and the production manager.

The underlying current of the functions of any manager is to achieve his/her organisational goals. An understanding of functions of management and the contemporary management practices will enhance the effectiveness and efficiency of the manager.

*Being everywhere.

SUMMARY

- ◆ Luther Gulick uses the word POSDCORB to refer to the following functions of management: planning, organising, staffing, directing, coordinating, reporting and budgeting. Two additional functions — innovation and representation have been suggested in place of reporting and budgeting.
- ◆ According to Henri Fayol, the functions of management are planning, organising, commanding, coordinating, and controlling.
- ◆ In general, management functions include planning, organising, staffing, directing, and controlling. Here directing includes leadership, motivation, communication, and coordination.
- ◆ Planning refers to the process of preparing for the future by choosing the best course of action to achieve the goals. Planning ends with decision-making.
- ◆ The elements of planning include forecasting, objectives, policies, strategies, programmes, procedures, schedules, and budgets.
- ◆ Organising involves (a) identifying and classifying the activities to be performed, and (b) assigning the authority and allocating the responsibility for each position. It gives rise to organisational structure that further provides scope for formal communication.
- ◆ Staffing refers to filling the positions in the organisation with the right people. Staffing function covers many jobs such as recruitment, selection, training, placement, appraisals, promotions, and career planning.
- ◆ Directing is concerned with issuing orders and guiding the subordinates so that they can perform their jobs as planned. A manager has to lead his group of people effectively, keep them motivated with financial and non-financial incentives, communicating both formally and informally, if necessary. It is necessary for the manager to be very good at coordinating the performance of his group of people.
- ◆ Controlling involves measurement of actual performance with the plan and taking remedial measures for improvement, if necessary.
- ◆ The levels of management include top level, middle level, and lower level. At every level, the management functions are performed.
- ◆ The management functions are considered *ubiquitous* because all the management functions are performed in the entire organisation at every level, though in varying degrees.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Luther Gulick coined a new term 'POSDCORB'. In this acronym, what does the B stand for?
 - (a) Bullion
 - (b) Bearish
 - (c) Budgeting
 - (d) Bench Marking

2. According to Henri Fayol, management process covers all except
 - (a) Organising
 - (b) Commanding
 - (c) Ordinating
 - (d) Controlling
3. Which one of the following stages is not included in Planning?
 - (a) Goal identification
 - (b) Exploring courses of action
 - (c) Evaluation based in demerits
 - (d) Select the best course of action
4. The process of determining the best course of action to achieve the given goals is called
 - (a) Organising
 - (b) Planning
 - (c) Controlling
 - (d) Coordinating
5. Which one of the following is not an element of planning?
 - (a) Objectives
 - (b) Policies
 - (c) Budgets
 - (d) Analysis
6. The course of action to be followed and how the resources are to be deployed to achieve the given objectives is called
 - (a) Procedures
 - (b) Strategies
 - (c) Forecasts
 - (d) Programmes
7. Which one of the following indicates what is to be done at a given point of time?
 - (a) Budgets
 - (b) Policies
 - (c) Schedules
 - (d) Objectives
8. What refers to the process of grouping of related activities and assigning them to a manager with authority to supervise it?
 - (a) Staffing
 - (b) Directing
 - (c) Planning
 - (d) Organising
9. Which one of the following is not included in the staffing process?
 - (a) Recruitment
 - (b) Placement
 - (c) Demotion
 - (d) Appraisal
10. Which one of the following is a decisive function of the management?
 - (a) Leading

- (b) Directing
 - (c) Staffing
 - (d) Coordinating
11. What refers to the process of stimulating the employees to perform more effectively using their abilities and full potential?
- (a) Communicating
 - (b) Directing
 - (c) Leading
 - (d) Motivating
12. Which one of the following is not a financial factor in the motivation process?
- (a) Salary package
 - (b) Bonus
 - (c) Flexible working hours
 - (d) Allowances
13. Which one of the following is not a non-financial factor in the motivation process?
- (a) Career growth
 - (b) Minimal super vision
 - (c) Team building
 - (d) Overtime
14. Which approach considers that functions of management are sub-systems; the organisation is a system where all these functions are interrelated?
- (a) Empirical approach
 - (b) Systems approach
 - (c) Contingency approach
 - (d) Socio-technical Approach
15. From the systems point of view, which of the following is not a characteristic of management?
- (a) interlinked
 - (b) interdependent
 - (c) dispersed
 - (d) complex & intertwined
16. What is the time horizon for the top level management?
- (a) 10-15 years
 - (b) 0-5 years
 - (c) 10-20 years
 - (d) 5-10 years
17. Who is responsible for carrying out the decisions and policies made by the top management?
- (a) Chairman and Managing Director
 - (b) Middle level management
 - (c) Lower level management
 - (d) Head of the department
18. Which one of the following ends with decision making?
- (a) Planning
 - (b) Organising

- (c) Implementing
 - (d) Coordinating
19. Which one of the following phrase best describes the management functions?
- (a) Omnipresent
 - (b) Omniscient
 - (c) Ubiquitous
 - (d) Permanent
20. Which approach says that technology alone cannot make organisation successful?
- (a) Systems approach
 - (b) Socio-technical approach
 - (c) Case study approach
 - (d) Numerical approach
21. Which one of the following is not included in the communication process?
- (a) Creating
 - (b) Transmitting
 - (c) Approaching
 - (d) Interpreting
22. Which of the following refers to 'the measurement of actual performance with plan and taking remedial measures for improvement if necessary'?
- (a) Coordinating
 - (b) Controlling
 - (c) Directing
 - (d) Forecasting

Question II: Fill in the Blanks

1. The term coined by Luther L. Gulick to represent management functions is
2. The two new management functions as suggested by Gulick are (a).....and (b).....
3. Classical thinkers on management suggested two additional functions to the existing list. They are (a)..... and (b)
4. 'Deciding in advance what is to be done in the future' is called
5. Planning ends with
6. Name any two functions of management considered indispensable by the behavioural scientists (a)..... and (b)
7. The process of determining the course of action to achieve the goals is called
8. The process of identification and grouping of activities in an organisation and assigning them to a manager with authority is called
9. A successful professional organisation tries to mould its organisation structure to suit to the of its personnel.
10. The guide like tool to explain how many positions are in the organisation and at what level is called
11. function aims at selecting the right person for the right job.

12. Staffing is a process of recruiting, , training, placement, appraisal, promotion and
13. Name two non-financial factors that motivate the employees (a) and (b)
14. The process of estimating the future based on the present and past data is called
15. The process of guiding subordinates to enable them to achieve goals is called
16. To optimise the benefit of efforts in direction, the leader has to see how well the of the group are related to the organisational goals.
17. The leaders who involve their subordinates in decision-making are said to adopt style of leadership.
18. The process of stimulating the employees to perform more effectively is called
19. Communication is the process of creating, and interpreting.
20. The orderly arrangement of group efforts to provide unity of action in pursuit of a common purpose is called
21. Through the experiences of various successful managers, approach helps to understand what management is.
22. The approach that says ‘technology alone cannot make organisations successful’ is known as
23. Systems approach helps to study the basic features of the organisation to its
24. The time horizon for the top management level is years.
25. Management functions are performed in the entire organisation. Hence, management is called in nature.

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Planning
2. Motivation
3. Directing
4. Coordinating
5. Planning and controlling

Question IV: Essay Type Questions

1. Explain the different views expressed on the functions of management.
2. Discuss management as a process.
3. The logical sequence of management functions cannot be subordinated even by one function. Do you agree? Support your answer.

Answers to Question I

- | | | | | | |
|------|------|------|-------|-------|-------|
| 1. c | 2. c | 3. c | 4. b | 5. d | 6. b |
| 7. c | 8. d | 9. c | 10. a | 11. d | 12. c |

-
- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 13. d | 14. b | 15. c | 16. d | 17. b | 18. a |
| 19. c | 20. b | 21. c | 22. b | | |

Answers to Question II

- | | |
|---|-----------------------------------|
| 1. POSDCORB | 14. forecasting |
| 2. (a) reporting and (b) budgeting | 15. directing |
| 3. (a) representation and (b) innovation | 16. needs |
| 4. planning | 17. democratic |
| 5. decision-making | 18. motivation |
| 6. (a) leadership and (b) motivation | 19. transmitting |
| 7. planning | 20. coordination |
| 8. organising | 21. case study/empirical approach |
| 9. abilities and motivations | 22. socio-technical system |
| 10. organisation structure | 23. minutest detail |
| 11. staffing function | 24. 5–10 years |
| 12. (a) selection and (b) career planning | 25. ubiquitous |
| 13. team building, flexible working hours | |

3

THE EVOLUTION OF MANAGEMENT THOUGHT

Learning Objectives

By the time you complete this chapter, you should be able to understand

- the concept of scientific management and its benefits
- developments in human relations period
- identify the real issues that need the manager's attention in the modern management period

INTRODUCTION

This chapter outlines the contribution to management thought during different phases of its evolution. The contribution of different management thinkers and practitioners is reviewed here.

STAGES IN THE EVOLUTION OF MANAGEMENT THOUGHT

The development of management thought could be traced to over 2000 years BC. However, the significant contributions that came up during the last three centuries could be grouped under the following four periods:

- Period of management awakening
- Scientific management period
- The human relations period (this is also called the behavioural sciences period)
- Modern management period

Period of Management Awakening

This was the period of the Industrial Revolution, which paved the way for large growth and diversification of business enterprises. Some of the chief features of the industrial revolution were:

- (a) Automation (muscle power is transferred to machines)
- (b) New inventions increased demand
- (c) The number of commercial establishments expanded

During this period, certain pioneers challenged the traditional approaches to management with their new ideas and approaches. Significant of these contributions are listed herein:

Robert Owen Robert Owen was the first person who spelled out the mostly neglected critical issues relating to personnel management. He believed that workers' performance was influenced by a number of

factors such as the shop-floor working conditions, working hours, housing facilities, training of workers, provision of canteen, rest places, kind treatment, and so on.

Charles Babbage Babbage advocated the use of science and mathematics for investigations and accurate data to run the factories which were at that time using traditional methods, opinions, and rules of thumb for decision-making. Charles Babbage is more remembered because

- he invented the analytical engine, which was the early version of the modern computer
- he suggested the division of work into mental and physical efforts, determining the precise cost for every process, payment of bonus, profit sharing, and so on.

James Watt JR and Robinson Boulton Both of these were the sons of James Watt, who invented steam engine. They used, for the first time, several management techniques such as forecasting, market research, planned machine layout, production planning, standardisation of parts, welfare of workers, elaborate statistical records, and others in their factory at Soho. These techniques are considered as vital even in today's context.

SCIENTIFIC MANAGEMENT PERIOD

The scientific management period holds prominently two greatest exponents of classical theories—Henri Fayol (1841–1925), who was a French industrialist (a mining engineer), and FW Taylor (1856–1915), who started his career as an apprentice in engineering and later rose to the level of a shop superintendent.

A clear distinction is visible in the contributions of both Fayol and Taylor. While Fayol's contribution was enterprise-oriented, Taylor's focus was work-oriented. In other words, Fayol tried to understand organisations from the top to the bottom. On the contrary, Taylor analysed organisations from the bottom to the top.

Highlights of Henri Fayol's Contribution

The following were the highlights of Henri Fayol's contribution to management:

Fayol defined managerial functions as forecasting and planning, organising, commanding, coordinating, and controlling. He identified six types of activities to be accomplished in every industrial organisation: *technical* (e.g. production), *commercial* (e.g. buying and selling), *financial* (e.g. procuring capital), *security* (e.g. protecting property and people), *accounting* (e.g. maintaining account books), and *managerial* (e.g. planning and controlling).

Also, Fayol identified 14 principles of management. They are:

- (a) *Division of work* Here, the work is divided among the members of the group based on the employee's skills and talents. It also provides an opportunity to specialise in different problem areas.
- (b) *Authority* It refers to the right or power to give orders. It must also be adequately supported by responsibility.
- (c) *Discipline* Both the employer and employees should respect each other by observing the rules.
- (d) *Unity of command* An employee should receive instructions from only one superior.
- (e) *Unity of direction* Where the objectives are similar, the action plans also should be similar. In other words, similar activities should be grouped together, placed under one manager and there should be one action plan.
- (f) *Subordination of individual interest to group interest* Group interests or goals of organisation must prevail any time over the individual interests or personal goals.

SITUATION ANALYSIS**Sharing the services of computer operator**

In an organisation, the services of a computer operator were being shared by two managers. There was constant flow of work for the computer operator and consequently he was under a lot of stress and strain. Being unable to cope up with the situation, he started avoiding work for both on a pretext that the computer is out of order. The computer operator had direct contact with the chief manager who was his close relative.

If you are appointed as the management consultant, what do you suggest for this company to improve upon? Which of the Fayol's principles of management are violated here?

- (g) *Remuneration* The wages and salaries must be fair and bring out the best possible commitment in the employees to achieve the organisational goals.
- (h) *Centralisation of authority* Authority is said to be centralised when decision-making powers are retained at the top level. The degree of centralisation or decentralisation is determined by the needs of the company.
- (i) *Scalar chain* It indicates how the authority flows from top to bottom.
- (j) *Order* It means keeping the right man or a right thing in the right place.
- (k) *Equity* This implies that the dealings with the employees should be so fair and so open that they will reinforce their commitment to the organisation. Be kind and fair to them.
- (l) *Stability of tenure of personnel* This indicates avoiding frequent transfers of the employees much before they settle in their jobs.
- (m) *Initiative* The staff should be encouraged to show initiative, within the limits of authority and discipline.
- (n) *Esprit de corps* This means team work; implying that there is unity in strength.

These principles reflect how the organisations should be structured. They also explain how the managers and workers should be taken care of. Henri Fayol contributed immensely to the growth of professional management. Hence, he is hailed as the *father of modern management*.

Contribution of Frederick Winslow Taylor Frederick Winslow Taylor is well known as the *father of scientific management*. Taylor spent a greater part of his life finding solutions to the problems of achieving greater efficiency on the shop floor. Taylor observed that the workers used to intentionally delayed the process of completing the job, and that the tools and equipment provided to them were not standard and modern. He identified the need to teach the workers the *prima facie* that if they turn out more work, they would not be thrown out of employment. The solutions suggested by Taylor were the outcomes of his own experience at work, initially as a shop floor worker himself and later as a manager. All this was against the backdrop of the industrial revolution, which turned out to be very ugly, particularly towards the end of the nineteenth century. Employers used to give a high degree of priority to efficient working methods. New industries were cropping up. New plant and machinery and plentiful labour were seen everywhere. The employers were preoccupied with the task of organising all these efficiently and profitably.

Taylor was passionately interested in the efficiency of working methods. He, initially, realised that the systematic analysis of work would find a solution to all the problems associated with enhancing the efficiency of the working methods. He also realised that this was the only way to address the apprehensions of the workers. Taylor, thus, consolidated his ideas at Bethlehem Steel Company and conducted some of his most famous experiments in improving labour productivity. His writings were published as *The Principles of Scientific Management* in 1911.

Taylor was the first person to recognise and emphasise the need for adopting a scientific approach to the task of an enterprise.

Scientific management Scientific management was the process of applying scientific principles to management-related issues. The process contained the following elements:

- Develop a scientific method for each operation replacing opinions or rule of thumb
- Determine accurately in a scientific way the correct time and method for each job
- Develop a suitable organisation to make the workers responsible
- Select and train the workers
- Convince the management that scientific approach is better than arbitrary methods of controlling workers, and thus, they need to cooperate with workers for better results

Taylor's experiment Taylor demonstrated the benefits of increased productivity and earnings through an experiment at Bethlehem Steel Works.

This experiment dealt with the study of the efforts of two first class shovelers. Each man had his own personal shovel (a traditional tool) with which he used to shift coal. This shovel was used to shift every type of ore or coal. Earlier, the average shovel load was about 38 pounds and at this rate, each handled about 25 tonnes of material a day. As a part of the experiment, each worker was given a smaller shovel to study the impact of size of the shovel on productivity. Amazing! The daily tonnage went up to 30 tonnes! In due course, the workers' output was observed with several different sizes of shovel. There was a rise in the daily output, averaging about 21 pounds per load, whether he was working with heavy ores or light ores. The workers who could achieve these standards were promised an increase in wages by 60 per cent. Those who were not able to reach these standards were further trained in handling the ore with smaller shovels.

After a three years, Taylor reviewed the extent of the success at the Bethlehem Works. The results were encouraging: the workers earned higher wages (60 per cent on an average more than their counterparts), there was saving in handling costs per ton by 50 per cent, and the workers became highly productive. With the result, a workforce of 140 could take care of the entire work (which was earlier done by 400–600 workers!)

What Taylor wanted to achieve Taylor considered that opinions and guesswork had to be replaced by facts. The facts could be collected from a study of the jobs of a sample of skilled workers, making a note of each operation and timing it with a stopwatch. All unnecessary movements could then be eliminated in order to produce *the best method* of doing the job. Thus, standards were evolved for similar jobs. An advanced form of this analytical approach has been Work Study, practised today all over the world.

Taylor insisted that the practice of rule of thumb should be done away with. The management should volunteer to accept the responsibility of developing working methods. This is a critical job and can hardly be left to the initiative of workers. Taylor demonstrated to the entire world how the average worker could perform better if a definite task was given with clear-cut standards. This has been criticised as having led to

fragmentation of job into tasks. It also has led to the separation of the ‘planning and controlling’ function from the ‘doing’ function. Thus, it emphasised division of labour!

Taylor felt that both—the management and the workers should benefit from scientific management. He did not agree with the way the most piece rate systems were operated during those days. If one produces more beyond a level, the wage rate was reduced to keep the total earnings within an acceptable level. Taylor wanted that jobs of the workers should be scientifically measured, and wage rates should be determined. The workers should be fully rewarded for their productivity without any limit. Due to the complications involved in measuring timings, the managers used to reduce arbitrarily the rates where measurements were not exact.

Taylor wanted the wage rates to be determined scientifically and not by the arbitrary factors such as union power or management’s whims and fancies. He suggested to shift their *focus* to contribute to a bigger cake (which means surplus here) than to argue about the division of the existing cake.

He called for a mental revolution both on the part of the workers and the management. The workers and the management should develop considerable degree of trust and mutual cooperation to reap the benefits of scientific approach. Mutual understanding and prosperity, he felt, should replace the age-old practices of mutual exploitation. He regarded that there was *one best way* of doing every thing, whether it was using a shovel or filling a piece of paper.

Directions to workers Scientific management directed the workers to

- stop worrying about how the surplus was divided between wages and profits
- work in the correct way, and thus, earn more
- discard the rule of thumb approach and cooperate with the management in developing the scientific method to carry out the given job
- accept the instructions of the management with the conviction that the management will look after the future course of action
- volunteer for getting trained in new methods, where necessary

Criticism of Scientific Management

The theory of scientific management was heavily criticised by the employers, the workers, and psychologists. The employers criticised the process of scientific approach as costly and unworkable.

Some of the other arguments against scientific management were:

- It ignores the functional areas of management such as marketing, finance, and so on.
- Individual creativity is ignored by favouring one best way.
- Worker is reduced to a cog in the machine.
- Over specialisation made the work more fragmented. It emphasised more on the analysis and organisation of individual task or operations making the worker more mechanical.
- Mobility among workers gets restricted because of narrow specialisation.
- Workers were not involved in the planning part of the job which was controlled by the management. As a result, some of the jobs created continued to be repetitive and boring.

Workers too, did not like to part with the rule of thumb privilege. They felt more insecure to adhere to the scientific standards given by management. Taylor clarified his stand firmly. He said that the standards were scientifically determined, and hence, one cannot have any reason to disagree.

Benefits From Scientific Management

Scientific management proved to be very beneficial to the industry at large.

- Scientific management improved working methods and brought enormous increase in productivity.
- It developed a rational approach to measure tasks and processes with a considerable degree of accuracy.
- It initiated certain improvements in working methods, plant design and other things, based on information generated by measurement of tasks and processes.
- Piece rate wage system was introduced and incentive systems were evolved.
- It stimulated the employers and the higher levels of management to take a positive view of leadership at the shop floor operations. This has led to the introduction of systems for tight control over work.
- Physical working conditions for the employees underwent a sea change.
- It laid the foundation for work study and other related techniques.
- The scientific approach replaced the most widely prevalent traditional rule of thumb approach.
- The observations about worker formed the basis for McGregor's theory of X assumptions about people.
- The concepts of work design and job enrichment were meant for the victims of the fragmentation effects of Taylorism.
- Japanese companies combined most of the beneficial aspects of scientific management with other approaches to produce a highly successful production system. One example is theory Z, developed by W Ouchi, which focuses on developing the ability of the organisation to coordinate people, not technology, to achieve higher productivity.

Scientific Management in the Modern Context

Though the basic approach of Taylor's system is outdated, his contribution in terms of Work Study, standardisation, and establishment of personnel department holds relevance even today. Its greatest contribution is that it paved the way for new ideas and techniques for improving the systematic analysis of the job content. A wide variety of productivity improvements have emerged since then.

Henry Gantt He was a contemporary of Taylor and inspired by Taylor's ideas. Gantt's studies were more related to selection of workers in a scientific manner and development of incentive bonus system. He believed that the labour and management need to cooperate with each other and maintain harmonious relations. He is more known for developing a bar chart, popularly called Gantt's bar chart, to depict graphically the plans. Gantt's bar chart further simplified the process of managerial control. It is mostly used, even today, in planning and controlling the work.

Frank and Lillian Gilbreth These were the famous husband and wife team. Their main field of interest was motion study. Motion study was concerned with eliminating waste resulting from unnecessary ill-directed and inefficient motions.

Frank Gilbreth introduced process chart, identified therbligs (spell Gilbreth backwards)—the fundamental motions involved in doing an activity. Therbligs were used to record job-related movements of a worker in a standardised manner. After a detailed analysis and redesign, Frank could reduce motions involved in brick laying activity from 18 per brick to 5 per brick successfully.

Frank and Lillian were convinced by Taylor's 'one best way' concept. As employers, they practised what they preached. They developed systematic rules and procedures for the efficient operation of the work and insisted

that these must be strictly followed. They paid the workers better than the market rates. This made the workers work with no argument for unnecessary fatigue or effort. Gilbreths planned the work and the workers had to execute the same. Thus, the planning function was separated from the doing. This way, it was an extension to what Taylor preached. Today, Gilbreth's motion study is the buzzword for the industry. Motion study is discussed in detail in Chapter 16 on Work Study.

Lyndal F Urwick LF Urwick identified numerous principles for internal structure and operations of organisations in his book *Elements of Administration*. Urwick focused more on setting the organisational mechanisms right. External factors affecting management systems were not covered in his studies.

EFL Brech Brech viewed management as a social process of planning and controlling the activities of an organisation for achieving the given objectives. He focussed more on the organisation structure covering issues such as defining the managerial responsibilities, delegating authority, coordinating, and building morale in the organisation. He concentrated more on management training and development.

HUMAN RELATIONS PERIOD

Human relations period is characterised by the focus on the human factor in dealing with business and production issues. The researchers and practising executives concentrate more on issues such as human behaviour at the work place, motivation, group relationships, and leadership. The contribution of selected behavioural scientists is outlined below.

George Elton Mayo Mayo was known for his famous experiment at the Hawthorne Plant of the Western Electric Company, Chicago, USA, for evaluating the attitudes and psychological reaction of workers on the job situations. The study focussed on the influence of social attitudes and relationships of workgroups on performance. The experiment started as a study into physical conditions and productivity. It ended as a series of studies into social factors: membership of work groups, informal relationship with the supervisors, and so on. It revealed that workers valued most the social relations at work and these were viewed as important as monetary incentives and good physical working conditions. The study demonstrated that the influence of groups in determining behaviour at work can be very powerful.

SITUATION ANALYSIS

Changes in mindset

What changes did you notice in the mindset of people over a period of time in respect of the following?

- in work
- in attitudes
- in priorities
- in relationships
- in values
- in any other aspect

Why such changes occur?

What is your opinion about these changes?

The Hawthorne Experiments

In one of the Hawthorne experiments, Mayo's research team examined changes in the amount of light available in the work area. The results were confusing at first. When the lighting was increased, output rose; on the other hand, when the light was decreased, output still rose. An analysis of this and other such puzzling results showed that the workers were highly motivated more for the importance given to them. The reduction in light did not affect their work. What mattered to them was that they were really making a contribution to company operations and this fact is being recognised by the top management.

The research team also examined other effects of change in the work environment. They varied the working conditions such as rest periods, hot lunches, and working hours; used interviews to determine attitudes; and analysed the social organisation among workers. During the studies, it was found that changes in the work environment had little long-term effect upon worker productivity.

The reasons for this phenomenon were very interesting. The workers started feeling that they were being recognised. Since management had asked for their opinions on working conditions, the workers felt that their relationships with management were no longer impersonal. When the workers were being informed the reasons for the management decisions, they felt that they had achieved a status and some degree of respect. The Hawthorne studies revealed that recognising the emotions of workers, in this way, could enhance the productivity and physical well being of the employees.

The following were the *conclusions* from the Hawthorne researches:

- Individual workers must be seen as members of a group.
- The sense of belongingness and effective management were the two secrets unfolded by the Hawthorne experiments. The workers enjoyed more the sense of belongingness, as evident from their high morale and functional interrelationships among the members of a group. The management was effective in terms of understanding human relationships among workers, particularly groups. The way the workers were motivated, counselled, led, and communicated proved very effective. This highlights the recognition of the human factor and constitutes the essence of the 'Hawthorne effect'.
- Need for status and belongingness to a group were viewed as more important than monetary incentives or good physical working conditions.
- Informal or personal groups influenced the behaviour of workers on the job.
- To seek workers' cooperation, the management should be aware of their social needs and cater to them. Otherwise, there is every danger that the workers ignore and turn against the interests of the organisation.

Abraham Maslow Maslow was a psychologist. He identified human needs in the form of a hierarchy, ascending from the lowest to the highest. He concluded that when one set of needs was satisfied, this kind of need cannot be a motivator any more.

The hierarchy theory is based on the assumption that most people are motivated by the desire to satisfy specific groups of needs, as outlined in Figure 3.1. The needs as identified by Maslow can be elaborated as follows:

- *Physiological needs* Include need for food, sleep, warmth, shelter, sex, and others. These are basic needs and if these are not satisfied, one does not think of needs at the higher level.
- *Safety needs* Safety needs are also called security needs. These cover security, protection, job security, safety of property, availability of food or shelter on a continuing basis, and so on.
- *Affiliation or acceptance needs* Man cannot live in isolation. He wants to live in society as a member of society. He wants to love and be loved by others. He feels great when others recognise his efforts and

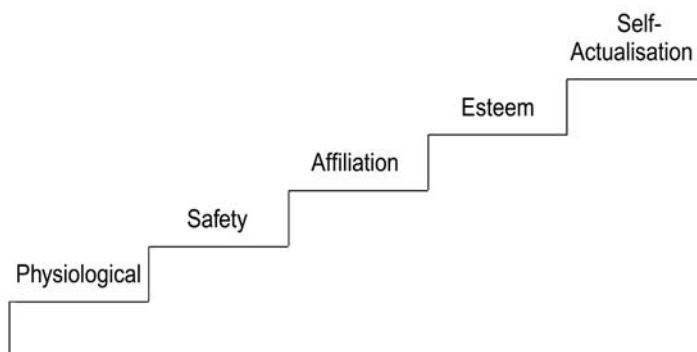


FIGURE 3.1 *Maslow's hierarchy of needs*

accept him as a member of their group. Affiliation or acceptance needs include desire to seek or show affection and recognition, need for companionship, identification with a group, and so on.

- **Esteem needs** Maslow states that one does not stop with affiliation or acceptance needs. One goes one step beyond. One wants to be respected and garlanded. To satisfy the esteem needs, people want to feel more prestigious, politically very strong and powerful, or enjoy better status!
- **Self-actualisation needs** These needs indicate the strong desire to achieve something, particularly in view of the potential one has. Suppose a trader is confident of his business acumen and it can bring him an international focus. He strives hard for it. The passion to go international with his products and services keeps him working all the time. Finally, when he is successful in the exports, he feels that he has achieved what he is capable of achieving! What he has achieved is the self-actualisation need.

Douglas McGregor Douglas McGregor presented two sets of assumptions managers make about the nature of their employees. These sets are named as theory X and theory Y.

Under theory X, it is assumed that

- employees are inherently lazy
- they require constant guidance and support
- sometimes they require even coercion and control
- given an opportunity, they would like to avoid responsibility
- they do not show up any ambition but always seek security

To explain theory X, McGregor elaborated Taylor's observations about workers using the rule of thumb approach.

Theory Y focuses a totally different set of assumptions about the employees. Theory Y states that

- some employees consider work as natural as play or rest
- these employees are capable of directing and controlling performance on their own. They are much committed to the objectives of the organisation
- higher rewards make these employees more committed to organisation
- given an opportunity, they not only accept responsibility but also look for opportunities to outperform others
- most of them are highly imaginative, creative, and display ingenuity in handling organisational issues

Frederick Herzberg Herzberg developed a two-factor theory of motivation—hygiene factors (also called dissatisfiers) and motivators.

Hygiene factors are the basic requirements such as company policies and procedures, salary, security, supervision, working conditions, personal and social life, and so on. If these are provided, it may not lead to happiness. But if these are not provided, it may lead to unhappiness. In other words, hygiene factors do not motivate. These set minimum criteria for normal functioning of the organisation. If these are provided, people can work in the organisation in the normal way. But if these are not provided, it results in dissatisfaction.

The other set comprising motivators refers to the higher order needs such as recognition on the job front, awards and rewards, challenging assignments, promotion, and so forth. All these needs are built around the nature and content of the job. Where these, at least a few, are taken care of, it leads to satisfaction. If not, it may not result in satisfaction. But it does not definitely end up in dissatisfaction.

Victor H Vroom Vroom developed the expectancy theory of motivation. This has been an alternative approach to the above ‘needs’ theories. This theory disapproves the need-based behaviour of individuals. On the other hand, it suggests that individuals are motivated to act in a certain way because they strongly expect that a particular action will lead to a desirable result. According to this theory,

$\text{Force} = \text{valence} \times \text{expectancy}$, where *force* is due strength of a person’s motivation, *valence* is the strength of an individual’s desire for a particular outcome and *expectancy* is the probability that a particular action will lead to a desired result.

If the probability is zero, Force also will be zero. In other words, what is required is a relatively high degree of probability to achieve the goal. One gets strongly motivated to get into action to reach a goal, if he perceives that he can make it, or he can see that what he is doing will help him in emerging successful. This theory focuses on the relationship between efforts, performance, and rewards.

Chester Barnard He stressed that the cooperation within an organisation depends on three factors: physical, environmental, and social. It was Barnard who identified that the formal organisational structure can be supplemented by an informal organisation, which has the potential to contribute greatly to the vitality of the organisation as a whole. He was the first among those who stressed the importance of encouraging upward communication.

There are other prominent behavioural scientists such as Chris Argyris (his major contribution was on leadership), DC McClelland (on the need for achievement, power, and affiliation), and others.

MODERN MANAGEMENT PERIOD

The management studies of the last fifty years or so have tried to integrate the findings of scientific management, principles of management, and human relations movements. While all these groups made significant contribution to management thinking, they ignored each other’s contribution. This resulted, as Harold Koontz observed, in ‘management theory jungle’.

The modern management period is characterised by dynamic business environment. The list of demands and expectations from all the segments of the society—producers, consumers, intermediaries, governments, and others has been growing ever globally. The state-of-the-art technology has revolutionised the range of goods and services available to the customers. The firms are able to compete with one another globally. The massive improvements in the communication systems have literally made the entire world a global village.

Against this background, what are the issues of concern that attract the attention of the management thinkers and the practitioners? The following statement lists down the key management issues. These are

decisive factors which influence the role of the future managers. The concepts are outlined in brief, along with the respective major contributors to management theory.

Key Management Issue and Concept	Major Contributors to Theory
(a) <i>Establishing Vision</i>	Trigger the kind of culture for excellence through establishing vision.
	Peters T and Waterman R
(b) <i>Managing Environment</i>	Identify key variables in both external and internal environment for better control over the results. External environment includes customers, suppliers, local communities, other external shareholders, and so on.
	Porter, ME and Kotler, P
	Internal environment includes the employees, managers, and others.
	Optimisation of the interaction of these variables and their contribution is the real challenge of modern management.
(c) <i>Developing Culture</i>	Developing pro-organisational approach and shared values in the organisation.
	Mintzberg, H
(d) <i>Empowering Employees</i>	Optimise employee contribution by enabling him/her to do the job effectively and efficiently.
	Peters, T
(e) <i>Applying New Technology</i>	Let the new technology be your competitive advantage. Strengthen yourself in terms of better products, systems, procedures, customer base, and so on.
	Hammer, M and Champy, J
(f) <i>Managing Change</i>	Change is one of the grey areas for managers. The transition from old to new is, many times, not smooth. The organisation should prepare its managers to manage change.
	Peters, T and Moss Kanter
(g) <i>Finding Competitive Advantage</i>	Develop certain factors of competitive advantage such as customer satisfaction, latest technology, and so forth, to justify higher prices.
	Porter, M
(h) <i>Creating Excellence</i>	Develop standards of excellence throughout the organisation and strive continuously to achieve them.
	Peters, T and Waterman, R

LEADERSHIP AND LEADERSHIP STYLES

Leading and Leadership

Leading, in the words of Koontz and O'Donnell, is one of the prominent functions of management. One who leads a given group or team of people is called leader. Leadership is one of the variables that influence interpersonal behaviour in organisations. If you can influence people to perform better in a given organisational

setting, that means you are a leader. In other words, leadership is ability to influence people to achieve the given goals in an organisation. A leader is identified with the traits he possesses. The leader is characterised by his vision, ability to inspire followers, communication skills, personality characteristics such as charisma, appearance maneuvering skills, high energy levels, adaptability, aggressiveness, enthusiasm, self-confidence, initiative and a strong capacity to convert the unfavourable situation to a favourable one for the benefit of the organisation.

A true leader is one who shares success with followers and absorbs all failures. He knows that this is the only way of maintaining a high-morale among his followers. There are different theories on leadership. While leadership is viewed as a bundle of traits, it is also considered as the ability to handle a given complex situation.

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

Today, in view of the volatility of business dynamics, every organisation looks for capable leaders in every functional area of management. For instance, a marketing manager is expected to explain the marketing strategies to all the sales people in the lower hierarchy. He has to lead all the sales team to get things done through them whatever the work assigned to them. Like this, for every functional area in management, there will be one leader to lead the functional departments like HR, systems and Finance, etc.

Managing vs Leading

Managers and leaders are distinctly different. Managers have to be a mini-leaders (they have to inspire their subordinates and get work done) and leaders have to be mega-managers (otherwise, they do not understand the ground realities of functioning). In one way or the other, all managers in a way are business leaders, and they require a formal position and power to influence people. Leadership stems from a social influence process. Management is an integral component of technical as well as social process. Leadership is not an essential attribute required to handle business situations only. Leadership is an essential requisite in every context, whether the focus is on profit or service. In the armed forces, in the government, in universities, in hospitals and wherever people work in groups, a need for strong and effective leadership function emerges. These must be somebody to guide that group. The group leader may also be an informal leader, one who emerges from the rank of the groups based on the consensus of the members.

The words 'leader' and 'manager' are closely related. To day, organisations prefer to select such managers who have strong bias for leadership and who can handle easily the tough situations. They do not want employees, they want leaders who can take responsibility and deliver results in times of uncertainty. For instance, Tata Consultancy Services (TCS) says that its core competence is 'delivering results in uncertainty'. Gone are the days when it was believed that leaders were born. Today, it is widely recognised that leadership can be taught, nurtured and honed. Modern organisations prefer to spend or have been spending huge resources on training and development to ensure that their employees emerge as leaders. However, the distinctions among them have become blurred. It is useful to place each of them in its right perspective.

The following table outlines the basic differences between manager and leader:

Leader	Manager
Shapes organisational/work culture	Maintains organisational/work culture
Influences followers	Directs subordinates
Focuses on creativity and innovation	Focuses on regulation and ensures that the given system is adhered to

Prefers to take high risk	Does not believe in risk taking, plays safe always, at the most may take moderate risks
Does not believe in positions, a position in organisation is not necessary for a leader	A position in organisation is a necessary for a manager
Driven by values	Driven by task and schedule
Does things effectively or does the right things (not necessarily always)	Does things efficiently or does thing right
Earns respect through his achievements and potential to achieve	Earns respect through his authority
Concerned with the future	Concerned with the present
Focuses on people	Focuses on systems and structure
Inspires trust	Relies on control
Long-range perspective	Short-range perspective
Asks what and why	Asks how and when
Eyes on the horizon	Eyes on the bottomline
Challenges the <i>status quo</i>	Accepts the <i>status quo</i>
Has followers	Does not have followers, managers have subordinates
Own person, fights on his own, followers follow the leader	Classic reliable soldier, fights for others

To summarise, the manager is expected to execute different functions of management whereas leadership is the process of influencing for the purpose of achieving shared goals. Organisations require both managers and leaders. The distinction between them can be made on the basis of the qualifications. Managers, by virtue of being in a managerial position, can manage but they may not be in a position to lead. In other words, they may not possess many leadership traits or the ability to influence other people. Leaders exercise emotional appeals. They are capable of altering the mood of their followers and raise their hopes and expectations, whereas, managers are expected to be rational decision-makers and problem solvers. They are expected to use their analytical minds in the process of establishing and achieving organisational goals. The leader focuses on fulfilling the needs of the followers and the managers work for meeting organisational goals.

The Leadership Styles Leaders can be differentiated into good or bad based on the styles they adopt or how they choose to influence their followers. A leader has not only to plan, organise, lead and control but also consider human element in the followers. In other words, he has to ensure that people under his guidance are comfortable and their good work is recognised. A good leader has to adopt such a style of working that takes care of people around him. There are also some leaders who do not care for people and who care more for the task completion. Based on use of authority the leadership styles can be classified as follows:

Autocratic leadership Here, leaders command the followers and expects compliance from them for all the instructions given. Leaders are more dogmatic and positive. They lead by his ability to withhold or give rewards

or punishments. Here, no suggestions from the followers are entertained and an almost top-down approach is seen. They are authoritarian in their approach. They direct others. They do not allow any participation. They are concerned with the task and tell followers what to do and how to do it.

Democratic or Participative leadership Here leaders consult subordinates and involve them in decision making. They encourage discussion with the group. Leaders believe in two-way communication. They listen to followers, try to facilitate the decision making. They share his leadership responsibilities with his followers. They are involved in the process of planning and execution of the task.

Free-Rein Leadership Free-rein leaders is also called *laissez-faire* leader. Free-rein leaders exercises little authority and give maximum freedom to subordinates while making decisions. It is a bottom-up approach. Suggestions from the followers are encouraged and rewarded. They give high degree of independence to the subordinates in their operations. The free-rein leader gives total freedom to the subordinates to set their own goals and also the means of achieving them. The role of leader, here, is to aid the operations of the followers.

Delivering What Business Demands: The Satyam Way

Satyam Computer Services Ltd. (SCL) is a leading global consulting and IT services company. It offers a wide array of solutions customised for a range of key verticals and horizontals. From strategy consulting right through to implementing IT solutions for customers, SCL straddles the entire IT space. Its major domain competencies include different verticals such as automotive, banking and financial service, insurance and healthcare, manufacturing, telecom-infrastructure-media-entertainment-semiconductors (TIMES). As a diverse end-to-end IT solutions provider, SCL offers a range of expertise aimed at helping customers re-engineer and re-invent their businesses to compete successfully in an ever-changing marketplace.

The SCL network spans 57 countries, across 6 continents. Nearly 42,500 dedicated and highly skilled IT professionals work in development centers in India, the USA, the UK, the UAE, Canada, Hungary, Singapore, Malaysia, China, Japan and Australia and serve over 570 global companies, including over 165 Fortune 500 corporations. SCL has strategic technology and marketing alliances with over 90 top-notch companies that help us in providing end-to-end services to our customers. SCL's need-driven deployment of domain and technology expertise brings to customers a range of solutions and products that enhance performance and competitiveness.

Belief in People Organisations excel through placing strong belief in people and their capabilities. For instance, SCL believes its true strength lies in the potential of its associates. Its associates work in an atmosphere of trust and confidence. It believes that every individual associate is a leader. This leadership is expressed in the way tasks are assigned and taken up, the freedom with which workstyles are negotiated and high standards of quality set independently by each and every associate. A high degree of operational freedom helps associates exercise their creativity and expertise in approaching tasks and achieving *customer delight*. SCL says every Satyamite is a leader. The major mission at SCL is delighting the associates, the customers and the investors alike.

Entrepreneurship At Satyam, it's ideas that drive people. A variety of programs are frequently organised to facilitate associates in creating tangible value, constantly encouraging them to convert ideas into market value, in the true spirit of entrepreneurship and leadership.

Customer-centric Enterprise SCL is very sharply focussed on delivering not only what the customer demands but also providing them with the weapons to compete with. The purpose is to deliver business competitiveness that will eventually leads to *customer intimacy*.

Pursuit of Excellence Achieving excellence in anything SCL does is a part of its corporate DNA. It is not just lip service. Rather it is a process driven strategy that allows the company to benchmark everything against the global best and then surpass it, so that it can set the benchmark for others to follow. In the process, SCL is always a couple of steps ahead of its nearest competitor. It adheres to stringent *quality processes* that meet and exceed international standards that are continuously monitored.

Feedback-oriented culture SCL believes in a feedback-oriented culture for continuous improvement. This is done through surveys, such as the Associate Delight Index (ADI) and other surveys. These surveys garner feedback from all the stakeholders involved in achieving process improvements. Initiatives such as ADI, together with the idea portal, lead on to *associate delight*, internally, thereby leading to *customer delight*, externally.

SUMMARY

- ◆ The concept of management is as old as man himself. However, the significant contributions to management thought could be brought under four periods: Period of Management Awakening, Scientific Management Period, the Human Relations Period, and the Modern Management Period.
- ◆ The Period of Management Awakening was characterised by the onset of Industrial Revolution, growth and diversification of commercial activity. The validity of the traditional techniques of management was questioned.
- ◆ The Scientific Management Period was a significant milestone in the history of management thought. Taylor and Fayol revolutionised management thinking both at the worker level and the enterprise level.
- ◆ Fayol identified six types of activities to be accomplished in every organisation. These activities are technical, commercial, financial, security-related, accounting-related, and managerial in nature.
- ◆ Fayol's 14 principles of management are designed to inject perfection in the management setting of the organisation. These principles are:
 - (a) Division of work
 - (b) Authority
 - (c) Discipline
 - (d) Unity of command
 - (e) Unity of direction
 - (f) Subordination of individual interest to group interest
 - (g) Remuneration
 - (h) Centralisation of authority
 - (i) Scalar chain

- (j) Order
- (k) Equity
- (l) Stability of the tenure of personnel
- (m) Initiative
- (n) Esprit de corps

- ◆ FW Taylor's Theory of Scientific Management was the application of scientific principles to the management problems to achieve higher productivity. Scientific investigation and experimentation form the backbone of scientific management.
- ◆ Taylor advocated the 'one best way' to do a given job. Scientific investigation and experimentation form the basis to find out the best way for a given job.
- ◆ The process of scientific management can be identified with the following elements:
 - (a) Developing a scientific method for each operation to replace opinion
 - (b) Determining accurately through science the correct time and method for each job
 - (c) Setting up a suitable organisation for better job performance
 - (d) Selecting and training the workers in a professional manner
 - (e) Developing science for each operation and cooperate with workers
- ◆ Scientific management principles were experimented and results from these experiments were found to be impressive.
- ◆ The theory of scientific management was equally criticised by all the groups: workers, psychologists, and even the owners of the industrial units.
- ◆ Despite the criticism, scientific management theory had clear benefits to offer. Most of the modern management techniques have their roots in the principles of scientific management.
- ◆ Henry Gantt (known for Gantt Bar Chart) and Frank and Lillian Gilbreth (known for motion study or method study techniques) were among the other prominent contributors to the management thought during this period.
- ◆ In Human Relation Period, more attention was paid on the human factor. The contributions of Elton Mayo, Abraham Maslow, Douglas McGregor, Frederick Herzberg, and Victor Vroom unfolded the basic realities of human nature. Their contributions hold relevance even today.
- ◆ The main conclusion of the Hawthorne experiments conducted by Elton Mayo was that the workers tend to get motivated if they are taken better care of. Workers performed better not only because of increase in physical facilities but also because the management considered the workers important. Workers liked themselves being considered as important.
- ◆ Abraham Maslow's theory of the hierarchy of human needs is based on the assumption that most people are motivated by the desire to satisfy specific groups of needs: physiological, safety, affiliation, esteem, and self actualisation.
- ◆ Douglas McGregor's Theory X and Theory Y were based on two sets of assumptions managers make about the employees. Theory X regards employees lazy, avoiding responsibility, and only seeking authority. Theory Y regards employees as self-directed and ready to accept not only authority but also responsibility.
- ◆ Herzberg's Two-Factor Theory of Motivation deals with hygiene factors (also called dissatisfiers) and motivators.

- ◆ Vroom's Expectancy Theory of Motivation states that

$$\text{Force} = \text{Valence} \times \text{Expectancy}$$

- ◆ In the modern management era, the key management issues were varied. Some of the issues that can be identified are: managing change, developing pro-organisational approach and shared values in the organisation, creating excellence, empowering employees, and so on.
- ◆ One who leads a given group or team of people is called leader. Leadership is ability to influence people to achieve the given goals in an organisation.
- ◆ A leader is identified with the traits he possesses. He/she is characterised by his vision, ability to inspire followers, communication skills, personality characteristics such as charisma, appearance, maneuvering skills, high energy levels, adaptability, aggressiveness, enthusiasm, self-confidence, initiative and a strong capacity to convert the unfavourable situation to favourable situation for the benefit of the organisation.
- ◆ A leader shapes organisational culture whereas the manager maintains the existing organisational/work culture. Like this, we can see manager and leader differing in what they do and how they do it.
- ◆ There are different types of leadership styles: a) Autocratic or Authoritarian style b) Democratic or participating style and c) Free-rein Style.
- ◆ An autocratic leader commands the followers and expects compliance from them for all the instructions given.
- ◆ A democratic or participative leader consults subordinates and involves them in decision making.
- ◆ A free-rein leader exercises little authority and gives maximum scope to subordinates while making decisions.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Who believed that workers' performance was influenced by a number of factors such as working hours, housing facilities, kind treatment?
 - (a) Charles Babbage
 - (b) Robert Owen
 - (c) James Watt JR
 - (d) Robinson Baulton
2. Which one of the following activity is not accomplished in every industrial organisation as given by Fayol?
 - (a) Technical
 - (b) Managerial
 - (c) Security
 - (d) Social
3. What does '*esprit de corps*' stand for ?
 - (a) team work
 - (b) right thing in the right place
 - (c) initiation

- (d) avoiding frequent transfers
4. Who is regarded as the Father of Scientific Management?
 - (a) Henri Fayol
 - (b) Mc Gregor
 - (c) F.W. Taylor
 - (d) Charles Babbage
 5. Who is regarded as the Father of Modern Management?
 - (a) F.W.Taylor
 - (b) Henri Fayol
 - (c) Mc. Gregor
 - (d) Robinson Boulton
 6. Which one of the following is not the direction given to the workers as per scientific management?
 - (a) Work in the correct way
 - (b) Discard the rule of thumb approach
 - (c) Ignore the functional areas of management
 - (d) Volunteer for getting trained in new methods
 7. Which one of the following is an argument against scientific management?
 - (a) Individual creativity is ignored
 - (b) Stop worrying about how the surplus is divided
 - (c) Worker is reduced to a cog in the machine
 - (d) Mobility among workers gets restricted
 8. Which one of the following is not a benefit from Scientific Management?
 - (a) Improved working methods
 - (b) Control over work liberal
 - (c) Job enrichment
 - (d) High degree of accuracy
 9. Who focused more on setting the organisational mechanisms right?
 - (a) EFL Brech
 - (b) Henry Gantt
 - (c) LF Urwick
 - (d) Frank Gilberth
 10. Which one of the following is not recognised in the Maslow's Hierarchy of Human Needs?
 - (a) Safety needs
 - (b) Esteem needs
 - (c) Physical needs
 - (d) Acceptance needs
 11. Which one of the following is not a characteristic of Theory X managers?
 - (a) Inherently lazy
 - (b) Require constant guidance
 - (c) Avoid responsibility
 - (d) Highly creative
 12. Which one of the following is not a characteristic of Theory Y managers?
 - (a) Capable of directing & controlling performance

- (b) Look for opportunities to out perform others
 - (c) Do not show up any ambition
 - (d) Higher rewards makes them more committed
13. Who identified that the formal organisational structure can be supplemented by an informal organisation structure?
- (a) Victor H Vroom
 - (b) Chester Barnard
 - (c) Herzberg
 - (d) Abraham Maslow
14. Who gave the concept of 'Developing Culture'-Developing pro-organisational approach and shared values in the organisation?
- (a) Peters T & Waterman R
 - (b) Porter ME & Kofler P
 - (c) Peters T
 - (d) Mintzberg H
15. Who defined the concept of 'Competitive Advantage' to include certain factors of competitive advantage such as customer satisfaction, latest technology etc?
- (a) Hammer M & Champy J
 - (b) Porter ME
 - (c) Peters T & Moss Kanter
 - (d) Mintzberg H
16. Which one of the following is not one of the Fayol's 14 Principles of Management?
- (a) Authority
 - (b) Remuneration
 - (c) Decentralisation
 - (d) Unity of Direction
17. Name one of the following not related to the Human Relations Period.
- (a) Mayo
 - (b) Mc Gregor
 - (c) Henri Fayol
 - (d) Victor Vroom
18. Who gave the Two Factor Theory of Motivation?
- (a) Vroom
 - (b) Herzberg
 - (c) Fayol
 - (d) Maslow
19. In the modern management era, which one of the following is a key management issue?
- (a) creating excellence
 - (b) empowering employees
 - (c) developing organisational approach
 - (d) managing change
20. What refers to the strength of an individual's desire for a particular outcome?
- (a) Force
 - (b) Valence

- (c) Expectancy
 - (d) Valant
21. According to Chester Barnard, the cooperation within an organisation does not depend on which factor?
- (a) Physical
 - (b) Environmental
 - (c) Technical
 - (d) Social

Question II: Fill in the Blanks

1. The father of scientific management is
2. Henri Fayol divided the activities of organisation into six groups. They are technical,, financial,, accounting and managerial.
3. The practice of leaving working methods by management to individual workers is referred by Taylor as
4. In case there is a clash between individual interest and group interest, will prevail.
5. Unity of command means
6. Esprit de corps refers to
7. Taylor called for mental revolution on the part of and
8. The scientific approach suggested by Taylor consists of four stages: observation, management, experimentation, and
9. Two of the prominent contributions of scientific management are (a) and (b)
10. The theory given by W. Ouchi that centres around developing the ability of the organisation to coordinate people to achieve productivity is called
11. The concept of therblig is given by
12. Elton Mayo is well known for his experiments.
13. The need to maximise one's potential and to accomplish some thing is covered by need in the Maslow's hierarchy of needs.
14. Theory X and Theory Y was contributed by
15. The two examples of dissatisfiers are (a) and (b)
16. The Expectancy Theory of Motivation given by Vroom states that
Force = ×
17. triggers the kind of culture that the organisation will develop towards excellence.
18. The two significant variables that underlie the process of developing organisational culture are: (a) and (b)
19. In his theory of scientific management, Taylor suggested to separate function from function.
20. was the foundation for work study and other productivity related techniques.

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Mention any six principles of management, as given by Fayol, in brief.
2. Explain the background conditions that led to the genesis of scientific management.
3. Mention the elements of scientific management.
4. Explain why scientific management is still respected.
5. What were the areas of interest for Frank and Lillian Gilbreth? Give an outline of their contribution.
6. What were the conclusions from Hawthorne experiments?
7. Mention the different needs as identified by Abraham Maslow. Give an example of each.
8. What are the assumptions of Douglas McGregor about the behaviour of managers?
9. Identify any two key management issues and explain what they are.
10. Explain expectancy theory of motivation.

Question IV: Essay Type Questions

1. ‘Scientific management did much more than what was planned.’ Do you agree? Discuss.
2. Explain the principles of management as outlined by Henri Fayol.
3. Give a brief account of the developments in management thought during Human Relations period.
4. Explain and evaluate the process of scientific management.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. b | 2. d | 3. a | 4. c | 5. b |
| 6. c | 7. b | 8. b | 9. c | 10. c |
| 11. d | 12. c | 13. b | 14. c | 15. b |
| 16. c | 17. c | 18. b | 19. c | 20. b |
| 21. c | | | | |

Answers to Question II

- | | |
|---|---|
| 1. Frederick Wilson Taylor | 11. Gilbreth |
| 2. commercial, security | 12. Hawthorne |
| 3. rule of thumb | 13. self-actualisation |
| 4. group interest | 14. Douglas McGregor |
| 5. one employee—one boss | 15. salary, job security |
| 6. teamwork | 16. valence, expectancy |
| 7. management and workers | 17. Establishing vision |
| 8. inference | 18. (a) pro-organisational approach,
(b) shared values |
| 9. (a) standardisation,
(b) productivity improvement | 19. planning and control function, doing function |
| 10. theory Z | 20. Scientific management. |

4

MANAGERIAL OBJECTIVES

Learning Objectives

By the time you complete this chapter, you should be able to understand

- what the managerial objectives are and how these contribute to the overall goals of the organisation
- the concept of social responsibility
- how the corporate sector takes up on itself the task of social responsibility

INTRODUCTION

Organisations are created to achieve defined goals. These overall goals imply objectives for a particular department or a particular position. Attainment of the departmental objectives leads to the achievement of the ultimate goals of the organisation. This chapter focuses on the different managerial objectives, of which social responsibility is one.

MANAGERIAL OBJECTIVES

An objective is a desired goal—a target or aim. Managerial objectives refer to the goals the managers would like to pursue with the resources available at their disposal. Many organisations identify their objectives from the mission statement, which outlines what the organisation wants to achieve. The managerial objectives govern the focus of the efforts of the organisation, departments or individual employees.

Objectives may be a broad or general statement about the organisation or a specific and narrow statement about a department or an employee's activities. For example, company-wide objectives can be stated as:

- To earn a fair return on investment for our shareholders
- To improve our market share
- To provide quality service to our customers
- To adapt to the changing circumstances
- To develop human resources
- To ensure optimum utilisation of resources

These company-wide objectives are also called major objectives. These can be translated into more specific objectives to understand them better and to measure the performance at the departmental level. Some of the specific objectives may be stated as below:

- To increase productivity by 10 per cent during the current year (departmental goal)
- To reduce the maintenance costs by 12 per cent (departmental goal)
- To improve the rate of attendance (individual worker goal) and so on

It is necessary that every employee is made aware of the managerial objectives, both at the corporate and department levels. This will not only inspire the employees but also develop in them a sense of pride and commitment to contribute their best for the attainment of these objectives.

Most Common Objectives

Every business organisation pursues one or more of the following objectives.

- (a) *Making profit* Every business organisation pursues this goal, because it is essential to get profit for survival. Profits constitute the reward for taking risks. The production and marketing strategies are aimed at making profit.
- (b) *Improving profit* Increase in profit is an indication of improvement in the business activity. So organisations want to improve their profits from year to year.
- (c) *Providing value for shareholders* It is necessary to keep the shareholders satisfied, both in terms of payment of dividends and enhancing the market value of their shares.
- (d) *Financing growth and diversification* Growth implies an increase in size or value. Diversification refers to spreading investments over several products or projects. Organisations strive hard to grow and also diversify over a period of time.
- (e) *Morale and Motivation* Morale is the mental attitude of a person or a group especially as regards confidence, discipline and so on. Motivation refers to stimulating the interest of a person in an activity. Business organisations try to keep up the morale and motivation of the employees in the organisation.
- (f) *Breaking-even* Newly formed organisations may aim to break-even in the first year. Break-even is also called ‘no profit or no loss’ point. When the firm meets its total costs through the total revenues, it is said to breakeven.
- (g) *Increasing market share* Market share of a company is the percentage of the total market size the company caters to. Generally every company wishes to increase its market share.
- (h) *Being the market leader* A market leader is an organisation that tries to sell more products than all of its rivals or perhaps all its rivals combined. As the market leader, one can also achieve maximum profits in view of the large-scale economies.
- (i) *Attaining organisational growth* The larger the organisation is, the more likely it is to attract investors, and thus, be able to produce on a large scale. This can be achieved by increasing the overall size of the business by merging with other firms or buying them out through take over.
- (j) *Providing better customer service* By customising its operations as per the customer requirements, an organisation achieves higher turnover and profits. Most of the organisations maintain their customer service programme efficiently and effectively. In most of the public sector organisations such as Indian Railways, Road Transport Corporations (RTCs), service is the major focus rather than profit making.
- (k) *Caring for Society* Most of the successful organisations believe that they should share their progress with the unprivileged sections of the society. With this view, they integrate their business objectives with social responsibility.
- (l) *Caring for the environment* Increasing number of modern organisations are choosing environment-friendly technologies to avoid environmental pollution, which is reaching dangerous levels due to the growing rate of industrialisation.
- (m) *Ensuring survival* In case of cut-throat competition, organisations tend to operate very carefully with a reluctance to take risks. Profits are obviously low in such cases, and survival becomes the most crucial objective.

SOCIAL RESPONSIBILITY

For most of the business organisations, social responsibility is a way of life. Social responsibility refers to the process which includes several activities ranging from providing safe products and services to giving a portion of the company's profits to welfare organisations with a philanthropic perspective.

Social responsibility of a business is also viewed as conducting its operations in a *free and fair manner* by discharging its commitment towards different segments of its operational environment such as shareholders, consumers, employees, creditors, Government, competitors, and the general public as explained below:

- (a) *Responsibility towards shareholders* The business enterprise has the responsibility to provide fair return on capital to the shareholders. The firm must provide them regular, accurate, and full information about the working of the enterprise in order to fulfill and encourage their interest in the affairs of the company.
- (b) *Responsibility towards consumers* The management has to provide quality products and services to the customers at reasonable prices. It should consider customer-suggestions and also plan its services more effectively through consumer satisfaction surveys, which focus on unfulfilled customer expectations.
- (c) *Responsibility towards employees* Good working conditions motivate workers to contribute their best. It is the responsibility of the management to recognise their unions and respect their right to associate with a union of their choice. The management has to provide a fair deal to its employees by planning for social security, profit sharing, growth and development promotions, grievance settlement machinery, and employee welfare.
- (d) *Social responsibility towards creditors* The business has to repay the loans it has taken from the financial institutions as per the repayment schedule. Also, it should inform the creditors about the developments in the company from time to time. The business firm has to live up to the ethical and moral expectations of its creditors by fulfilling its commitments.
- (e) *Responsibility towards the Government* The business firm has to pay its taxes and be fair in its endeavours. It should also support the Government in community development projects.
- (f) *Responsibility towards competitors* The business firm should always maintain the highest ethical standards and maintain cordial relations with each of the competitors, which is a critical and sensitive segment.
- (g) *Responsibility towards general public* Business units have tremendous responsibility towards the general public to support the cause of community development. Most of the companies maintain public relations departments exclusively to maintain good relations with the community.

Social Responsibility of Business: Infosys Foundation

To support and encourage the underprivileged sections of the society and philanthropy, Infosys Technologies Ltd., created Infosys Foundation. The Foundation provides medical facilities to remote rural areas, organises novel pension schemes and extends aid to orphans and street children. It has undertaken a large rural education programme and, as a part of this, 5500 libraries have been set up in government schools spread across many villages. Its other activities include the reconstruction of old school buildings, setting up of Science Centers in rural areas and schemes to provide support to traditional art and culture forms, otherwise ignored.

Responsibility for the Upliftment of the Society

As a part of its commitment to the upliftment of the society, the corporate houses voluntarily evince a sense of social responsibility. Many companies have the conviction that they owe their growth to the society. Hence, they believe that a part of the profits generated in the course of their business should be committed in a philanthropic manner towards the development needs of the society. This may be for economic, social, cultural or community development.

Commitment to social responsibility enhances the visibility of the corporate houses in the minds of their target customer segments, and hence acts as a strategy to build up corporate image. More often, the corporate perfectly calculate the costs and rewards associated with such projects.

Empowering the very poor: The social responsibility strategy

The very poor should gain purchasing power and only then can they draw attention from the marketers as potential customers. It is interesting to observe how the very poor people could gain purchasing power through these examples:

Walton (chain of Departmental stores, USA), Mohammed Yunnus (Grammin Bank, Bangladesh), and Verghese Kurien (National Dairy Development Board, India) made significant progress in this direction.

- Walton sold products at the lowest prices. In this process, he also generated employment and thereby created purchasing power among his 60,000 strong workforce.
- Mohammad Yunnus extended very small loans to the poorest to ensure credit to his 2 million borrowers in 34,000 villages--half the 68,000 villages in Bangladesh. By doing so, he generated employment for 11,000 people in 1041 of his branches. Grammin Bank could ensure 99 per cent recovery of its loans.
- Amul is the brain child of Verghese Kurien who promoted National Dairy Development Board in India. Together with 170 unions over 70,000 villages across India, the Board markets 10 million litres of milk every day, and supplements the family incomes of 90 lakh people by Rs 4000 per year. Every day, 90 lakh milk pourers line up in collection centres in 70,000 villages. This type of cooperative effort facilitated the milk pourers to get a satisfactory price for their milk.
- Several other cooperatives of the very poor such as Lijjat Papad have emerged as powerful ventures, encouraging the formation of small groups to help each other.

Several public and private organisations, educational institutions, charitable trusts, non-government organisations, and others can be involved in this process. For instance, the series of Janmabhoomi programmes, which the Government of Andhra Pradesh has undertaken in recent years, reveal that governments also can strategically appeal to the masses to take part in building infrastructure as per their requirements. The focus of all these programmes has been to build necessary infrastructure such as community roads, community schools, sanitation, health and so on as per the perceived requirements of the community.

Social responsibility: Latest initiatives

Increasing number of info-tech professionals from the US have been turning their attention to India in the name of social responsibility.

The Silicon Valley professionals are represented by The Indus Entrepreneurs (TIE), a powerful organisation with several thousands of non-resident Indian members who are keen to give back a portion of their knowledge and power to India.

The members of TIE and entrepreneurs from Bangalore are putting forth proposals to upgrade the learning technologies to make India globally more competitive.

Social responsibility adds an additional dimension to the economic performance of the company. The society expects the corporate to take part in meeting the community needs such as arts, education, public health, environment, social welfare and so on.

Taking a cue from philanthropic activities of overseas companies, leading Indian organisations like Ranbaxy, Telco, Bajaj Auto, Infosys and many more have taken up community development as a strategy to enhance their corporate image. Many companies have developed their own social or community programmes. The following examples present a glimpse of the type of activities undertaken in this direction by the corporate sector in India.

EXAMPLE 4.1

The Tata group of companies, one of the pioneers of philanthropic activities in India, took up social projects as part of its corporate policy. In 1979, Tata Steel promoted Tata Steel Rural Development Society (TSRDS) for community service in some 32 clusters of villages around Jamshedpur. TSRDS extended these activities to all major locations where Tata Steel had business interests, including the mines and collieries in undeveloped regions of Bihar, Orissa, and Madhya Pradesh. Today, it serves nearly 800 villages in eight districts of these three states.

TSRDS projects include

- building infrastructure such as construction of link roads and culverts
- developing sources of water both for irrigation and domestic use
- helping farmers to adopt improved methods of cultivation and animal care
- construction of school buildings and community halls
- promotion of rural industry and entrepreneurship
- promotion of adult literacy
- empowerment of women and youth
- providing health and rural sanitation
- providing healthcare and other facilities to the underprivileged and the visually disabled

EXAMPLE 4.2

Ranbaxy, one of the pharmaceutical giants, has specialised in community health care. It set up the Ranbaxy Rural Development Trust to reach out to the socially deprived sections of society. It is committed to making primary health care accessible to those for whom even basic medical facilities are out of reach. Over a period of time, the trust introduced mobile health care vans to service small villages in the vicinity of Ranbaxy plant locations. Its activities cover

- promotion of a community health care society with a corpus fund of Rs 15 million to serve the urban and semi-urban communities besides the underprivileged
- extending community development services
- providing comprehensive medical care at the doorstep through its nine mobile health care units in Delhi, Mohali and Beas (Punjab), Dewas (Madhya Pradesh), and Paonta Sahib (Himachal Pradesh). A team comprising a doctor, health advisor, and a pharmacist moves in the mobile vans from village to village to attend to the needy.

EXAMPLE 4.3

The multinational Asea Brown Boveri (ABB) associated itself with the following corporate community initiatives:

- Community development at ten factory locations across India focussing on adult education, healthcare, and family welfare in the villages. The work is carried out with the help of volunteers from the company as well as community leaders.
- Working with the World Wildlife Fund (WWF) in Baroda.
- Producing books for children on air, water, soil, energy, and agriculture in local languages.
- Providing education for wives and children of employees, with a special emphasis on environmental consciousness.

It instituted the Centre for the Measurement of Environmental Pollution. The Green Line in Delhi, an initiative of ABB, maintains three stretches to plant saplings and also takes care of the maintenance works.

EXAMPLE 4.4

Aswini Homeo and Ayurvedic Products, Hyderabad, freely distributes homeo-medical kit to 30,000 committed and trained volunteers across the villages in Andhra Pradesh, Orissa, and Karnataka to attend in particular to the victims of snake and scorpion bite and chronic patients of asthma and diabetes. It also runs a charitable trust to cater to the community needs of health, education, environment and sports.

EXAMPLE 4.5

Indian Aluminium Company Limited (Indal) contributes to social development by

- encouraging its employees to participate in social welfare and community development activities
- supporting flood and drought affected areas of Orissa, Kerala, and Maharashtra by providing necessary materials
- undertaking community development programmes such as literacy and family welfare
- promoting sports and fine arts, in general, and classical music, in particular.
- protecting the cultural heritage by restoring monuments and historical buildings in Kolkata

EXAMPLE 4.6

ICI India Limited has involved itself in the following activities:

- Community development activities relating to education, environment, and health.
- Rural development projects such as promoting awareness on hygiene, family planning, introduction of biogas plants, construction of schools, roads, and community centres, setting up of service centres to provide quality seeds, fertilisers and pesticides.

EXAMPLE 4.7

Bajaj Auto has focussed on hygiene as an important part of its social development strategy. It has taken up an integrated project to raise awareness regarding clean water and to provide solutions for the water supply problems by working with communities around Pune—its headquarters. It has also set up pilot projects providing expertise for the construction of community toilets.

Role of the Corporate Sector: A Summary

The following can be the broad classification of the activities for community development that the Indian corporate have been supporting:

- Work creation through innovative training programmes* and offering apprenticeship
- Welfare programmes
- Support for educational institutions by donating recycled paper, wiring schools for the internet, allowing the employees to donate a part of workday to class room teaching with an idea to build the next generation of loyal workforce for the company
- Enhancing awareness on socially relevant issues such as family planning, eye donation**, AIDS awareness and prevention, literacy, womens education, fighting against corruption and superstitions, and so on
- Support to promote arts such as Kuchipudi dance, classical music, literature and so on.
- Contribution to overseas physical and financial aid in times of natural calamities
- Afforestation schemes in the townships created around the corporate factories
- Establishment of hospitals with advanced medical facilities and care
- Clean-up-the-environment projects such as
 - (a) projects for the reduction of water pollution and destruction of fish through discharge of chemical effluents, hot liquids and similar materials into the streams and the water table
 - (b) reduction of air pollution from auto emissions and particle discharges from mines, chemicals, metals and similar enterprises.

An Intelligent Business

Some innovative corporate houses could successfully integrate social responsibility concept into their marketing strategy. For example, one of the leading companies dealing in jeans outfit announced 20 per cent reduction in the price of the new jeans if old ones were exchanged. The old ones, thus collected, were freely distributed to the people in distress.

The companies should, thus, be intelligent enough to innovate new solutions and values in a socially conscious way to be more successful in the hard days to come.

*Small Industrial Bank of India (SIDBI) sponsors a 14-week Small Industry Management Assistants' Programme primarily for unemployed graduates to provide them small industry exposure and employment in due course in the small industry. This benefits the small industry also because it can get reasonably well trained manpower for employment.

**Some Charitable trusts and other agencies organise eye donation campaigns and also provide treatment for eye diseases like Cataract. They distribute spectacles freely.

Andhra Pradesh Road Transport Corporation and Indian Railways print, on the reverse side of the ticket, a slogan that inspires the general public in this direction.

SITUATION ANALYSIS**Relocating polluting industries**

One of the recent developments in Delhi was the Supreme Court's ruling to remove and relocate the polluting industries from their present area of operation. This incurred a lot of protests from the entrepreneurs and employees.

The entrepreneurs averred that the industries were originally located very far from the residential areas and the industrial areas have become residential in view of the employee preferences to stay close to their workplace. One of the fears of the entrepreneurs was that most of their units would become sick or face sudden demise in case they were shifted. The locational advantages would also cease to continue in such a case.

In this situation, how do you evaluate the entrepreneurs' responsibility to get shifted and relocated?

SUMMARY

- ◆ The main purpose of organisation is to achieve the goals set by the top management.
- ◆ Organisational goals are further disintegrated into departmental objectives to facilitate the managers to achieve these objectives. The objectives may be general or specific.
- ◆ The most common objectives of business include making profit, breaking even, increasing market share, being the market leader, caring for the society and environment, achieving the organisational growth and expansion, and surviving in the long run.
- ◆ Social responsibility is one of the primary objectives of the business. It is viewed as conducting its operations in a free and fair manner discharging its commitment towards shareholders, customers, employees, creditors, Government, competitors, and ultimately to the general public.
- ◆ The managerial responsibility for the upliftment of the society cannot be brushed aside.
- ◆ A business seeking to be truly intelligent needs to be committed towards the development needs of the society.

REVIEW QUESTIONS**Question I: Fill in the Blanks**

1. An objective can be defined as
2. Social responsibility of business refers to the practice of
3. Enhancing market share means
4. Two examples for programmes for community development are (a) and (b)

5. One example for company-wide objective is
6. ‘Break even’ means
7. The market leader can be defined as the one

Question II: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Define objective. Give two examples.
2. How do you distinguish specific objectives from general objectives? Give two examples for each.
3. Explain what you understand by ‘managerial objectives’. Give any four managerial objectives.
4. Define Social Responsibility. Explain the social responsibility of business to its different segments.
5. Does the size of the firm limit its capacity to contribute its might to the upliftment of the society? Substantiate.
6. How can an intelligent business take part in social responsibility related activities? Explain.
7. Illustrate how marketing strategies and commitment to social needs can be integrated by a business unit?
8. What activities can a university undertake to demonstrate its commitment to social development? Identify.

Question III: Essay Type Questions

1. Explain what you understand by ‘managerial objectives’. What could be the different objectives the management can set for itself? Illustrate.
2. Explain the concept of social responsibility. Explain the activities of any four of the business organisations which undertake activities related to community development in your town.
3. Explain the broad classification of activities supported by Indian corporate sector for community development. Illustrate.

Answers to Question I

1. *desired goal—a target or aim.*
2. *producing safe products and sharing its prosperity with the community*
3. *increasing the percentage of the total market it has.*
4. *(a) literacy campaigns and (b) awareness building activities for family planning*
5. *to adapt to changing circumstances*
6. *total revenues = total costs*
7. *who tries to sell more products than all of its rivals or perhaps all its rivals combined.*

UNIT II

Chapter 5: Basic Issues in Organisation

5

BASIC ISSUES IN ORGANISATION

Learning Objectives

By the time you finish this chapter, you should be able to understand

- the difference between organising and organisation
- basic concepts relating to organisation
- principles of organisation
- types of organisation with their justification
- organisation structure
- organisation chart

INTRODUCTION

An organisation is more known by how it is visualised, planned, and executed. The elements of this chapter reveal how the effectiveness can be built in by developing the right kind of organisation.

Organisation and Organising

Very often, these terms are used interchangeably, which is not correct. Organisation is different from organising. Organising is one of the functions of management whereas organisation refers to the institution wherein the management functions are performed. Organising is the means to achieve the plans. If planning involves making a road map for the chosen destination, then organising is the means by which you reach your chosen destination. Organising is a process of

- determining, grouping, and structuring the activities
- creating roles for effective performance at work
- allocating necessary authority and responsibility for results
- determining detailed procedures and systems for different problem areas such as coordination, communication, decision-making, motivation, conflict resolution, and so on.

The ultimate result of organising is organisation. In other words, organising function ends with creating a structure of relationships. It explains who is responsible for a given task. If the entire organisation is viewed as a system, its sub-systems are the departments of production, marketing, finance, and personnel.

Organisation: Formal or Informal?

Organisation may be formal, informal, or both. It is said to be formal when it is created for achieving a common purpose. Certain rules and regulations always govern it. The chief executive calls his staff for a meeting at a given time and when the staff meets, it is called a formal organisation. A formal organisation comes into being when persons in official capacity (a) are able to communicate with one another, (b) are willing to act in an atmosphere of cooperation, and (c) share a common explicit purpose.

On the other hand, after the meeting is called off, when some staff stay back to discuss their personal problems with the chief executive, it is said to be an informal organisation.

Another simple example for an informal organisation is a cricket team with members drawn from different levels in the organisation. The same team becomes a formal one, once it is placed under the control of a captain.

The whims and fancies, or likes and dislikes of the members bind the informal organisation, not the rules and regulations of the organisation. However, it is the informal organisation that determines the success of formal organisation. It is so because the rules and regulations do not yield results, and they condition the behaviour of people in the organisations. The degree of participation and involvement of people in the organisation enhances the quality of the results. Only informal organisations such as weekend meets, cultural meets, sport meets, and so on, develop bondings which, in turn, strengthen the degree of participation and involvement of people in the organisations. Imagine the effect on the morale of the student whose progress is monitored by the Principal who appreciates him while chatting with his faculty and students! With this, the other students also get inspired! This informal organisation (the student, the principal, and the faculty) could strengthen the discipline and overall functioning of the formal organisation, in this example, the college.

The 'human touch' in organising

It is the need of the hour to adopt a direct approach to people and work. The process of organising must not be carried out in a mechanical manner. It should be handled with a humane perspective considering human values, vision, creative thinking and better means of motivation. Some of the prominent variables in the organisation design that make humane organisations are:

- Vision and values which provide alignment and bind the organisation together
- The choice of means of performance appraisal
- How best one can think holistically and act collaboratively.

It was Elton Mayo who contributed to the concept of informal organisation. Informal organisations are not reflected in the organisation charts. But, the informal relationships are dynamic in nature. They are capable of affecting the relationships in the formal setting. A manager can lead and direct the subordinates better, to the advantage of the organisation, if he is aware of the importance of these interpersonal relationships.

Relationship Between Management and Organisation

Management and organisation are closely related. The nature of organisation depends upon the goals of management. Management is concerned with defining the purpose of organisations, fulfilling it by adapting to change and maintaining a functional balance among the various conflicting forces and factors at work.

The process of management is adequately influenced by the advances in the organisation theory, such as self-appraisal, networking, the learning organisation*, and so forth.

The manager is concerned with his people, work and structures, and systems and procedures. Can the manager function ignoring the other variables such as goals of the organisation, available technologies, the values and beliefs of the organisation? No. The reason is that a change in one variable will be affecting one or more variables also. Thus, management and organisation are closely related. To manage successfully is to balance these factors in a way that meets the needs of the organisation at a given time. The character and structure of the organisation may be contingent on several factors such as technology in use or the organisational environment, and so on. The best way of structuring organisations keeps on changing, based on the situation. This theory is called the *contingency theory* or the *situational theory*.

BASIC CONCEPTS RELATED TO ORGANISATION

The following concepts provide an insight into the functioning of organisations:

Organisational Hierarchy

The hierarchy in a business refers to the layers of management from the top management down to managers or supervisors of the lowest rank. In small businesses, usually, there are few layers of hierarchy. For instance, in sole trader type of organisation, the owner makes and implements all decisions. He acts as both the manager and the worker.

The top management comprises directors or chief executive. It is concerned with formulating strategic, long term plans, and policy decisions within the organisation. It is the responsibility of the top management to ensure that the subordinates implement these plans and decisions. A clear chain of command runs from the top level to the lowest level, through each department, in the organisation. Orders pass through this chain of command. The data required for certain decisions such as sales, revenues, output, staff turnover, and the like is forwarded to the top management through periodical reports.

Employees in a hierarchy have varying degrees of authority. Higher levels in the hierarchy are characterised by higher responsibility and authority. Managers need to have authority over their subordinates in order to implement decisions and policies. They have to direct their staff regarding what to do and what is expected of them.

Authority and Responsibility

Authority is the power to give commands and to use discretion vested in that particular position or job. If the person is removed from the job, he or she loses the authority. Responsibility is the obligation on the part of the subordinate to complete the given job. If a manager has only authority, he may misuse it. As a control measure, the employee is held responsible for the results also. Authority can be transferred to lower positions but not responsibility.

The authority and responsibility should always be commensurate and coexistent with each other. Otherwise, the performance of the managers goes unchecked. Where the authority exceeds responsibility, it may lead to misutilisation of authority. The manager can get away with it. On the contrary, where the responsibility exceeds authority, the manager feels frustrated. It is because he is held responsible for more

*Learning organisations are those that lend learning approach to organisational strategy with a view to take risks and try new opportunities so that the employees keep learning to develop.

tasks. The authority delegated to him is not in proportion to the responsibility. He has no adequate authority to get the tasks completed.

Delegation of Authority

The process of transferring authority from the top to the lower levels in the organisation is called *delegation*. Although a task may be delegated or passed down the chain of command from a manager to a subordinate, the manager continues to be responsible for making sure that his/her instructions are carried out. The organisation is said to be *centralised* when the authority to take decisions is held by the corporate office. If the authority is delegated to the regional offices, then the organisation is said to be *decentralised*.

Factors determining the degree of decentralisation To what extent the authority is to be centralised or decentralised depends on a number of factors such as:

- How significant and costly is the decision?
- Is it necessary to implement policy in a uniform manner?
- How big is the organisation?
- Does the department have enough economic resources and managerial talent?
- How was the business built? Had it been built from within or expanded under the directions from the promoters? If it was built from within, it has a tendency for centralised authority. If it was expanded under the directions of the promoters, it provides adequate evidence for handling matters with decentralised authority.
- What is the philosophy of management? Decentralisation or centralisation is often considered as a way of organisational life. If the top management wants to retain efficiency and discipline offering its managers freedom of expression, initiative, and decision in the organisational matters, it may choose a decentralised set up. This may look simple in small organisations. But as organisations grow, this may prove to be an uphill task. On the other hand, if the management prefers to exercise control over its managers to direct them in the day to day organisational matters, the natural choice is centralisation.
- What is the competence of managers in the organisation? Can they function independently? Or do they look for guidance at every stage?
- Is there adequate number of managers available to head different divisions or departments?
- How sophisticated are the control techniques? Are they capable of directing the organisation towards decentralisation? The control techniques here include statistical devices, accounting controls, usage of computers, and others.
- What is the extent of geographical area over which the activities of the organisation are dispersed? If the area is wide, decentralised organisation is the only choice to take advantage of different types of economies pertaining to division of labour, technology, materials, and markets.
- How fast are the changes in the internal and the external environment? The pace with which the enterprise keeps changing in a given market indicates the need for decentralisation. The top management cannot continue to take decisions both at the macro and micro levels in the organisation in ever-changing market conditions. The only alternative is to encourage the managers at the lower levels to use their discretion and take calculated risk.
- How influential are the external factors such as government control over matters relating to prices, labour hours, taxes payable and so on. The tasks relating policy-making over such matters cannot be left

to the managers at the department level. In other words, the top levels of management continue to hold the power to take strategic decisions, which effect the performance of the business at the macro level.

Span of Management

It is also called span of control. It refers to the number of subordinates that can be effectively controlled by the manager at a given point of time. If the production manager has, say, five employees under his direct control, it means his span is five.

Different opinions have been expressed about the ideal size: varying from four to twelve. It assumes great importance as the number of relationships, after a particular number of subordinates, grows linear with every additional increase.

V.A. Graicunas demonstrated mathematically the increase in the number of relationships arising from each increase in the number of subordinates. He classified superior-subordinate relationships into three categories, which are (a) direct single relationships, (b) direct group relationships, and (c) cross relationships. He propounded that:

$$\text{Number of all kinds of relationships (N)} = n(2^{n-1} + n - 1)$$

where n = number of subordinates reporting to a manager

The following table illustrates how the increase in relationships grows in a linear way with every increase in the number of subordinates:

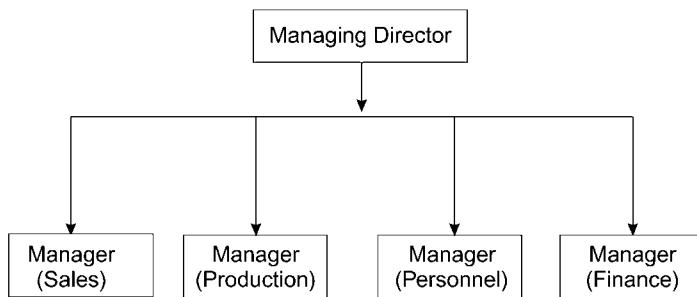
No. of Subordinates (n)	No. of Relationships (N)
1	1
2	6
6	222

The right span depends on several factors such as:

- How well are your subordinates trained and disciplined?
- Is the authority defined clearly?
- How clear are the plans?
- Can the performance of the subordinates be judged in an objective manner?
- What is the rate of change?
- How sophisticated are the communication techniques prevalent in the organisation?
- Does it require a fair degree of personal contact to bring forth the expected results?

Flat and Tall Organisations

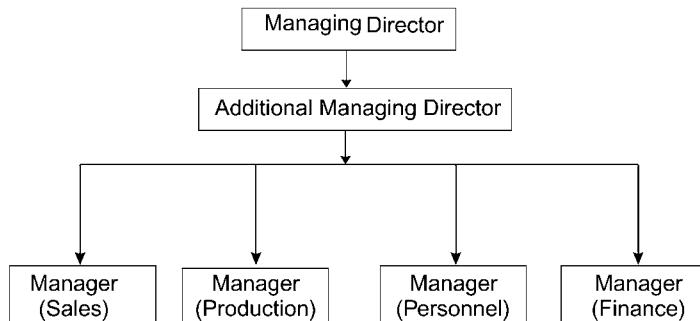
Flat organisations are those, which have relatively few or even one level of management. Many enterprises have adopted flatter structures to reduce levels of management and bureaucracy and to give their work force greater decision-making responsibilities. A service organisation with 3 equal partners and 30 employees is the best example for a flat structure. Flat organisations are known by their wider span of control. In other

**FIGURE 5.1** *Flat organisation*

words, each manager controls more number of employees at a given point of time. Flat structured organisations facilitate communication across the organisation. Figure 5.1 presents an organisation with little height, usually referred to as a flat organisation.

Generally, the greater the height of the organisation chart, the smaller is the span of control, and vice versa.

Tall organisations have many levels of management. Tall structure organisations focus on vertical communication through the levels of grades in it. Figure 5.2 presents a tall organisation.

**FIGURE 5.2** *Tall organisation*

Tall organisation structures involve a narrower span of management.

Wide and narrow spans of management are evaluated as given below:

Wide Span of Control

Advantages

- Fewer levels of management and decision-making
- Lower supervision costs
- The subordinates feel more satisfied on the job front with greater decision-making authority

Disadvantages

- Makes it difficult to supervise the subordinates directly
- Flat structures may not work as the business expands

Narrow span of control

Advantages

- Allows for tight control and supervision
- Communication with subordinates is easier

Disadvantages

- Subordinates may feel left out of the decision-making process and may lack motivation
- Costs related to management and administration tend to increase
- Coordinating decisions of numerous managers becomes difficult
- Too much supervision may hinder initiative and motivation

To keep the organisations vibrant, cost-effective, and competitive, the modern trend is to reduce the size and length of organisations to lean and flat. Most of the public and private organisations announce ‘golden handshake’ schemes* to motivate people to leave the organisation.

PRINCIPLES OF ORGANISATION

The following are the cardinal principles of a sound organisation:

- (a) *Align departmental objectives to corporate goals* It is to be ensured that the objectives of different departments in the organisation are unified and aligned to the corporate goals.
- (b) *Cost-effective operations* An organisation is said to be efficient if it can achieve the goals at the lowest costs and with minimum undesirable consequences.
- (c) *Optimum number of subordinates* In each managerial position, there is a limit to the number of persons an individual can effectively manage. The optimum number will depend on various factors such as efficiency of the superior and subordinates, the nature of work—routine or special, responsibility, and so on.
- (d) *Specialisation* Similar activities are grouped together to ensure better performance of the work and efficiency at each level.
- (e) *Define authority* The authority and responsibility relationships underlying each position in the organisation have to be defined clearly to avoid confusion or misinterpretation.
- (f) *Flow of authority* This refers to the line of authority from the top management in an enterprise to other levels. If this is clear, then the terms of responsibility also can be understood. Further, this will strengthen the flow of communication to different levels in the organisation.
- (g) *Manage via exceptional cases* An organisation should be geared in such a way that manager’s attention is drawn only to exceptional problems. In other words, a system (such as organisation manuals) should be developed to take care of routine administration.
- (h) *Ensure one employee, one superior* Each subordinate should have only one superior. There should not be any room for conflict of command.
- (i) *One head and one plan* Every group of activities with common objective should be handled by one person and one plan. If handled by different persons, the organisation may lose direction.

*Giving a sum of money larger than what they would have earned had they continued in service.

- (j) *Define responsibility* A superior is responsible for the omissions and commissions of his subordinates and at the same time the subordinates must be held responsible to their superiors for the performance of the work assigned.
- (k) *Commensurate authority and responsibility* Authority is the right constituted in a position to exercise discretion in making decisions affecting others. The manager occupying that position exercises the authority. Responsibility is the willingness on the part of the employee to be bound by the results.
- The authority and responsibility should always be commensurate and coextensive with each other. In other words, if the authority is less than the responsibility, the manager cannot deliver performance of the task and similarly, if the responsibility is less than the authority, the employee may go berserk and unchecked. In other words, the manager cannot discharge his responsibility for want of necessary authority to execute the work assigned.
- (l) *Attain balance* Every organisation needs to be a balanced one. There are several factors such as decentralisation of authority, delegation of authority, departmentation, span of control, and others, that have to be balanced to ensure the overall effectiveness of the structure in meeting the organisational objectives.
- (m) *Ensure flexibility* The more the flexible structures, the better is the scope to be successful. The principle of contingency endorses this. Where the organisation procedures are cumbersome or rigid, it is necessary to develop an in-built mechanism to forecast any type of constraint.
- (n) *Provide for continuity* The organisation structure should provide for the continuation of activities. There cannot be any breakdown in the activities of the organisation for the reasons such as a change in the policies or retirement or death of any key employee in the organisation.

TYPES OF ORGANISATION

An organisation can be classified on the basis of authority relationships or on the basis of its departments. The types of organisation based on authority relationships are: (a) Line organisation, (b) Line and staff organisation, (c) Functional organisation, (d) Committee organisation, and (e) Matrix organisation.

The organisation can also be divided into the following groups based on its activities or departments: (a) Functional organisation, (b) Product organisation, (c) Regional or geographical organisation, (d) Customer organisation, (e) Committee organisation, and (f) Matrix organisation. This classification is more or less need-based. In other words, there is no standard list of the types of organisation. The only thing is that the basis of creating the organisation should be a justifiable one.

Organisations Based on Authority Relationships

Line organisation Line organisation is also called military or scalar organisation. It is said to be the oldest and most traditional type of organisation, which is widely used even today. This is called line organisation because managers in this organisation have direct responsibility for the results. Based on authority relationships, a line organisation structure can be drawn as shown in Figure 5.3. Consider this example. An engineer, setting up a consultancy, employs a few young graduate engineers and draughtsmen to prepare designs and drawings, plans, and specifications. The line organisation is the most suitable in this case.

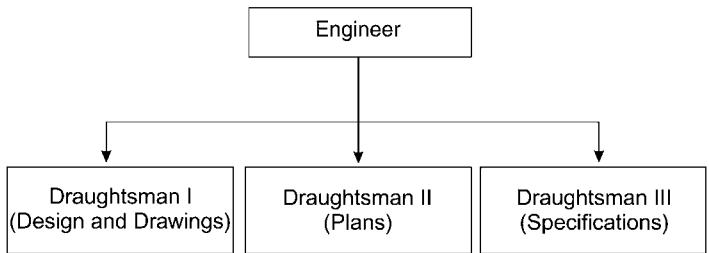


FIGURE 5.3 *Line organisation*

Line organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
<ul style="list-style-type: none"> (a) It sets clearly the direct lines of authority and responsibility of a line manager (b) It is simple to understand (c) Each section or department can be treated as a unit for control purposes (d) It is flexible (e) It facilitates quick decisions and prompt actions 	<ul style="list-style-type: none"> (a) It is likely that the line manager is overburdened with all tasks relating to a particular section or department (b) There is no scope for specialisation (c) There is more scope for favouritism and nepotism (d) It may lead to low morale in the organisation (e) Instability is likely, due to lack of continuity

Line and staff organisation This concept is drawn from earlier civilisations and armies. In this organisation, we have both the line managers and the staff managers. Staff managers support the functions of the line managers.

The word ‘staff’ means a stick for support. The staff managers are specially appointed to give advice, suggest, or assist the line managers in their day to day matters. The line manager may require legal updates and counselling, and for this process, he is provided with a competent specialist who can offer valuable suggestions in the matters of policy-making and providing the latest rules and regulations on a given issue. The line managers can take the support of their staff managers to get a full view of the issue under consideration.

Line and staff organisation in a service organisation In practice, it is not necessary that the line manager has to follow the suggestions offered by the staff managers. The line manager has the authority to consider or ignore such suggestions. In other words, he may or may not consider the suggestions made by the staff manager. The ultimate decision, however, is taken by the line managers. It is the line managers, not the staff, who are responsible for the final results. This is illustrated in Figure 5.4 which depicts the line and staff relationship in a service organisation. If the organisation expands, the engineer may appoint an accountant and an administrative officer to take care of the support functions such as maintaining the cost records or preparation of financial statements, and so on. They will not be entrusted with any of the line functions.

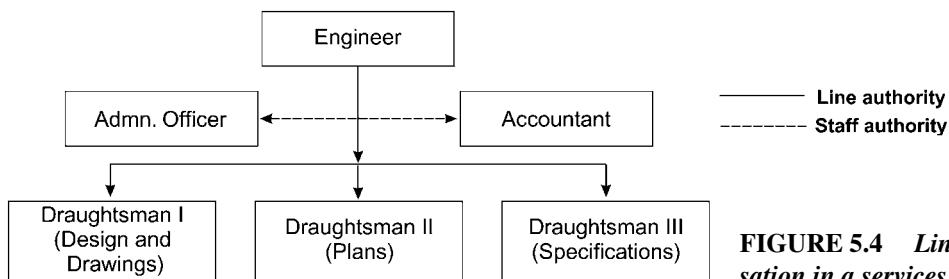


FIGURE 5.4 Line and staff organisation in a services organisation

Line and staff organisation in a manufacturing unit The line and staff organisation in a manufacturing unit is depicted in Figure 5.5. Here, the purchasing, production and sales departments are generally considered as line departments. The finance, accounting, personnel and administrative services are regarded as staff.

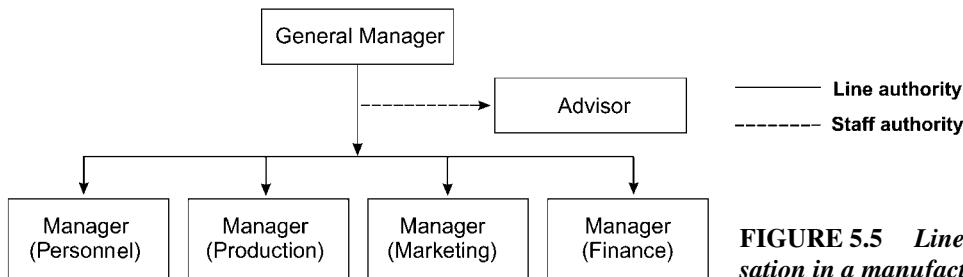


FIGURE 5.5 Line and staff organisation in a manufacturing unit

Line and staff in the armed forces In the armed forces, the roles of line and staff are relatively more clear. The line part of the organisation includes those actually doing the front line fighting. The staff roles are concerned with providing all necessary support such as supply of information, logistics and other things. Some times, it is difficult to tell which post is associated with staff role or line role by looking at the organisation chart. It is so because there could be staff roles in a line function, and vice versa. More often, the line and staff roles get interchanged in armed forces when staff managers take the command if the line managers fall in battle.

Line relationships in staff positions There could be line relationships in the staff positions also. For the organisation as a whole, personnel department has an advisory role to play. Hence, it is in staff relationship with the entire organisation. Within the personnel department, for instance, there is a line relationship between the personnel manager and his staff (from the sections of recruitment and selection, training, safety, welfare, etc). To illustrate this point, take the case of an engineer employed in construction by a private company. His job is to supervise the construction of a particular complex and he is responsible to complete the construction by a given deadline. Here, he is a line manager. Suppose he leaves this private company for good and joins a large bank as a technical advisor. Now, he is the staff manager as his job now is concerned with advising the bank on the technical aspects of the proposed new projects. His job is confined to making advice to the administration. It is upto the line managers to consider his advice or not.

Evaluation Line and staff organisation is evaluated in terms of the following merits and demerits:

Merits	Demerits
(a) It enhances the quality of decisions (b) There is a greater scope for advancement (c) It relieves the line managers (d) It is mostly beneficial where there is a line of command within staff departments, as in the case of the Armed Forces	(a) It may create more friction or conflict between line and staff managers (b) Staff suggestions are seldom implemented (c) It is expensive to have both staff and line managers

Criticism There is criticism against staff managers, most often from line managers, about the degree of their involvement and cooperation. Similarly, even staff managers complain about the behaviour of line managers. Staff managers are criticised on the grounds that they do not come out with practical solutions and fail to realise the ramifications of the entire problem. Line managers are criticised approaching the staff managers for counselling, only when they are about to sink. Quite often, it is complained that they do not take the staff managers into confidence.

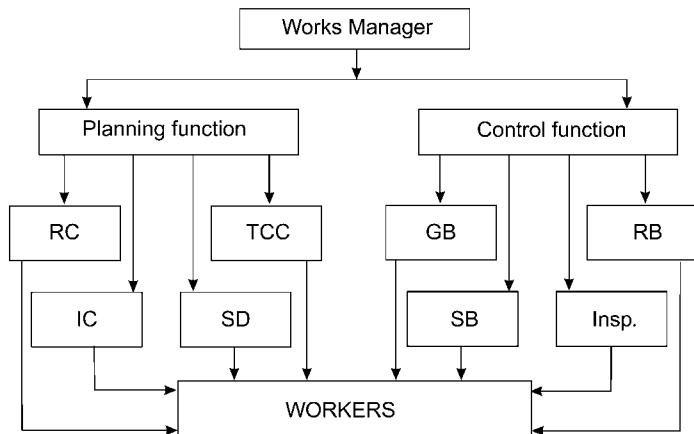
Involve both line and staff managers in administration An organisation cannot function smoothly, if its line and staff managers cannot work as a team. In fact, the line and staff managers should work complementarily for better results in the organisation. There are organisations such as nationalised banks, which involve both line and staff managers in the administration. It is ensured that the services of both types of professional managers are effectively utilised. The rotation of line and staff roles provides an opportunity to appreciate each other's view points and imbibe in themselves a sense of accommodation and not confrontation. It is necessary to ensure cooperation between line and staff managers as the organisation is like a bullock cart or a scooter that runs on two wheels.

Functional organisation FW Taylor suggested functional organisation in his theory of scientific management in support of his 'one best way' of doing things.

Taylor observed that one single foreman was overburdened with all the operations such as task setting, time recording, quality inspection, disciplinary jobs and so on. He divided this job into eight functional foremen—four dealing with the planning task and four dealing with the implementation task. In other words, the planning and implementation tasks are divided to ensure the division of labour. He suggested the functional type of organisation structure as outlined in Figure 5.6.

The foremen involved in the planning task were:

- Route clerk (identifies the route for the materials to pass on)
- Instruction clerk (gives instructions to the workers about what to do and what not)
- Time and cost clerk (identifies the time and cost for each job)
- Shop disciplinarian (maintains the discipline on the shop floor)



RC = Route clerk; **IC** = Instruction clerk; **TCC** = Time and cost clerk; **SD** = Shop Disciplinarian; **GB** = Gang Boss; **SB** = Speed Boss; **RB** = Repair Boss; **Insp.** = Inspector

FIGURE 5.6 Taylor's functional organisation

Those involved in implementation were:

- Gang Boss (assembles the machinery needed for the worker)
- Speed boss (standardises and sets the speed of the machines)
- Repair boss (repairs the machinery in case of breakdown)
- Quality inspector (responsible for the matters relating to quality)

All were in charge of workers as far as their functional matters were concerned. The functional relationships between the functional foremen and the workers have been depicted in Figure 5.6. From this, it can be noted that the functional type of organisation violates the principle of one employee, one superior. Taylor justified this stating that the functional foremen had clear demarcation of their duties and responsibilities, and hence, they were not overlapping. The functional organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
(a) Planned specialisation	(a) Ineffective controls as workers have more than one boss
(b) Separates activities related to planning and control	(b) Very costly
(c) Facilitates large scale production through standardisation	(c) Calls for more coordination
(d) The disciplinary controls are well defined	(d) Less appropriate when an organisation diversifies
(e) Appropriate when there is a single product or service	(e) No clear line of authority
(f) Offers clear career paths for functional specialists	

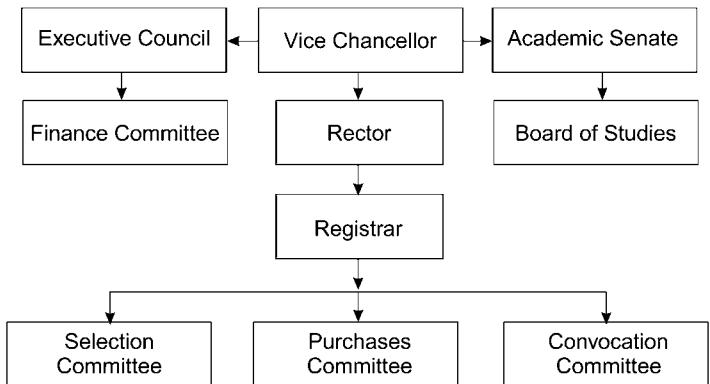


FIGURE 5.7 Committee organisation in a university

Committee organisation A committee is formed when two or more persons are appointed to work as a team to arrive at a decision on the matters referred to it. It is intended to utilise the knowledge, skills, and experiences of all the concerned parties. Particularly, in large organisations, problems are too big to be handled by one single expert.

Figure 5.7 presents a typical committee organisation in a university. Here, the finance committee is responsible for executive council directly. Similarly, the Board of Studies (intended to review, revise and update the syllabus of different academic courses in the university) submits its report to the Academic Senate. The chairman of both the academic senate and executive council is the vice-chancellor. The members of committees for selection, convocation, purchases and others, meet, discuss the issues placed before them, decide and submit their report to the registrar. Some of the issues that call for appointment of committees are revision of wages, selection of faculty or technical staff, disciplinary matters, purchase of equipment and so on. In a university, for example, there are various committees such as purchase committee (to decide which equipment is to be bought), selection committee (to recruit teaching and non-teaching staff members), board of studies (a committee to prescribe the syllabus for different courses of engineering), anti-ragging committee (to prevent ragging). These committees are supportive in nature. In an industry setting, there are several committees such as production committee, grievance handling committee, finance committee, welfare committee and so on.

Conceptually, the committee is intended to gain cooperation of all the parties involved, coordinate the efforts necessary, and utilise the resources of all members associated with the committee.

At times, whenever any problem arises, the management may choose to appoint a committee with the main parties associated with it as members. A time frame is fixed for submitting its recommendations to resolve the crisis. Within this time limit, the committee members consult, coordinate, and deliberate to stimulate necessary ideas in resolving the conflicts or differences.

The committee studies the nature of the problem by carefully scrutinising the office records, rule position, analysis of precedence (how such cases have been dealt with in the past), and so on.

Evaluation Though it looks very interesting to see how it should work, most often, it is painful to see how the committees function. It appears as though none of the members assumes responsibility. Everybody says that it is the ‘committee’s decision’. Also, it is alleged that, when the idea is not to settle the matter quickly, a committee can be constituted. More often, a committee is known for its laxity, wastage of time and resources, irrelevant discussions and indecision. In spite of all this, there are cases of exemplary performance displayed by the committees. It is necessary that the chairman must be provided with all the secretarial assistance for achieving better results. If the members of the committee are capable of handling the entrusted matters in a

responsible way, the role of the committee chairman will be just to coordinate their thinking. If the members are of evasive nature or do not act in a responsible way, the chairman needs to be a taskmaster to be after them to pursue for early decisions.

It is better if the committee form of organisation is used sparingly, considering the costs, time, and speed of taking decisions. The merits and demerits of committee form are outlined here:

Merits	Demerits
<ul style="list-style-type: none"> (a) It pools up the organisational resources in terms of knowledge, skills and experience (b) It represents all interested groups and thus, facilitates group decision (c) It yields good results if the committees are headed by taskmaster like chairman and time-bound in terms of decision-making (d) It minimises the fear of too much authority vested in one person (e) It motivates all the concerned or affected groups to participate 	<ul style="list-style-type: none"> (a) Responsibility for decisions cannot be fixed on a particular person (b) It calls for high degree of coordination (c) It involves high cost in terms of time and money

Matrix Organisation

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

Figure 5.8 shows a president having three vice-presidents, each representing a functional area: production, finance, and sales. Additionally, there are two project managers for two locations A and B. The figure reveals that both the functional manager and the project manager exercise authority over those working in the matrix

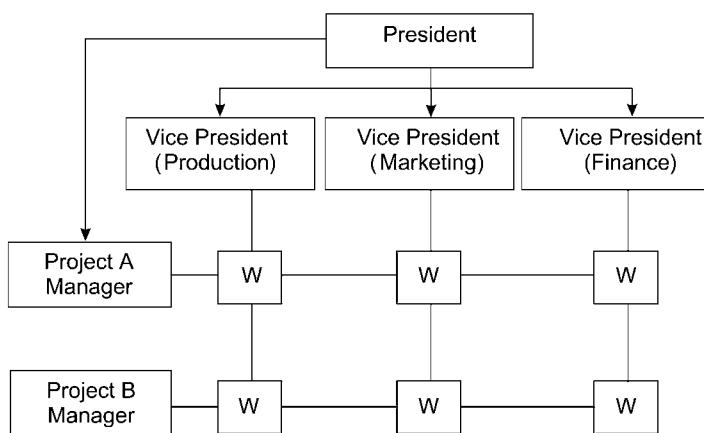


FIGURE 5.8 *Matrix organisation*

unit. The president coordinates or balances power between the functional and the project managers. Each work group (represented by a square on the matrix) is held uniquely accountable to two supervisors.

Evaluation

The matrix organisation is increasingly used in high-technology enterprises but there are cases of many failures also. Matrix organisations have one striking advantage—flexibility and optimisation of resources. Work groups, along with its resources, can be shifted from one project to the other, depending upon the exigency. When the project is completed, they return to their functional departments. The process of monitoring and controlling the work groups is easier since the workers are under the charge of one project manager from the beginning to the end.

One of the shortcomings of matrix organisation is that it does not observe the principle of ‘one employee, one superior’. However, as long as the managers are aware of their roles, things go well. In other words, the authority and responsibility relationships, in case of matrix organisation, need precise definition. Otherwise, the workers suffer from the overlapping and conflicting authority and responsibility. Working with two taskmasters may, at times, result in suffocating, disgusting, and frustrating experience. This may lead to inertia and lack of motivation also. Much before this happens, it is advisable that the top management appoints a general manager (Projects) for coordinating the project managers and the functional managers to settle the differences, if any.

The matrix organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
(a) It offers operational freedom and flexibility	(a) It calls for greater degree of coordination
(b) It seeks to optimise the utilisation of resources	(b) It violates unity of command principle
(c) It focuses on end results	(c) It may be difficult to define authority and responsibility precisely
(d) It maintains professional identity	(d) Employees may find it frustrating to work with two bosses
(e) It holds an employee responsible for management of resources	

Organisations Based on Departments

The process of classifying the organisation on the basis of departments or similar activities in it is called *departmentation*. This facilitates planning and control at department level. It is possible to fix the responsibility on the departmental head for its targets. It offers scope to introduce division of labour and ensure specialisation.

Functional departmentation This is similar to the modern view of functional structure of organisations. Marketing, engineering, production and finance are the basic functions of a manufacturing organisation. So, the departments are also named accordingly. It is not uncommon to find research and development, public relations as major departments as per the needs of the organisation. Figure 5.9 presents a typical functional organisation.

Evaluation This reflects logically the main functions of the organisation. It follows the specialisation principle. The focus of training is made very clear. Planning and control are simplified.

It is likely that the departmental managers strive hard in pursuit of the departmental objectives. In such a case, it is likely that they lose sight of the overall corporate objectives. In other words, it calls for a need for

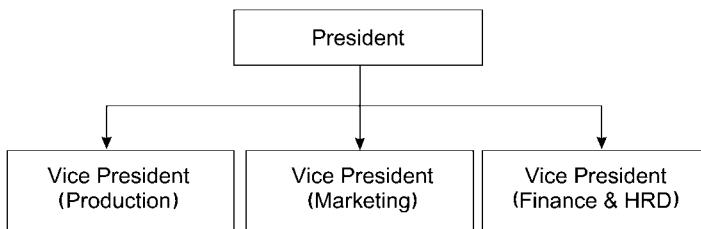


FIGURE 5.9 Functional departmentation

careful integration of departmental objectives into the overall objectives of the company. The coordination among different departments may be critical and quite often this determines the success of the organisation. There is another danger that every department is viewed as a separate entity by itself, leading to water tight compartment culture in the organisation. This can be effectively overcome by ensuring a frequent interaction among the various departments.

The functional organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
<ul style="list-style-type: none"> (a) Here, each function or process is focussed (b) Specialisation enhances the quality of decisions (c) It reduces the load on the senior executives (d) It offers better control (e) Training needs can be well identified for career progression (f) It is more suitable for large and medium organisations 	<ul style="list-style-type: none"> (a) It delays decisions and implementation (b) It calls for more coordination (c) It is expensive in terms of time and resources (d) It may not be suitable for small organisations (e) Here, departmental objectives are more focussed than the corporate goals

Product organisation Here, the departments are based on the products manufactured or services rendered. It is common in case of organisations specialising in different products or services such as manufacturing, financing, wholesaling, and the like.

Product-based organisations emerged from the limitations of functional organisations. With phenomenal growth in the activities, the organisations also grew in size and as a result, the functional organisations could not adapt to the changing requirements of the management. Figure 5.10 presents a typical product based organisation that meets the specific needs of management, pertaining to different types of products and services. When the departments are reorganised along product lines, it simplifies the managerial tasks. This structure empowers the staff with an extensive authority over all the operations in manufacturing, financing, sales, service and so on, that relate to a given product or product line. Also, a target can be fixed on each of the managers in terms of costs and profits for each product or service.

Evaluation The product-based organisation offers scope to strengthen the manufacturing facilities, skills and knowledge for every product or service. It can be used to plan for growth and diversification. It simplifies the control function as the targets can be fixed in terms of costs and profits. Customers can be better taken care of since all the functions relating to the product are housed under one roof. There is a danger that the

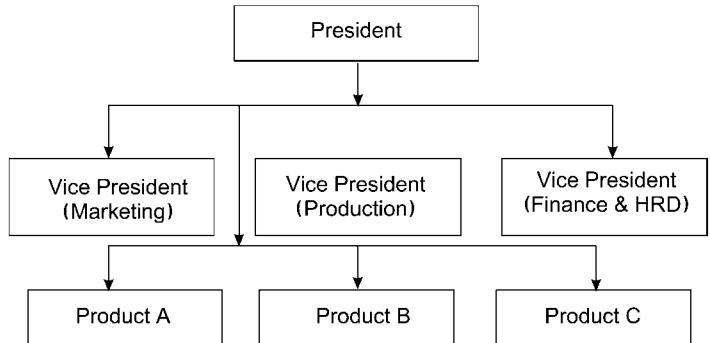


FIGURE 5.10 Product-based organisation

whole organisation gets disintegrated in the anxiety of pursuing individual products. This can be averted by holding enough decision-making control with the head office level. The top management may find it difficult to recruit enough capable managers as each product department calls for persons with proven or time-tested managerial capabilities. This type of organisation structure may involve duplication of some of the overheads both at the central office and the department level.

The product organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
(a) It strengthens the manufacturing facilities product-wise or process-wise	(a) Adequate number of qualified and professional managers may not be available
(b) It provides for growth and diversification	(b) Maintaining central services may not be cost-effective
(c) It ensures better customer care	(c) It tends to increase the problems of control for top management
(d) All facilities are available under one roof	(d) The organisation may get disintegrated with increasing focus on departments
(e) Responsibility can be fixed for sales and profits for each product or service	
(f) Managers can be trained for senior positions	

Geographical, regional, or territorial organisation This is a further specialised type of organisation, which is used to operate over wide geographic areas. Figure 5.11 presents a typical territorial organisation.

Here, organisation is divided into territories or regions commonly used for the decentralisation of responsibility over certain areas. This method is popularly used in sales and production functions. Companies like Sony have set up manufacturing plants across the world to take advantage of the differential labour costs. Particularly in production, Sony makes use of the local labour to minimise its assembly labour cost and to lower the total cost. This enables the company to compete even globally.

Evaluation Departmentation by territory offers many benefits. Managers at lower levels can be made more responsible. A strategy can be formulated to compete in local markets. This form encourages utilisation of local labour. This will create jobs for the local community and goodwill in the international community. It reduces the transportation and labour costs, cuts down on delivery time, and enhances the competitive edge for the company.

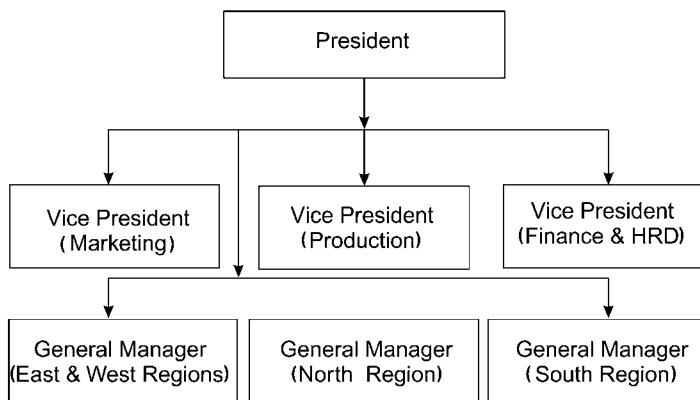


FIGURE 5.11 Territorial organisation

This type of organisation has some problems also. It may be difficult for the head office to monitor the activities of the managers in the territorial departments. This may involve duplication of costs in terms of functional services such as administration which are also required at the head office. If competent general managers are not available, the activities at the territorial departments may hinder.

The territorial organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
<ul style="list-style-type: none"> (a) Responsibility is fixed at the territory level (b) Local facilities and resources can be well utilised (c) Managers at lower levels can be made more responsible (d) It enhances the competitive edge in terms of lower delivery times and lower labour costs (e) It trains managers for senior management positions 	<ul style="list-style-type: none"> (a) It may be difficult for the top management to monitor and control the territory level operations (b) It may involve duplication of costs (c) It may be difficult to find competent managers to head different locations

Customer organisation Here, all the activities of the enterprise are grouped on the basis of the profile of its customers. Each group is managed by one department head. This type of organisation caters to the differing characteristics and needs of its customers.

This type of organisation is designed to cater to the requirements of clearly defined customer groups. Educational institutions, for instance, customise their regular and extension courses to serve the needs of different groups of their students. A technological university may have different BTech programmes for day-time students, part-time students, correspondence students, and so on. The profile of the customer for each of these programmes is distinctly different. There are departments created in the university catering to the specific needs of each of the customer segments.

Similarly, a particular multi-national bank may have several departments such as community-retail banking, corporate banking, institutional banking, real estate and loans, agricultural banking, and so on. Each of these

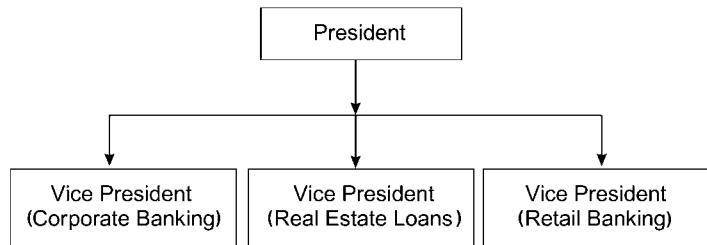


FIGURE 5.12 Customer departmentation

departments will be managed by a qualified and professional manager. This is a case of customer organisation where service differs from customer to customer, based on his background. For instance, the terms of payment differ from the nature of the borrower segment such as institutional borrowers, farmers or employees, and so forth. Figure 5.12 illustrates a typical customer departmentation in a large bank.

Evaluation Customer organisation works out to be very convenient where the market can be classified based on the customer's needs. Customers also feel comfortable to find quick and personalised service and settlement of their transactions on case to case basis. The organisation can, eventually, develop a focussed insight into the specific needs of the target group of customers. This may, in course of time, develop into its core competence.

While taking care of the customer's requirements the organisations may enjoy the high degree of patronage, the organisations may face certain difficulties also. It may call for additional training for the staff. The customer groups cannot be always clearly defined, such as large corporate firms versus other corporate businesses. When market conditions change adversely, the facilities and the services of the specialised staff may be under-utilised. For instance, when the stock market conditions are not favourable, customers may not come forward in a large number to avail bank loans. Similarly, the drought conditions may continue for a long time. In such a case, the services of key officials such as agricultural finance officers in a bank have to be redeployed. The customer organisation can be evaluated in terms of the following merits and demerits:

Merits	Demerits
<ul style="list-style-type: none"> (a) It focuses on the specific needs of individual customers (b) It ensures better customer care (c) It develops a competitive advantage through core-competence (d) It is based on growing and diversified needs of customers 	<ul style="list-style-type: none"> (a) It calls for focussed training programmes to cater to the specific customer needs (b) It may be very costly (c) Frequent changes in the market conditions may render under-utilisation of services (d) It may be difficult to specialise in the customer problems if the customer group is small (e) The customer requirements keep changing and so also the customer groups

ORGANISATION CHART

A formal organisation is governed by an organisation structure, which outlines the superior-subordinate relationships among the people in the organisation. It helps to understand how the authority flows in the entire

organisation. The chart that displays flow of authority across and down the levels in the organisation is called the organisation chart. It indicates how departments are tied together along the principal lines of authority and responsibility. It is flexible, and hence, it can be changed as and when the management feels it necessary in the light of changed circumstances.

A clearly defined organisational structure and well-depicted organisation chart minimises the uncertainty. It speeds up decision-making. It brings out coordination. It eliminates buckpassing by fixing responsibility on the individuals. Policies can be made clear and focussed. If an organisation chart is not clearly defined, it may lead to politics and frustration. As a result, organisation in due course may become inefficient. Figure 5.13 presents partial organisation structure of a university covering its colleges at different locations.

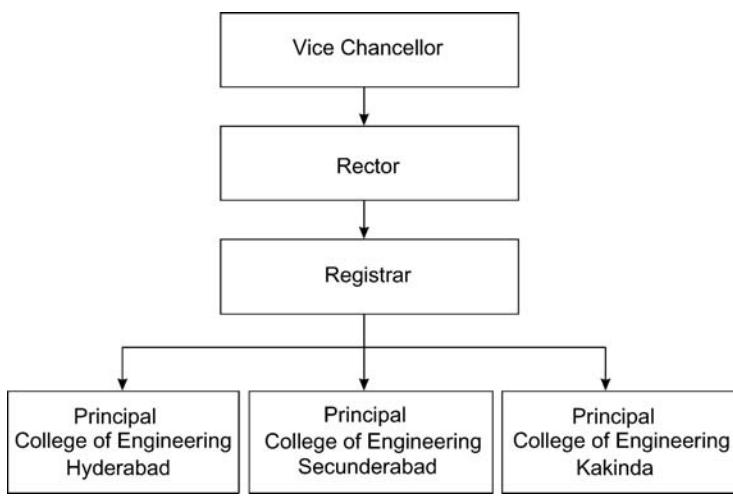


FIGURE 5.13 Partial organisation chart of a university

Advantages

- The chart identifies lines of authority and responsibility, flow of work between individuals and span of control.
- It illustrates the superior-subordinate relationship that is, who reports to whom.
- It illustrates how the activities of the entire organisation are coordinated into one unit.
- It shows whether the functions are grouped together in a logical order or not.
- It focuses what kind of managerial relationship (line, line and staff or functional organisation) is prevalent in the organisation.

Limitations

- It does not illustrate informal relationships among individuals.
- It does not reflect how much amount of authority at a given level.
- Managers tend to neglect or hesitate to redraft charts, as and when necessary. The organisation structures are dynamic, and hence, organisation charts also need appropriate corrections in tune with the changes in the organisation structures.

SITUATION ANALYSIS

Power shifts

This is a case of a private limited company. The chairman of the company was a leading business figure and was guiding the affairs of the company. The managing director was a very close associate of the chairman in all the matters including business. The chairman had a son who had returned from USA with an MBA degree. The son started taking an active part in the business matters. There was a shift of focus and power from the managing director to the son of the chairman.

What do you think will be the consequences of such a trend? How could such a problem be eliminated?

Organisation manual describes the organisational goals, objectives, policies, procedures, strategies, schedules, budgets, and other particulars in addition to the duties, functions, and responsibilities of every department in the organisation. The issues which cannot be decided based on the guidelines in the organisational manual may be referred to the corporate office for clear instructions and guidelines. It is developed for the use of the regional offices. It acts as guide for reference, when an issue relating to the general administration requires any clarification.

Redesign organisations in tune with the changing scenario

Globalisation, changing technologies and dynamic aspirations of individuals have made the existing organisation structures, the ways of managing people and methods of performance appraisal redundant and obsolete.

Today, organisation structures will have to be redesigned and operationalised considering the reality of organisation. These organisational structures need to be redesigned considering the technology, business strategy and policies, tasks, and people's aspirations.

The appraisal systems, for instance, should be based more on objective factors rather than subjective factors such as loyalty and the like. Organisations should be made more realistic considering the role of people and their working environment to enhance their abilities to perform effectively and efficiently.

MODERN TRENDS IN ORGANISATIONAL STRUCTURE DESIGNS

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

The main focus of organic structures is *to do away* with those activities which do not directly contribute to the growth of the organisation and focus only on those activities which directly lead the organisation for the achievement of the given goals. These are discussed below:

Virtual Organisation

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

The virtual Organisation is a temporary network of companies that come together quickly to exploit fast changing opportunities. Virtual Organisations appear to be bigger than traditional organisations. As virtual organising requires a strong information technology (IT) platform. The boundaries that traditionally separate a firm from its suppliers, customers and even competitors are largely eliminated, temporarily and in respect to a given transaction or business purpose. Virtual Organisations come into being 'as needed' when alliances are called into action to meet specific operating needs and objectives. When the task is complete, the alliance rests until next called into action. Each partner in the alliance contributes to the virtual Organisation what it is best at-its core competence.

Cellular Organisation

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

Team Structure

A structure in which the entire organisation is made up of work groups or teams is known as team structure. Team structures are both permanent and also temporary in nature as situation demands. Traditional Organisations are characterized by vertical structures and modern Organisations are identified by the horizontal i.e., team structures. 'We report to each other' is the main feature of team structure. It leads to boundaryless Organisation in a borderless world. In team structures, we find cross functional teams meant for improving lateral relations, solving problems, completing special projects and accomplishing routine tasks. A cross functional team comprises members from different functional departments such as marketing, finance, HR, production etc. Project teams are convened for a particular task or project and these get dissolved once task is completed. The intention here is to quickly bring together the people with the needed talents and focus their efforts intensely to solve a problem or take advantage of a special opportunity. Here employees are more involved and empowered because of reduced barriers among functional areas. Sometimes, when there is pressure on teams to perform and there is no clear chain of command, team structures fail to deliver results.

Boundaryless Organisation

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

Inverted Pyramid

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

SUMMARY

- ◆ Organising is different from organisation. Organising is a function of management whereas organisation refers to an establishment where the functions of management are performed.
- ◆ Organisation may be formal or informal. It is formal when governed by rules and regulations, otherwise, it is informal. An informal organisation is more governed by an individual's choice. Informal organisation strengthens the functioning of a formal organisation.
- ◆ A formal organisation is always governed by organisational structure.
- ◆ Organisation chart displays the lines of authority.
- ◆ Management and organisation are closely related. Management is viewed as a function carried out in organisation.
- ◆ Authority and responsibility should always be coextensive and commensurate.
- ◆ Contingency or situational theory states that the character and structure of the organisation may be contingent on several factors such as the technology in use or the organisational environment. The best way of structuring organisations keeps on changing based on the situation.
- ◆ The process of transferring authority from the top to the lower levels in the organisation is called delegation.
- ◆ The organisation is said to be centralised when authority to take decisions is held by the corporate office. The organisation is said to be decentralised if the authority is delegated to the lower levels.
- ◆ Authority can be delegated but not responsibility.

- ◆ Span of management refers to the number of subordinates that can be effectively controlled by the supervisor at a given point of time. The right span depends on several factors such as subordinate training, clarity of plans and policies, communication techniques used, and so on.
- ◆ There are 14 principles governing a formal organisation. They are:
 - (a) Align departmental objectives to corporate objectives
 - (b) Cost-effective operations
 - (c) Optimum number of subordinates
 - (d) Specialisation
 - (e) Define authority
 - (f) Flow of authority
 - (g) Manage via exceptional cases
 - (h) Ensure one employee one superior
 - (i) One head-one plan
 - (j) Define responsibility
 - (k) Commensurate authority and responsibility
 - (l) Attain balance
 - (m) Ensure flexibility
 - (n) Provide for continuity
- ◆ There cannot be more than one superior for a given subordinate.
- ◆ Manage-via-exception refers to drawing the managerial attention only to exceptional problems. Routine administration is taken care of by well-defined policies, procedures, and programmes.
- ◆ Line managers are responsible for taking decisions. Staff managers are specially appointed to advise the line managers on legal or policy issues. In organisations where line and staff organisations exist, there lies the conflict between line and staff managers also. The best way to reconcile such conflicts is to involve both of them in the administration as in the case of armed forces.
- ◆ Functional organisation, as suggested by Taylor, is based on the concept of division of labour. Here the planning function is separated from the control function.
- ◆ Committee organisation is recommended where it is necessary to utilise the knowledge, skills, and experience of the selected members in the organisation.
- ◆ Matrix organisation is recommended where it is necessary to secure a higher degree of coordination than what is possible from the conventional organisational structures such as line and staff, and others.
- ◆ Functional type of organisation is intended to enhance the effectiveness of each of the functions by employing the most competent and qualified managers.
- ◆ Product organisation can be used where size of operations is extremely large. Each department in the product organisation will look after all the issues relating to a particular product or service independently.
- ◆ Geographical/regional/territorial organisation is recommended when the organisation has to cater to the requirements of its customers spread over the length and breadth of the entire country, state or a given region.
- ◆ Customer organisation caters to the sensitive requirements of each segment of its customers.
- ◆ Virtual Organisation is a flexible Organisation structure that removes the traditional boundaries. The Virtual Organisation is a temporary network of companies that come together quickly to exploit fast changing opportunities.

- ◆ Organisation structured around the units/cells that complete the entire assembly processes are called cellular organisations.
- ◆ A structure in which the entire organisation is made up of work groups or teams is known as team structure. Team structures are both permanent and also temporary in nature as situation demands.
- ◆ Boundaryless Organisation eliminates internal boundaries among subsystems and external boundaries with external environment. It is a combination of team and network structures with the addition of temporariness.
- ◆ Inverted Pyramid is an alternative to the traditional chain of command. This is a structure which is narrow at the top and wide at the base. It includes a few levels of management.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Which of the following is not a characteristic of a formal organisation?
 - (a) able to communicate with one another
 - (b) willing to act in an atmosphere of cooperation
 - (c) share a common implicit purpose
 - (d) share a common explicit purpose
2. The obligation on the part of the subordinate to complete the given job is called
 - (a) Authority
 - (b) Power
 - (c) Reliability
 - (d) Responsibility
3. The process of transferring authority from the top to the lower levels in the organization is called
 - (a) Authority
 - (b) Delegation
 - (c) Power
 - (d) Responsibility
4. What is the type of organization when the authority is delegated to the regional offices?
 - (a) centralized
 - (b) decentralized
 - (c) both
 - (d) none
5. Which of the following is not defined by V.A. Graicunas classification for superior-subordinate relationships?
 - (a) group relationships
 - (b) direct single relationships
 - (c) direct group relationships
 - (d) cross relationships
6. Which one of the following is a disadvantage for wide span of control?
 - (a) fewer levels of management
 - (b) difficult to supervise the subordinates directly

- (c) lower supervision costs
 - (d) fewer levels of decision making
7. Which one of the following is an advantage in narrow span of control?
- (a) subordinates may lack motivation
 - (b) costs related to administration tend to increase
 - (c) allows for tight control and supervision
 - (d) too much supervision may hinder motivation
8. Which one of the following is not a cardinal principle of sound organization?
- (a) flow of authority
 - (b) maximum number of subordinates
 - (c) attain balance
 - (d) specialization
9. Which one of the following is not a factor that determines the optimum number of subordinates?
- (a) efficiency of the superior
 - (b) nature of work
 - (c) duration of work
 - (d) responsibility
10. Which one of the following is not a factor that helps the organization to attain its balance?
- (a) span of control
 - (b) centralization of authority
 - (c) delegation of authority
 - (d) departmentation
11. The Line organization is favoured because of
- (a) more scope for favouritism
 - (b) no scope for specialization
 - (c) flexibility
 - (d) no scope for nepotism
12. Which one of the following is a demerit of the line organization?
- (a) simple to understand
 - (b) facilitates quick decisions
 - (c) each section is treated as a unit for control purposes
 - (d) instability is likely, due to a lack of continuity
13. Which one of the following is the demerit of line and staff organization?
- (a) relieves the line managers
 - (b) greater scope for advancement
 - (c) staff suggestions are seldom implemented
 - (d) enhances the quality of decisions
14. Which one of the following is a merit for the functional organization?
- (a) calls for more coordination
 - (b) disciplinary controls are well defined
 - (c) very costly
 - (d) no clear line of authority
15. Which one of the following is a demerit of the committee?
- (a) motivates all the concerned groups to participate
 - (b) yields good results

- (c) calls for high degree of coordination
 - (d) facilitates group decisions
16. Which one of the following refers to a project organization?
- (a) line organization
 - (b) military organization
 - (c) scalar organization
 - (d) matrix organization
17. Which one of the following is a merit for the matrix organization?
- (a) calls for greater degree of coordination
 - (b) difficult to define authority
 - (c) offers operations freedom
 - (d) difficult to define authority
18. Which of the following is a demerit in the matrix organization?
- (a) focuses on end results
 - (b) employees may find it frustrating to work with two bosses
 - (c) maintains professional identity
 - (d) seeks to optimize the utilization of resources
19. What is the process of classifying the organization on the basis of similar activities?
- (a) Formulation
 - (b) departmentation
 - (c) execution
 - (d) implementation
20. Which of the following is a merit for the functional organization?
- (a) calls for more coordination
 - (b) delayed decision making
 - (c) offers better control
 - (d) expensive in terms of time
21. Which of the following is a demerit in the functional organization?
- (a) each function is focused
 - (b) reduces the load on senior executives
 - (c) specialization enhances the quality of decisions
 - (d) objectives are more focused than the corporate goals
22. Which of the following is a merit in the product organization?
- (a) central services maintenance may not be cost-effective
 - (b) tends to increase the control problems for top management
 - (c) organization may get disintegrated
 - (d) responsibility can be fixed for sales and profits for each product or service
23. Which of the following is a demerit for a product organization?
- (a) provides way for diversification
 - (b) ensures better customer care
 - (c) adequate number of professional managers may not be available
 - (d) all facilities are available under one roof
24. Which of the following is a demerit for the territorial organization?
- (a) responsibility is fixed at the territorial level
 - (b) may involve duplication of costs

- (c) managers at lower level can be made more responsible
 - (d) local resources can be utilized
25. Which of the following is a merit for the territorial organization?
- (a) local facilities can be under utilized
 - (b) difficult for the top management to monitor the territory level operations
 - (c) train managers for senior management positions
 - (d) difficult to find competent managers
26. Which of the following is a demerit for the customer organization?
- (a) ensures better customer care
 - (b) may be very costly
 - (c) develops a competitive advantage
 - (d) focuses on the specific needs of individual customers
27. Which of the following is a merit for the customer organization?
- (a) calls for focused training programs
 - (b) difficult to specialize in customer problems if the customer group is small
 - (c) it is based on the diversified needs of customers
 - (d) customer requirement keep changing
28. What is the limitation of the partial organization structure?
- (a) the superior subordinate relationship is illustrated
 - (b) managers tend to neglect to redraft charts as and when necessary
 - (c) describes how the activities of the entire organization are coordinated
 - (d) chart identifies lines of authority & responsibility
29. What refers to drawing the managerial attention only to exceptional problems?
- (a) manage via exception
 - (b) manage via perception
 - (c) manage via dictation
 - (d) manage via supervision
30. Which of the following refers to the policies & procedures of the organization?
- (a) manual
 - (b) book
 - (c) journal
 - (d) record
31. What refers to the effective control of a number of subordinates by a supervisor at a given point of time?
- (a) management
 - (b) control of power
 - (c) span of control
 - (d) authority
32. What refers to the line of flow of authority from the management to every subordinate in the organization?
- (a) unit of command
 - (b) flow of authority
 - (c) span of management
 - (d) delegation of authority

33. Which of the following is an example for organic structure of an organization?
 - (a) Line and Staff organization
 - (b) Product Organization
 - (c) Virtual Organization
 - (d) Matrix organization
34. Which of the following allows an easy reallocation of resources?
 - (a) Line and Staff organization
 - (b) Product Organization
 - (c) Matrix organization
 - (d) Virtual Organization
35. Which of the following requires a strong brand and high trust culture?
 - (a) Functional organization structure
 - (b) Line organisation
 - (c) staff organization
 - (d) virtual organisation
36. In which of the following organization structures, every team of workers has the responsibility to improve or maintain the quality and quantity of its products?
 - (a) Cellular organization
 - (b) virtual organization
 - (c) inverted pyramid
 - (d) matrix organization structure
37. Which of the following is a combination of team and network structures with the addition of temporariness?
 - (a) Cellular organization
 - (b) virtual organization
 - (c) inverted pyramid
 - (d) Boundaryless organisation

Question II: Fill in the Blanks

1. The framework of relationships, within which the management functions are performed is called
2. The process of grouping the similar activities and assigning responsibility is called
3. An organisation bound by defined rules and regulations is called
4. An organisation governed by likes and dislikes of its members is called
5. The lines of authority are identified in
6. Different layers in management in the organisation is called
7. The power to use discretion vested in that particular position or job is called
8. The process of transferring authority down the levels in the organisation is called
9. The guide used to refer to the policies and procedures of the organisation is called
10. The number of subordinates that can be controlled effectively by a supervisor at a given point of time is called
11. A flat organisation is always associated with span.

12. The line of flow of authority from the management to every subordinate in the organisation is called
13. The principle of ‘one subordinate-one supervisor’ is called
14. The authority and responsibility should always be and
15. The manager whose role is to support, guide or counsel is called
16. The manager who is responsible to take decisions is called
17. The functional organisation, suggested by Taylor, violates one of the basic principles of organisation. The name of this principle is
18. That type of organisation structure wherein no member owns responsibility for decision is called
19. The project organisation is also called
20. Dividing the organisation on the basis of its departments is called
21. That type of organisation structure which can closely focus into the customer requirements is called
22. That type of organisation structure, which empowers the staff with extensive authority over manufacturing, sales, service and engineering functions relating to a product is called
23. That type of organisation structure followed to take advantage of differential labour costs over different regions is called
24. The practice of drawing the manager’s attention to only the complicated issues is called
25. In times of cut-throat competition, organisation structure enables to lower the personnel costs.

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Explain organising.
2. Differentiate between organisation and organising.
3. Draw an organisation chart (indicating not more than three levels.)
4. What do you understand by organisation manual?
5. Explain the significance of informal organisation.
6. What do you understand by organisational hierarchy?
7. Explain the relationship between authority and responsibility.
8. Differentiate between flat organisation and tall organisation.
9. Evaluate flat organisation.
10. Evaluate committee type of organisation.
11. Evaluate line and staff organisation.
12. Evaluate matrix organisation.

Question IV: Essay Type Questions

1. Discuss the process of organising. Explain the principles to be observed while creating an organisation structure.

-
2. What do you mean by departmentation? Evaluate any three methods of departmentation.
 3. Discuss the utility of organisation structure in an organisation.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. c | 2. d | 3. b | 4. b | 5. a |
| 6. b | 7. c | 8. b | 9. c | 10. b |
| 11. c | 12. d | 13. c | 14. b | 15. c |
| 16. d | 17. c | 18. b | 19. b | 20. c |
| 21. d | 22. d | 23. c | 24. b | 25. c |
| 26. b | 27. c | 28. b | 29. a | 30. a |
| 31. c | 32. b | 33. c | 34. d | 35. d |
| 36. a | 37. d | | | |

Answers to Question II

- | | |
|--|--|
| 1. <i>organisation</i> | 6. <i>organisational hierarchy</i> |
| 2. <i>organising</i> | 7. <i>authority</i> |
| 3. <i>formal organisation</i> | 8. <i>delegation</i> |
| 4. <i>informal organisation</i> | 9. <i>organisational manual</i> |
| 5. <i>organisation structure</i> | 10. <i>span of management or span of control</i> |
| 11. <i>wider</i> | 19. <i>matrix organisation</i> |
| 12. <i>flow of authority</i> | 20. <i>departmentation</i> |
| 13. <i>unity of command</i> | 21. <i>customer organisation</i> |
| 14. <i>commensurate and co-extensive</i> | 22. <i>functional organisation</i> |
| 15. <i>staff</i> | 23. <i>territorial or regional organisation</i> |
| 16. <i>line</i> | 24. <i>management by exception</i> |
| 17. <i>unity of command</i> | 25. <i>flat and lean</i> |
| 18. <i>committee</i> | |

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UNIT III

Chapter 6: Plant Location and Plant Layout

Chapter 7: Productivity and Production

Chapter 8: Work Study

Chapter 9: Statistical Quality Control

6

PLANT LOCATION AND PLANT LAYOUT

Learning Objectives

By the time you complete this chapter, you should be able to

- identify the factors determining plant location
- explain the concept of plant layout and its goals
- explain the types of plant layout and identify their features
- evaluate different types of plant layout

INTRODUCTION

Plant location decisions deal with where the plant is to be located. Plant layout refers to the method in which the machinery is laid out within a given plant area. Both of these are the decisions taken at the top management level. These affect the cost of production significantly. This chapter presents a detailed discussion on the various issues relating to these decisions.

PLANT LOCATION

Plant location is a strategic decision. Several factors influence this decision. The main objective of any business is to optimise its costs and revenues, that is, minimise its costs and maximise its returns. The plant should be located in such a place where the large-scale economies accrue. Optimum size and optimum location go hand in hand. It should not be mistaken that a plant will get maximum benefit if the raw materials, labour, and other factors cost the lowest. It is necessary that all the factors governing plant location are optimised.

To ensure a balanced development of all the regions, every state announces an incentive package to attract new industry. It assures, from time to time, special infrastructure facilities such as continuous water and power supply, and so on, and announces financial incentives like subsidies, tax rebate, tax holiday, and other concessions. These are provided to all such units located in a developing area. At times, this offer from the government may be very lucrative from the point of view of subsidy and other incentives. Plant location is more a corporate decision than an engineering one. Other reasons for locating plants at specific sites can be governed by personal considerations. Usually, the promoters of the plant want to locate the unit in the places of their interest such as native place, and so forth. However, an entrepreneur has to necessarily understand the different factors that influence the location of a plant and their relative merits and demerits. This will facilitate a balanced and careful decision. Such a significant decision should not be carried out by flimsy factors such as likes and dislikes.

Factors Affecting Plant Location

The following are the factors governing the decision of a plant location

- (a) *Closeness to raw materials* Normally the proportion of the cost of raw material to the cost of production is significant for every product. If the plant is located close to the supply points of the raw material, the cost of procurement can be minimised, particularly if the raw material is fragile, perishable, bulky, or heavy. For this reason, the rice mills are located close to the paddy fields. This will save a good amount of transportation costs. If the raw material is an imported one, it is better to locate the plant close to the ports. The location should be such that the supply of raw material should be continuous and uninterrupted. There are cases where industries obtain raw material at less than the market price because of the financial linkages such as financing the agricultural activities during season. ITC Agro-tech finances the agricultural operations of the farmers and procures the sunflower seeds at less than the market price to manufacture sunflower oil. Here, raw materials include both primary and secondary material inputs. The availability of raw materials generally differs from place to place. However, in view of efficient methods of transportation, plants consider raw material factor less significant. Also, if the plant is very large in size, it may not depend upon one source of raw material.
- (b) *Nearness to the markets* If the plant is located close to the markets, the cost of transportation can be minimised. This also helps the producers to have direct knowledge of the requirements of the customers. The knowledge about the profiles of customer segments enables the plant to mould its sales strategies accordingly. The customer profile can be described in terms of age, sex, distribution of customers over given geographical area(s), number of households, size of households, extent of mobility, occupational pattern, income characteristics, consumption pattern, and so on.
- (c) *Fuel and power* The power sector has advanced so much in terms of technology that this ceases to be a vital factor affecting location decisions. Almost every rural area is well connected by power lines, and thus, power supply is not a problem at all. The real problem is the continuous supply of power without any wide fluctuations in voltage. In view of the diesel and electric power, industries can be located all over. However, if the factory is dependent on a particular fuel, its better to locate the plant close to its availability. For instance, if the factory is coal-based, the plant is better located near coal mines.
- (d) *Transport* Though per unit cost of transportation looks insignificant, the total transportation cost the company incurs is sizeable. Water transport continues to be the cheapest or lowest in terms of costs. This is the reason why the seaport cities grew more industrial in the past. In recent times, because of technological advances, the transportation time is reduced and timely delivery is also guaranteed and effectively monitored. However, this continues to be a crucial factor in a vast country like India. To ensure that the products reach every nook and corner of the country, it is advantageous to locate the plant at such a place, which is well connected by different modes of transport.
- (e) *Availability of labour* Labour is mobile. Hence, the location decisions are not significantly affected by the availability of skilled and unskilled labour. Availability of skilled labour in an area would depend on the educational facilities, current level of employment, and the wage rate in the area. It is also true to say that the more the industries, the more are the educational facilities around. For instance, India, in general, and Bangalore and Hyderabad, in particular, made a niche market for software talent all over the world. This is the main reason why most of the software firms are located in these cities, though knowledge firms, *prima facie*, need not be bound by such factors. In a vast country such as

India, wage rate differences are a common phenomenon. More often, the wage rate differences may throw more light if they are read along with productivity level differences.

- (f) *Agglomeration economies* If the plant is located in an industrial area, it is likely that it can avail certain special benefits. These result in cost savings, which accrue to a firm as a result of expansion and concentration of industries in a region. As a result, the plant enjoys economies, both internal and external to it.

SITUATION ANALYSIS

Mathura refineries, 20-year old, located 40 km away from Agra on the bank of Yamuna has been the focus of discussion among the environmentalists for two reasons: (a) the smoke emitted from the refineries was damaging the beauty of Taj Mahal, (b) the industrial effluents are discharged into the river which has been the source of drinking water.

Can change of location be a solution in such a case? Where else can the location of such a huge plant, be changed?

- (g) *Natural and climatic factors* In some cases, location of industry is simply the result of certain natural factors. Shipbuilding is located in Visakhapatnam and Mazgaon Docks in Bombay as these are deep-water harbours, besides having well-developed markets for labour, raw material, and machinery in its neighbourhood.
- (h) *Government influence* As already noted, the Government has its own strategy for a balanced regional development. To encourage the entrepreneurs in locating their plants in the backward and less developed areas, it announces fiscal and other incentives from time to time. It may withdraw the incentives, once it is satisfied that a particular area has reached an optimum stage of development in terms of industries.
- (i) *Political interference* This applies more in case of location of public enterprises. Many a time, political considerations override the economic rationale in assigning an industry to a particular location.
- (j) *Other considerations* These include pollution levels of an area and the safety factor. These days, environmental hazards and pollution levels are given serious thought in location decisions. Government has also notified certain areas as hazard-prone or pollution-affected. Licence can be procured only when the industrial units are located in places far from human habitation.

PLANT LAYOUT

Plant layout can be defined as the process of determining a spatial location for a collection of physical production facilities suitable to manufacture a product or provide a service. It is concerned with arranging

- the manufacturing and servicing departments in the factory site
- the machinery within these departments
- the layout of individual work places

Before the production facilities are set up, it is necessary to study how best the plant layout can be arranged to minimise the bottlenecks in the production process.

Significance

Plant layout studies are essential when

- there is a change in the product design and this changes the sequence of operations or requires new operations
- the management decides to manufacture a new product altogether
- the management wants to increase the output by using additional machinery or upgrading present machinery, or increasing the present rate of capacity utilisation
- it is necessary to reduce production costs
- the present machinery becomes obsolete and it is to be replaced by the new ones
- accidents occur frequently
- workers complain congestion or uncomfortable working conditions
- shifting the existing plant to a new location

In most of these cases, it may be necessary to redesign or reorganise the existing plant layout.

Role of Plant Layout

Plant layout affects both the productivity and the profitability of a company. Hence, it is as important as any major corporate decision. The cost of the product and the supply/demand ratio are directly affected by the plant layout. It is the plant layout that makes the arrangement of a company's physical facilities conducive for the efficient and effective use of its equipment, material, people, and energy. A good and effective plant layout minimises the material handling efforts and costs.

How Does a Mission Statement Spell Goals for Plant Layout

A mission statement can best communicate the primary goals of a plant layout and material-handling project. An extract of a mission statement reads as 'to build a plant to produce 100 cars per day out of three shifts at the lowest manufacturing cost'. From this, the following goals of plant layout can be identified:

- (a) Minimise unit cost
- (b) Optimise quality
- (c) Promote stable and effective use of people, equipment, space and energy
- (d) Employee's convenience, safety, and comfort
- (e) Control project costs
- (f) Achieve the production start date
- (g) Achieve other goals, such as,
 - Minimising work in process inventory
 - Just-in-time manufacturing
 - Lifting no more than one part at a time
 - No bending to pick up parts
 - First in-first out inventory
 - Flexible and adaptable production systems

Consequences of Poor Layout

If layout principles are not followed, the machinery cannot be properly and systematically arranged. In such a case,

- material handling costs will be high
- production time is lost because the workers keep moving between different work stations
- production cost gets jacked up
- working conditions cannot be any more safe
- return on capital employed may be low

An optimum plant layout can do away with these dangers. An optimum plant layout is one that ensures the most effective physical arrangement of the machines for production and the equipment for processing and service, facilitating a high degree of co-ordination among men, machines, and materials in a plant.

Systems of Plant Layout

The pattern of plant layout is basically decided by the relationship between the number of products (P) and the production quantity (Q). Plant layout is a specialised process. The major systems of plant layout are: Product layout, Process or Functional layout, and Fixed layout.

Product layout A large ratio of Q/P justifies a continuous mass production. In the product layout, to meet the mass production requirements, production facilities and auxiliary services are located based on the process details of the given product to be manufactured. The logical sequence in the production process forms the basis for the arrangement machinery under this layout. This facilitates a high degree of automation to minimise fatigue and error.

This layout is followed only by such industries where the product decisions are finalised and may not change at least in the near future. It is because a change in the product will call for a change in the plant layout. Figure 6.1 shows the product layout designed to manufacture product X.

For product X, the above layout displays six types of production operations: drilling, boring, grinding, milling, reaming, and after all these operations, the product manufactured is inspected and sent to the finished goods stores. In view of this sequence, these machines are also arranged in this order.

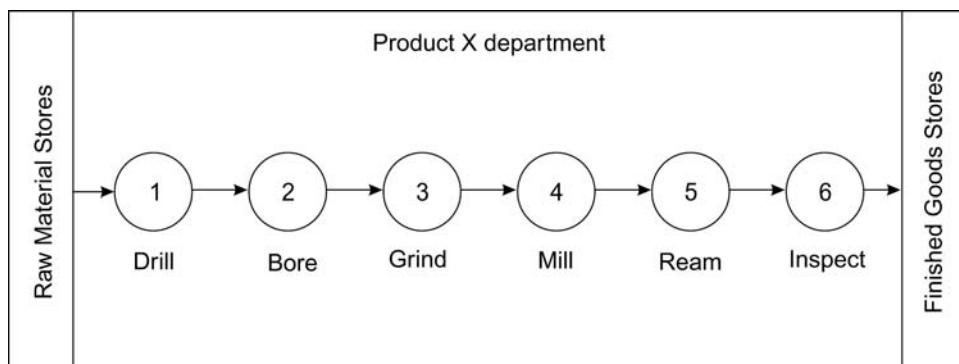


FIGURE 6.1 Product layout

Evaluation of product layout

Product layout has the following advantages:

- (a) *Faster and cheaper production* Product layout facilitates faster production. Production time per unit is lower.
- (b) *Lower cost of material handling* Since all the departments are located close by, material handling costs are lower
- (c) *Effective utilisation of floor space* Floor space can be effectively utilised as all the production departments are located at one point
- (d) *Easy monitoring* Monitoring is made easier in the sense that it requires few controls and records to maintain
- (e) *Team work benefits* Higher productivity is assured as the workers act as a team.

Product layout has the following disadvantages:

- (a) *Threat of duplication* There is possibility for duplication of processing equipment and machine tools
- (b) *Huge capital outlay* It calls for large investments.
- (c) *Little flexibility* There is little degree of flexibility to switch over to a new product or change in the design.
- (d) *Discontinuity in production likely* Since all the machines are arranged in the sequence, if there is a breakdown in one machine, the entire manufacturing activity comes to a grinding halt.
- (e) *Monitoring each worker made difficult* The output of one machine is the input of another machine. Hence, it is likely that the efficiency of a particular worker cannot be recognised. However, it encourages team effort and team productivity.

Applicability Product layout can be better employed where

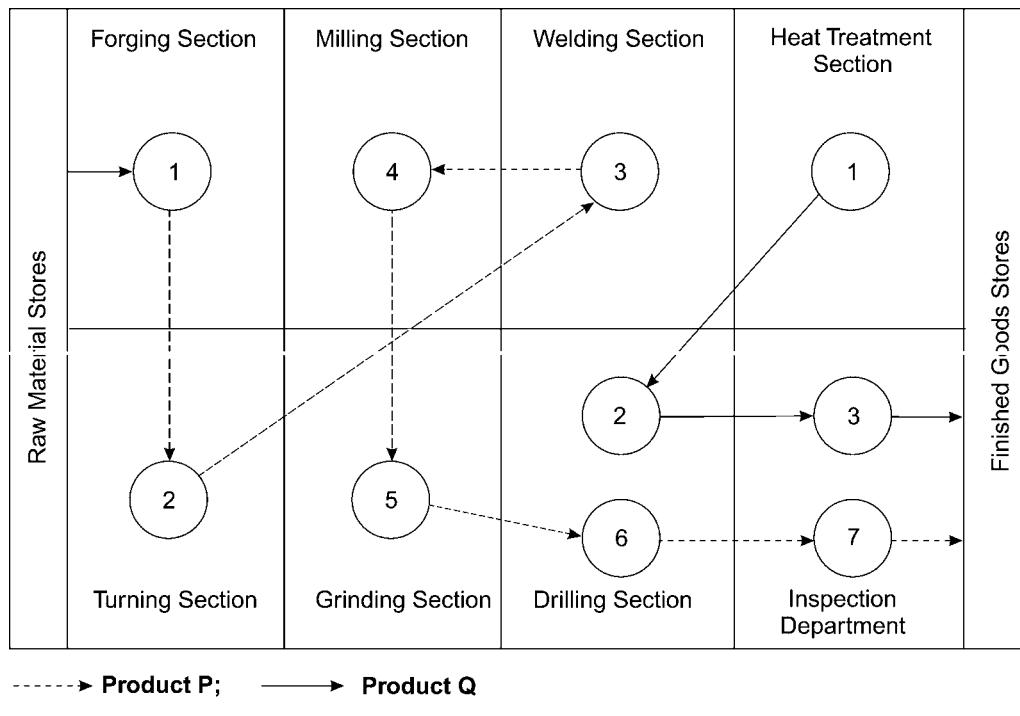
- the machines can be continuously handled for longer periods
- time and motion study can be conducted
- the products so manufactured do not require higher degree of inspection

Process or functional layout In the case of small ratio of Q/P, jobbing, or small-lot production, machines and services of like types are located together as work centres in one area of the plant. If the equipment is arranged as per the nature or types of the given set of products operations major it is called process layout. Here, all the lathes will be placed in a section or department, all the bore machines are placed in another section, all drilling machines are put in another section, and so on. This layout is shown in Figure 6.2 where the movement of two types of products—P and Q—is shown. The product P requires the following operations as per their sequence: forging, turning, welding, milling, grinding, drilling, and inspection. Product Q requires the following operations: heat treatment, drilling, and inspection.

Evaluation of process layout

Process layout has the following advantages:

- (a) *Optimum utilisation of resources* Here, duplication of equipment is minimised. Thus, optimum utilisation of financial resources is ensured

FIGURE 6.2 *Process layout*

- (b) *Flexibility* It involves a high degree of flexibility as any product with any design, as long as it requires the available processes, can be manufactured with the same layout
- (c) *Continuity* Breakdown in one machine does not affect the entire production activity
- (d) *Interesting to workers* The individual productivity can be assessed straight. Hence, the workers also take more interest
- (e) *Monitoring* Progress under each machine operation is inspected. Hence, reasons for poor performance or faulty operations can be quickly identified

Process layout has the following disadvantages:

- (a) *Higher material handling costs* It leads to higher material handling costs in view of the fact that due to backtracking it involves zigzag movements, of the work in progress.
- (b) *Larger production cycle* Production cycle may be long as it involves more number of production stages.
- (c) *Monitoring may be complex* Many units require to be monitored at every level of production. The process of production control may get more complex. It calls for more efficient routing, scheduling, and controlling.
- (d) *Higher inspection costs* It involves inspection at more points of production. Inspection costs are likely to be more.
- (e) *Higher wage bill* Each machine, whether it is general or a special purpose one, requires qualified and efficient staff to maintain it. This may mount up the wage bill.

Applicability To sum up, process layout can be preferred when

- more varieties of products are manufactured in fewer quantities
- close quality inspection is required
- it is difficult to carry out time and motion study
- it is necessary to use the same machine for more than one product

Fixed layout Here, the manufacturing facilities are fixed in their position. They cannot be shifted from one place to another place. This type of layout is used in case of large projects such as building ships, manufacture of aircrafts, heavy pressure vessels, and automobiles, construction of oil rigs, and the like. All spare parts, tools, equipment, and men are brought to this point for further assembly and processing operations on this fixed manufacturing facility.

Evaluation of fixed layout

The following are the advantages of fixed layout:

- (a) It does not involve large investment.
- (b) There is a high degree of flexibility in matters relating to product design, product mix, and production volume.
- (c) Workers find it very interesting since job-enlargement can be effectively practised. *Job-enlargement* refers to the practice of providing the worker a bigger role to play in the job when he gets bored with his/her present job.

Fixed layout has certain disadvantages also. These are:

- (a) Material handling costs will be very high. But there is no alternative other than moving all resources to the fixed layout position.
- (b) At times, the resources may be under-utilised in case many jobs cannot be planned simultaneously.

Combination of product and process layouts This is not a different method. It integrates the advantages of both the product layout and the process layout. Modern production organisations integrate these two layouts to optimise productivity by arranging the manufacturing sections in the process layout with scattered manufacturing lines as per the convenience. When items of different types and sizes are to be manufactured, the machinery is arranged in the process layout. The machines of similar processes are grouped as per the product details. The sequence of operations is the same. Only types and sizes of products vary.

SUMMARY

- ◆ Plant location is a strategic decision. There are many factors determining plant location. These are: (a) closeness to raw materials, (b) nearness to the markets, (c) fuel and power, (d) transport, (e) availability of labour, (f) agglomeration economies, (g) natural and climatic factors, (h) government influence, (i) political factors, and (j) other considerations.

- ◆ Plant layout refers to the arrangement of the physical production facilities.
- ◆ Plant layout has well-defined goals.
- ◆ A poor layout has serious consequences.
- ◆ Plant layout has three systems. They are product layout, process layout, and fixed layout.
- ◆ Product layout is based on the logical sequence to be followed in the production of a given product or service. It facilitates large-scale production. A change in the logical sequence may necessitate large-scale changes in the layout. Material handling costs in this method are lower. Monitoring is made easier. This method of layout promotes a sense of team effort that results in higher productivity.
- ◆ Process layout is based on the nature or types of operations involved in the manufacture of a given product or service. Each operation of process is a section by itself, for instance, drilling section, milling section, and so on. It offers a high degree of flexibility so that any product with any design can be manufactured with the same layout. Material handling costs are higher in view of the fact that the work in progress has to be moved from one section to the other.
- ◆ In fixed layout, production facilities are fixed in their position. They cannot be shifted from place to place, for example—ship building, and others. Here, the material handling costs tend to be high because all the resources of production have to be moved to this point of production facilities.
- ◆ Combination layout integrates the advantages of both the product and process layouts.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. What refers to the method in which the machinery is arranged within a given plant area?
 - (a) facilitates location
 - (b) plant location
 - (c) resources location
 - (d) wealth location
2. Which of the following is a strategic decision?
 - (a) facilitates location
 - (b) plant layout
 - (c) plant location
 - (d) resources location
3. Which of the following is considered more a corporate decision?
 - (a) plant layout
 - (b) facilitates layout
 - (c) resources layout
 - (d) plant location
4. Which of the following is not a factor affecting plant location?
 - (a) fuel & power
 - (b) transport
 - (c) diseconomies of scale
 - (d) government influence

5. Which of the following deals with the plant location?
 - (a) strategic decision
 - (b) engineering decision
 - (c) financial decision
 - (d) marketing decision
6. Which of the following is not a concern for plant layout?
 - (a) arrangement of the servicing department in the factory site
 - (b) arrangement of machinery within the departments
 - (c) arrangement of the financial department in the factory site
 - (d) arranging the layout of individual work places
7. Which of the following is not a significant factor for plant layout?
 - (a) reduce production costs
 - (b) shifting the existing plant to a new location
 - (c) management decided to manufacture a new product altogether
 - (d) management wants to decrease the present rate of capacity utilization
8. What is the effect of a good plant layout on the material handling costs?
 - (a) maximizes
 - (b) minimizes
 - (c) stable
 - (d) goes negative
9. Which of the following is not a goal of plant layout?
 - (a) minimize the unit cost
 - (b) optimize quality
 - (c) last in first out inventory
 - (d) lifting no more than one part at a time
10. Which of the following is a consequence of a poor layout?
 - (a) material handling cost will be low
 - (b) working conditions are much safer
 - (c) return on capital employed may be high
 - (d) production costs gets jacked up
11. Which of the following is not a major systems of plant layout?
 - (a) product layout
 - (b) flexible layout
 - (c) process layout
 - (d) fixed layout
12. What is an advantage for product layout?
 - (a) hug capital outlay
 - (b) little flexibility
 - (c) discontinuity in production likely
 - (d) lower cost of material handling
13. Which of the following is a disadvantage for product layout?
 - (a) faster production
 - (b) easy monitoring
 - (c) effective team work
 - (d) threat of duplication

14. What is an advantage for process layout?
 - (a) larger production cycle
 - (b) higher material handling costs
 - (c) interesting to workers
 - (d) higher wage bill
15. Which of the following is a disadvantage for process layout?
 - (a) continuity
 - (b) flexibility
 - (c) optimum utilization of resources
 - (d) monitoring may be complex
16. Which of the following is a disadvantage for a fixed layout?
 - (a) high degree of flexibility
 - (b) at times, resources may be under utilized
 - (c) does not involve large investment
 - (d) job enlargement can be effectively practiced
17. What refers to the process of providing the worker a bigger role to play in the job when he gets bored with his/her present job?
 - (a) job profile
 - (b) job enrichment
 - (c) job enlargement
 - (d) job rotation
18. Optimization implies
 - (a) maximize costs, maximize revenues
 - (b) minimize costs, minimize revenues
 - (c) maximize costs, minimize revenues
 - (d) minimize costs, maximize revenues
19. What are the economies available to all firms in an industrial belt or area?
 - (a) diseconomies
 - (b) internal economies
 - (c) external economies
 - (d) both internal & external economies
20. What is a determinant of productivity and profitability?
 - (a) resources layout
 - (b) plant layout
 - (c) plant location
 - (d) facilities layout
21. What is the process of determining a spatial location for a collection of physical production facilities?
 - (a) plant location
 - (b) facilities location
 - (c) plant layout
 - (d) transport facility
22. Which layout has relatively high degree of flexibility?
 - (a) product layout
 - (b) process layout

- (c) flexible layout
 - (d) fixed layout
23. Which layout facilitates high degree of automation to minimize fatigue and error?
- (a) product layout
 - (b) process layout
 - (c) flexible layout
 - (d) fixed layout

Question II: Fill in the Blanks

1. Plant location is a decision.
2. Optimisation refers to of costs and of revenues.
3. The location of the plant should be in such a place where the are available.
4. One of the commitments of the Government of India is of all the regions in the country.
5. The economies available to all the firms in an industrial belt or area are called economies.
6. In a vast country such as India, wage rate differences should be read along with differences.
7. The process of determining a spatial location for a collection of physical production facilities is called
8. Plant layout is a determinant of and profitability.
9. If plant layout principles are not followed, the material handling costs will
10. Optimum layout is one which ensures the most of machines, processing equipment, and service departments.
11. The pattern of plant layout is basically divided by the relationship between the and
12. Where the production facilities remain unchanged, that layout is called
13. In layout, the degree of flexibility is relatively very high.
14. That layout, wherein a breakdown in one machine leads to a breakdown of the entire production facility, is called

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Agglomeration economies
2. Goals of plant layout
3. The relevance of plant layout studies
4. Consequences of poor plant layout
5. Product layout
6. Combination layout

Question IV: Essay Type Questions

1. Explain in brief the factors determining the location of an industrial plant.

2. What do you understand by plant layout? Explain its systems and evaluate the same.
3. ‘Product layout is better than process layout.’ Do you agree with this statement? Support your answer.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. b | 2. c | 3. d | 4. c | 5. a |
| 6. c | 7. d | 8. b | 9. c | 10. d |
| 11. b | 12. d | 13. d | 14. c | 15. d |
| 16. b | 17. c | 18. d | 19. c | 20. b |
| 21. c | 22. b | 23. a | | |

Answers to Question II

- | | |
|-------------------------------|---|
| 1. strategic | 8. productivity |
| 2. minimisation, maximisation | 9. high |
| 3. large-scale economies | 10. effective physical arrangement |
| 4. balanced development | 11. number of products, production quantity |
| 5. external | 12. fixed layout |
| 6. productivity level | 13. process or functional layout |
| 7. plant layout | 14. product layout |

Learning Objectives

By the time you complete this chapter, you should be able to

- understand the concept of statistical quality control
- explain the concept of inspection and evaluate different methods of inspection
- explain, produce, and evaluate the process control charts
- explain the concept of sampling plan used to carry out acceptance sampling

INTRODUCTION

Quality is the determining factor for the success of any product or service. Large resources are committed in every organisation to ensure quality. How is quality ensured? This chapter answers this question.

What is Quality

Quality is defined as ‘customer satisfaction’ in general and ‘fitness for use’ in particular. Both — the external consumers who buy the products and services and the internal consumers, that is, all divisions or departments of the business organisation — are equally interested in the quality. Assume that there are two departments X and Y in an organisation. Department Y is said to be the internal consumer of the products of department X when the output of department X is further processed in department Y. The output of department Y will be of good quality only when the inputs it receives from the department X are error-free.

Quality control is a management tool. It is used to produce quality goods. The quality specifications are established in terms of acceptable limits of quality requirements such as size, weight, finish, function, and so on. The quality of products is maintained within these control limits. Quality refers to *any measurable characteristic* of a particular product or service. It is necessary that the products manufactured should be free of defects.

STATISTICAL QUALITY CONTROL (SQC)

The process of applying statistical principles to solve the problem of controlling the quality control of a product or service is called *statistical quality control*. W.A. Shewhart introduced, in 1931, the control charts on the basis of statistical principles. These are used to ensure quality.

Quality can be of two elements: (a) quality of design and (b) quality of conformance. Quality of design refers to product features such as performance, reliability, durability, ease of use, serviceability, and so on. Compare two cars, say, Maruti 800 and Indica. They look totally different in their features. Why? It is because

they are designed differently. Quality of conformance means whether the product meets the given quality specifications or not. In SQC, we are concerned with the quality of conformance.

INSPECTION

The process of measuring the output and comparing it to check whether it meets the given specified requirements or not, is called *inspection*. The main objective of inspection function is to determine conformity of the goods so produced to their specifications in terms of measurements, composition, strength or hardness, and so forth.

Why is Inspection Necessary

Inspection is done for a wide variety of purposes. They are:

- To separate bad products from good products
- To determine the process deviations
- To measure process capability
- To rate product quality
- To minimise the cost, in terms of rework, of the spoilt or defective items
- To provide data to product designers by identifying the root cause for the defects
- To rate the inspector's accuracy or
- To determine how far the measuring instruments are precise

The nature and process of inspection varies in relation to its purpose.

Inspection and Testing

The line of difference between inspection and testing is getting thin. Inspection is carried out under static conditions on items such as components. The activities of inspection generally range from simple visual examination to a series of complex measurements. In other words, inspection emphasises conformance to a given standard.

Testing is performed under static and also dynamic conditions. It is performed on more complicated items such as sub-assemblies or systems. The results of testing are used not only to determine conformance but also to evaluate a new design, diagnose problems, or make physical adjustments on products. The concepts of testing or inspection are useful to the manufacturers and also the service providers. For instance, service organisations use different terms such as review, checking, reconciliation, examination, and others for inspection or testing. Examples such as the accuracy of a sales-tax return, the cleanliness of a hotel room, or the tallying of a bank teller's closing balance with available cash are all real forms of inspection which involve measurement of the actuals and comparing these against the specifications. The decisions are taken based on the results of the testing or inspection.

Locating the Inspection Stations

Flow chart is the basic tool that helps to choose the location of inspection stations. The usual locations are:

- The point of receipt of material inputs (either raw materials or semi-finished goods) from suppliers. This is called *incoming inspection*.

- The last stage of the production process to assure the quality of the goods produced before shipping the completed products to the storage or to the customers. In either of these cases, it is called *final inspection* or *finished products inspection*.
- After the production machinery is set up and before the actual production starts, an inspection is required which is called *set-up approval*. This gives added assurance about quality or against the production of a defective batch.
- Processes which are critical, costly, or irreversible. This is called *process inspection*.
- Before delivering work-in-process to another processing department. This is known as *toll gate inspection*.

The inspection station need not necessarily be a fixed zone, where the work comes to the inspector. Where necessary, the inspector goes to the work by patrolling a large area and inspecting at a large number of locations. More often, the inspection station may not be located in or near the production area. The whole of the inspection may be performed on one or more of the locations such as the shipping area, the supplier's plant, or the customer's premises.

Inspection Methods: An Evaluation

The following are the methods of inspection evaluated on the basis of its merits.

Incoming inspection In this method, the quality of the goods and services arriving into the organisation is inspected. This ensures that the material supplies adhere to the given specifications. With this, defective material cannot enter into the production process. This focuses on the vendor's quality and ability to supply acceptable raw materials. At times, the material supplies are inspected on random sample basis. Particularly, where the materials or spares are vital in nature such as defence equipment or aircraft components, a 100 per cent inspection is undertaken. After inspection, the materials are forwarded to the stores or assembly lines.

Critical point inspection Inspecting at the critical points of a product manufacture gives valuable insight into the whole functional process. At the points of manufacture which involve high costs or which offer no possibility for repair or rework, inspection is crucial. Further operations depend on these results. Critical point inspection helps to drop the defective production, and thereby, facilitates avoiding unnecessary further expenditure on them. When the defectives are not capable of rework, they are bound to be rejected. For example, gauge of washer products can be inspected by setting the gauge for product tolerance, which is the critical point in this case. If there is a variation from the defined guage limits, the product is rejected and scrapped. The control charts are drawn on the basis of such inspection results.

Process inspection This is also called *patrolling inspection* or *floor inspection* or *roving inspection*. Here, the inspector goes around the manufacturing points in the shop floor to inspect the goods produced on random sample basis from time to time. This helps to identify the faults in the production process in the early stage itself. Hence, it is more effective and desirable.

Fixed inspection It provides for a centralised and independent process where work is brought for inspection from time to time. This method is followed where the inspection equipment cannot be moved to the points of production.

■ SITUATION ANALYSIS ■

Why quality is poor

One of the largest automobile plants issued a statement in the newspapers drawing the attention of all the owners who bought the cars within a particular period. The owners were asked to bring their cars for a detailed check-up to the nearest showroom. This shocked most of the owners and they rushed immediately to the company. The company made elaborate arrangements for a detailed check-up of the engine and other parts of each of the cars and replaced them, free of cost, wherever necessary.

This plant was an ISO 9000 certified company. Yet it had to face this turmoil.

What lapses might have led to such a situation? Were the quality control measures ineffective?

Final inspection This is a centralised inspection making use of special equipment. This certifies the quality of the goods before they are shipped. The final inspection becomes crucial, particularly in products that are of a critical nature such as manufacturing of LPG cylinders, and others. Even a slight degree of negligence may be hazardous.

The authority to provide ISI (Indian Standards Institute) certification to industries in India is the Bureau of Indian Standards (BIS), Government of India. The BIS quality inspectors visit the industries from time to time. In some cases where production is continuous and requires online inspection, the quality inspectors may be stationed in the factory on a shift basis. They certify that the production meets the quality requirements only after inspecting the final products on the shop floor.

ELEMENTS OF STATISTICAL QUALITY CONTROL

The techniques under SQC can be divided into two parts: (a) process control and (b) acceptance sampling. The following table outlines the scope of SQC.

Statistical Quality Control		
Process Control <i>is carried out through</i>		Acceptance Sampling <i>is carried out through</i>
<i>Control Charts</i>		
<i>For Variables</i>	<i>For Attributes</i>	
\bar{X} Charts R Charts σ charts *	'c' chart for number of defects per unit 'p' chart for defectives in a given sample	<ol style="list-style-type: none"> 1. Single sampling plan 2. Double sampling plan 3. Multiple sampling plan ♣ 4. Sequential sampling plan ♦

♣ Not covered here.

♦ Not covered here.

* σ chart is not covered here. These can be studied in the advance courses in quality control.

Process Control

Process control is a technique of ensuring the quality of the products during the manufacturing process itself. If a process consistently produces items with acceptable or tolerable range of specifications, it is said to be statistically under control. Process control is achieved through control charts. Process control aims to control and maintain the quality of the products in the manufacturing process.

Statistical Control Charts

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

The data relating to process performance contains groups of measurements that come from regular sequence of production. It also reflects the order of data. The quality of the production process may be affected by chance/random causes or assignable causes. The main objective of a control chart is not to achieve the state of statistical control but to identify process variation and generate background information helpful to reduce the same.

Chance causes Such causes, which may or may not affect the manufacturing process are called chance causes. Chance causes cannot even be identified. It is not possible to always maintain the given specifications. For instance, the length of a screw may be specified as 2" but the exact length of each manufactured screw may be 1.98" or 2.01". It is physically impossible to manufacture all the components exactly of 2". It is but natural to find a slight variation. The buyer gives his requirements in limits such as $2.00" \pm 0.02"$. These are called specification limits or tolerance limits**.

This variation is due to the chance causes operating on the manufacturing process. Ideally, only chance causes should be present on a process. The control chart of such a process has all of the data points within the statistical *control limits*.

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

The control chart helps to identify the different ways in which the assignable causes can affect the manufacturing process. Assignable causes are said to act upon the production process when the process variation exceeds the control limits. At this stage, the process should be investigated carefully to identify the causes of excessive variation. Random variation within the control limits implies that only chance causes are present and the amount of variation has stabilised, and hence, no more minor process adjustments are required. A control chart can reveal the presence of an assignable cause affecting the manufacturing process but it cannot find out what it is in specific terms. A subsequent investigation of the process alone can reveal what the specific cause is.

The primary objective of a control chart is to detect assignable causes of variation in the manufacturing process. The assignable causes lead to unusual degree of variations and can best be described by normal distribution. Quality controllers define limits within which variations are acceptable. Beyond these limits,

** Tolerance limits are also affected by changes in calibration of the machinery. Normally, calibration is done at the point of purchase for every machine. In the course of time, the calibration measurement gets deviated from the original setting for various reasons such as poor maintenance, wear and tear, and so on. According to the change in calibration, tolerance limits also have to be adjusted.

they are either unacceptable or they may require further examination. Such limits are called *control limits*. For example, in normal distribution, it is expected that 99.73 per cent of all chance or usual variations would occur within limits placed three standard deviations larger, and smaller than the mean value of variable $(\bar{X} \pm 3\sigma)$. Therefore, any variation beyond such limits is due to some other unusual or assignable cause and would immediately call for detailed investigation.

Process capability Process capability refers to the ability to achieve measurable results from a combination of machines, tools, methods, materials, and people engaged in production. The following example¹ highlights the concept of process capability.

EXAMPLE 9.1 The marketing manager of a bulk drug manufacturer describes two scenarios¹—old and new—between a customer and a sales manager:

Old Scenario

Customer: “Your product is not good.”

Sales manager: “I’ll offer discount.”

Customer: “Good, then it is OK.”

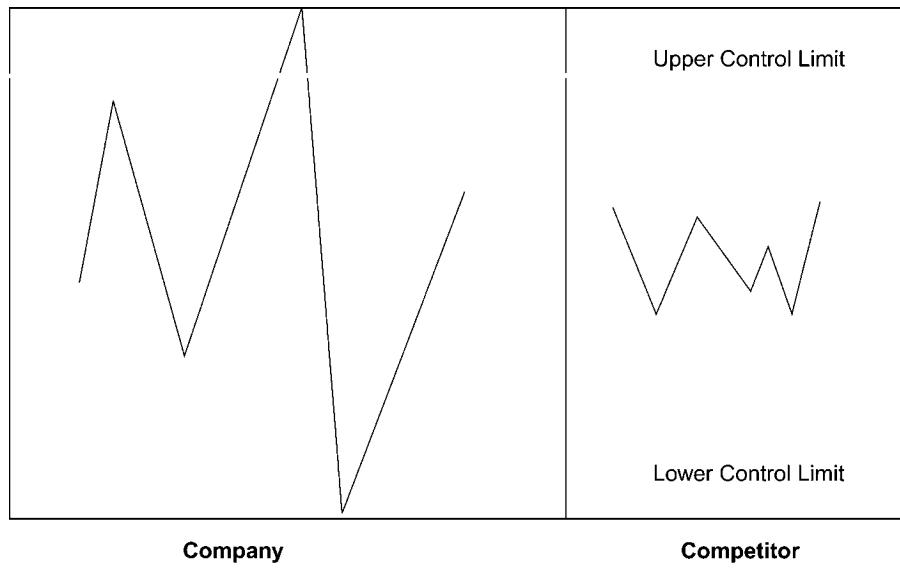


FIGURE 9.1 Variation and competition

New Scenario

Customer: “Your product quality is not good.”

Sales manager: “I’ll offer discount.”

Customer: “The price is acceptable; I said your quality is not good.”

Sales manager: “Is the product out of specification?”

¹Adapted from, J.M. Juran and F.M. Gryna: *Quality Planning and Analysis*, McGraw-Hill, 1993. With kind permission.

Customer: "No."

Sales manager: "I don't understand what you mean."

Customer: "Look at this figure (Fig. 9.1). It's not enough to meet the specifications. Your competitor meets the same specifications with less variability."

Utility of process capability information Process capability information is considered valuable because

- it helps to predict the extent of variability the process will exhibit. Designers value process capability information most because it helps to set realistic specification limits.
- it helps to choose the most appropriate process for the tolerances to be met.
- it assists in analysing how the sequential processes are inter-related. One process may distort or misinterpret the precision achieved by an earlier process, as in the case of wearing out of gear teeth. The quantified process capability information may indicate a solution to such production bottlenecks.
- it provides a basis to establish a schedule of periodical process control checks and necessary adjustments.
- it serves as a basis to specify the requirements for quality performance for new machines.

Confidence limits and control limits

Confidence limits indicate the range of confidence level. A confidence level refers to the probability that the value of a measurement or parameter, such as length of a screw, is correct. If a component is required with a measurement of 50 mm across, then the buyer may accept all components measuring between 48 mm and 52 mm across, considering a five per cent confidence level.

Control limits are found in the control charts. There are two control limits: upper control limit (UCL) and lower control limit (LCL). These are determined based on the principles of *normal distribution*. Control limits are used to decide whether the variation found in the production process is desirable or undesirable. In other words, when all the measurements fall within control limits, the variation is marginal or small. In such a case, no action is necessary. But where any of the measurements cross either the upper control limit or the lower control limit, it is an indication of the presence of an assignable cause and this calls for an immediate action to set the process under control.

Confidence limits are calculated by means of standard deviation (σ). If the process follows a normal distribution, the following are the percentage of observations for the defined σ limits:

Area of Normal Distribution Curve	Confidence Limits (% of observations covered)
$\pm 1\sigma$	68.27
$\pm 1.96\sigma$	95.0
$\pm 2\sigma$	95.45
$\pm 3\sigma$	99.73

As the above table reveals, $\pm 1\sigma$ occupy 68.27 per cent of the area of the normal curve and indicate that one can be 68.27 per cent confident that a random observation will fall in this area. Similarly, $\pm 2\sigma$ and $\pm 3\sigma$ limits occupy 95.45 per cent and 99.73 per cent area of the normal curve, respectively and possess a confidence

level of 95.45 per cent and 99.73 per cent, respectively. For plotting control charts, generally $\pm 3\sigma$ limits are selected and termed as control limits. After calculating σ , the upper control and lower control limits for a control chart can be determined.

EXAMPLE 9.2 In a pilot investigation of the length of the nails produced in the shop floor, it is found that the mean length \bar{X} is 4 cm, the standard deviation 3σ , the measure of variability of the nails produced 0.2 cm. How do you construct the control chart for this data?

SOLUTION A control chart can be set up with a mean of 4 cm and control limits of plus and minus 3 standard deviations. Such a chart (Fig. 9.2) can be used to test the quality of the nails then produced.

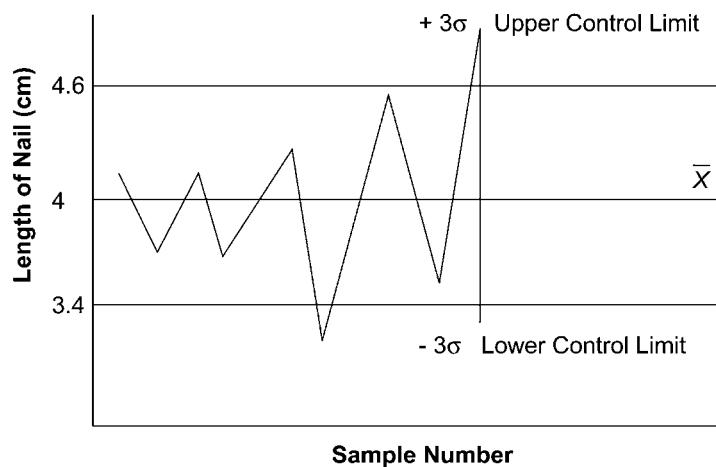


FIGURE 9.2 A sample control chart

Rather than examining every nail, a sample number of nails produced every hour is taken for detailed examination. The variations found in such a sample are plotted on the control chart. From this chart, it can be discovered that the process is initially in control. But later it is running out of control. This implies that it is often producing the nails shorter or longer than specified.

It can further be seen that one sample goes beyond upper control limit and one goes below the lower control limit. This is an indication that the process is out of control and there are assignable causes acting upon the process. The ideal control chart should reveal the pattern as shown in Figure 9.3 (as that of the teeth of the carpenter's saw).

If the measurement of one sample is below the central line, the next one should be above the central line and this pattern should continue. The control chart should reveal a zigzag pattern. Then the process can said to be well under control.

Advantages of control charts The following are the advantages of control charts:

- The control charts for variables and attributes focus on the assignable causes and help to bring a substantial improvement in product quality. Thus, they reduce the need for rework or spoilage.
- The inspection work is less as goods produced are inspected by samples.
- These highlight when the process is likely to be out of control and also when the tools need to be better planned, adjusted, or reset.

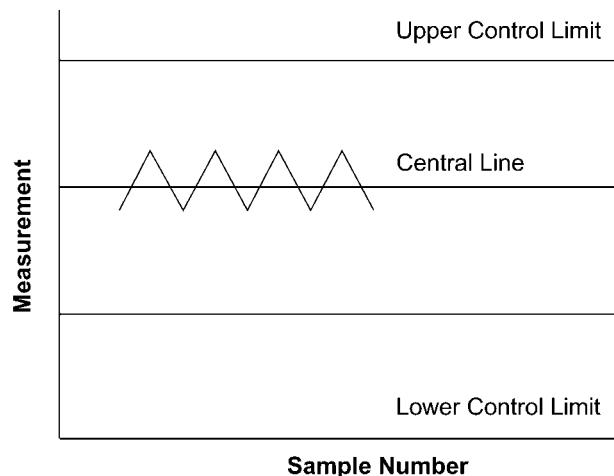


FIGURE 9.3 *An ideal control chart*

- These charts help to determine whether the process capability is compatible with the specifications or not.

How does an assignable cause affect the production process The following are the different ways in which an assignable cause can influence the production process:

The measurement of given samples, plotted in the control chart, should not be very close to the central line (if these are too close to the central line, it is called *hugging*). In such a case, it is too difficult to control quality. Points plotted too close to the central line (see Fig. 9.4) indicate that assignable causes are present.

The spread should be *uniform*. It should be equidistant from the central line. The distance of upper and lower control limits from the central line determines the extent of spread desirable.

If any variable crosses the lower or upper control limit, it is called a *freak*. In Figure 9.2, two points are plotted outside the control limits, one beyond the upper control limit and the other beyond the lower control limit. These are freaks.

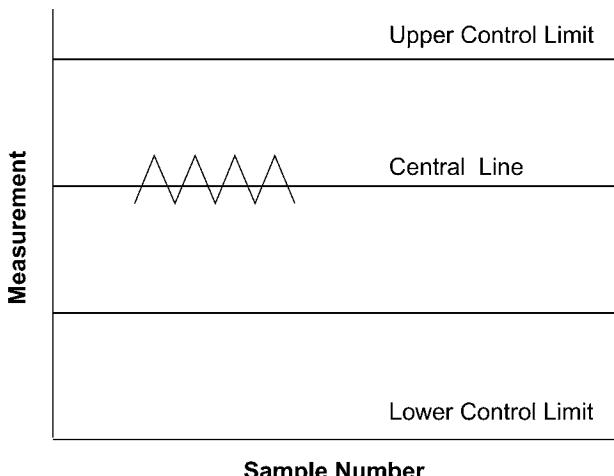


FIGURE 9.4 *Points plotted too close to the central line—a case of possible presence of assignable causes on the manufacturing process*

A shift in the process average is considered significant

- (a) if there are seven points on one side of the central line
- (b) if 10 out of 11 successive points on the control charts are on one side of the central line
- (c) if 12 out of 14 successive points on the control charts are on one side of the central line
- (d) if 14 out of 17 successive points on the control charts are on one side of the central line
- (e) if 16 out of 20 successive points on the control chart are on one side of the central line

In each of these cases, it is called a *run*.

Whenever points fall beyond the control limits,

- investigate the likely causes
- take an appropriate corrective action
- inspect the items remaining in the batch, if necessary

Control Charts For Variables

A variable is one whose quality measurement changes from unit to unit. The quality of these variables is measured in terms of hardness, thickness, length, and so on. The control charts for variables are drawn using the principles of normal distribution. These are usually designed to test the means of the samples more effectively rather than the measurement of the individual variables. In other words, the means of samples tend to be distributed normally though the actual variables resulting from a process do not conform to the normal distribution. This tendency is called Central Limit Theorem. Therefore, while constructing a control chart, only the mean or the average value of the dimensions in the sample is plotted on it. The distribution of means is aptly represented by the standard deviation, which is calculated as below:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \text{ where } \sigma_{\bar{x}} = \text{standard deviation of mean values of samples}$$

σ = standard deviation of individual samples

n = sample size.

There are two types of control charts for variables: \bar{X} and R charts

The control limits are set at $\pm 3\sigma$ for sample averages and sample ranges. The \bar{X} and R values are plotted on separate charts against their $\pm 3\sigma$ limits. The formulae for the control limits on sample averages are:

For \bar{X} chart

$$\text{Upper control limit} = \bar{\bar{X}} + A_2 \bar{R}$$

$$\text{Lower control limit} = \bar{\bar{X}} - A_2 \bar{R}$$

where $\bar{\bar{X}}$ = mean of means, \bar{R} = mean of sample ranges, and A_2 = constant taken from the table of constants given below.

For R chart

$$\text{Upper control limit} = D_4 \bar{R}$$

$$\text{Lower control limit} = D_3 \bar{R}$$

Where D_3 and D_4 are constants from the table of constants and \bar{R} is the average of sample ranges. (Range is the difference between the maximum variable and minimum variable. If there are four variables in each sample, such as 2 cm, 3 cm, 4 cm, and 5 cm, the range is 3 cm (5 cm–2 cm). The average of such ranges is called \bar{R}).

The values of A_2 , D_3 , and D_4 are given in the following table:

Table of Constants for \bar{X} and R charts

n	A_2	D_3	D_4
2	1.880	0	3.268
3	1.023	0	2.574
4	0.729	0	2.282
5	0.577	0	2.114
6	0.483	0	2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777

Procedure for constructing \bar{X} chart

- (a) Compute average of averages $\bar{\bar{X}}$
- (b) Calculate average range \bar{R}
- (c) Multiply the average range by the conversion factor A_2 . This gives $A_2\bar{R}$
 - (i) To obtain the upper control limit, apply the following formula

$$\text{Upper control limit} = \bar{\bar{X}} + A_2\bar{R}$$

- (ii) To obtain the lower control limit, apply the following formula:

$$\text{Lower control limit} = \bar{\bar{X}} - A_2\bar{R}$$

Procedure for constructing R chart

- (a) Compute \bar{X} and R for each of the samples obtained
- (b) Calculate average range \bar{R}
- (c) Multiply the average range by the conversion factor (D_4 or D_3).
 - (i) To obtain the upper control limit, apply the following formula:

$$\text{Upper control limit} = D_4\bar{R}$$

- (ii) To obtain the lower control limit, apply the following formula:

$$\text{Lower control limit} = D_3\bar{R}$$

Interpretation of \bar{X} chart and R chart Keep the \bar{X} chart and the R chart one above the other so that the average and range for any one subgroup are on the same vertical line. If any of the subgroups display lack of control for that subgroup, it can be observed either in one or both the charts.

If all points fall within the control limits, it can be concluded that the process is free from the influence of assignable causes. In case any of the points fall outside the control limits of \bar{X} chart, it is an indication that there is a general change affecting the process after the first freak. In such a case, it is better to study the operational details of the process and the workers' feedback to identify the cause for such variation. Typical causes of variation could be a tool wear, changes in temperature or vibration, defective raw materials, faulty equipment, untrained or inefficient production staff, improper machine settings, and so on.

If any of the points lie outside the control limits of R chart, it is an evidence that there is variability in the production process. Whenever there is a change in personnel, increased variability of material, or excessive wear and tear in the process machinery, it is likely that uniformity of the process gets affected. The R chart is so significant that it can warn even the impending machine accidents.

The \bar{X} chart points out the causes for the variations between samples based on averages. \bar{X} chart assumes that the process variation remains stable. This chart helps to detect the shift of any degree in the production process. The R chart indicates causes for the variation within the sample. It is likely that a sample with the same mean may not reveal a shift in the process at all. Hence, it is necessary to read both the \bar{X} and the R chart together to decide whether the process is under control or not. It is ideal to construct the R chart first and see if there is any significant variation including breakdown in the production process.

The \bar{X} chart will be meaningful only when quality variation is brought to the minimum level.

EXAMPLE 9.3 Construct \bar{X} and R charts from the following information and state whether the process is in control. For each of the following \bar{X} has been computed from a sample of 5 units drawn at an interval of half an hour from an ongoing manufacturing process.

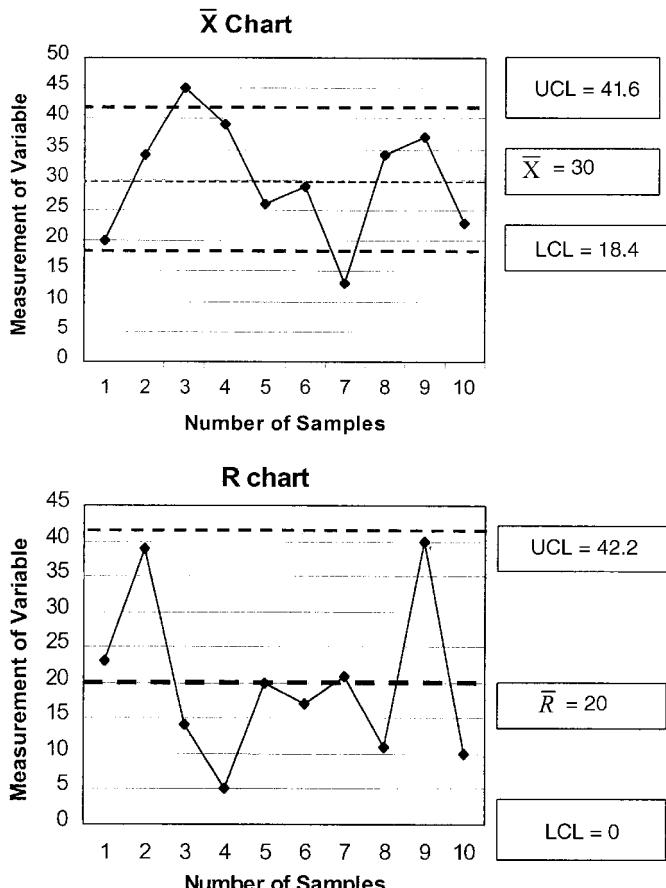
Sample	1	2	3	4	5	6	7	8	9	10
\bar{X}	20	34	45	39	26	29	13	34	37	23
R	23	39	14	5	20	17	21	11	40	10

SOLUTION The mean of means is calculated as shown below:

$$\bar{\bar{X}} = \frac{\sum \bar{X}}{n} \\ = 30$$

\bar{R} is calculated as below:

$$\bar{R} = \frac{\sum R}{n} \\ = 20$$

Figure 9.5: \bar{X} and R chartsFIGURE 9.5 \bar{X} and R charts

The upper and lower control limits for the \bar{X} chart are computed as below:

Considering the value of $\bar{X} = 30$, $\bar{R} = 20$, and $A_2 = 0.58$

$$\text{Upper control limit} = \bar{X} + A_2 \bar{R} = 30 + (0.58 \times 20)$$

$$= 30 + 11.6$$

$$= 41.6$$

$$\text{Lower control limit} = \bar{X} - A_2 \bar{R} = 30 - (0.58 \times 20)$$

$$= 30 - 11.6$$

$$= 18.4$$

Computation of control limits for R chart Refer to the table of constants given on page 147 to find out the value of D_4 for a sample size of 5. The value is 2.11

$$\text{Upper control limit} = D_4 \bar{R} = 2.11(20) = 42.2$$

Since the value of D_3 is zero, the LCL is zero.

$$\text{Lower control limit} = D_3 \bar{R} = 0(20) = 0$$

Two control charts are prepared to show the quality pattern of the above samples. These charts shown in Figure 9.5 reveal that sample number 3 and 7 are indicative of some assignable cause, and hence, the process is out of control at these points.

\bar{X} and R charts: An evaluation The \bar{X} chart is used to show the process variations based on the average measurement of the samples collected. It throws more light on diagnosing quality problems when read along with R chart. It shows the erratic or cyclic shifts in the manufacturing process. It can also focus on when to take a remedial measure to set right the quality problems. However, collecting data about all the variables involves a large amount of time and resources.

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

Control Charts for Attributes

The quality of attributes can be determined on the basis of ‘yes or no’, or ‘go or no go’. In other words, in case of a mirror-glass, even if there is one scratch, it is not considered to be a quality mirror. In such a case, the quality is decided based on whether the mirror has any scratches or not. Each scratch is considered as a *defect*. Every mirror containing one or more than one defects is called *defective*. In some cases, if the number of defects per unit is low, it can be sold as a second-quality item. The control charts for attributes are ‘c’ chart and ‘p’ chart.

‘c’ chart ‘c’ chart is used where there are a *number of defects per unit*. This control chart controls the number of defects per unit. Here the sample size should be constant. A control chart reveals the pattern of the quality. This chart is useful when several independent defects may occur in every unit produced, as in complex assemblies. The control limits are calculated as below:

$$\text{Upper control limit} = \bar{c} + 3\sqrt{\bar{c}}$$

$$\text{Lower control limit} = \bar{c} - 3\sqrt{\bar{c}}$$

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

EXAMPLE 9.4 Take a case of paper sheets and the number of defects on each of these. Specimen sheets of 10 by 15 inches in size were taken from production at regular intervals, and coloured ink was applied to one side of the sheet. Each individual inkblot appearing on the other side of the sheet within three minutes,

was counted as a defect. Twenty sheets were inspected and a total of one hundred defects were found. The particulars of the number of defects in each sample are furnished below:

Sample Number	Number of Defects	Sample Number	Number of Defects
1	5	12	6
2	4	13	7
3	9	14	3
4	7	15	5
5	8	16	3
6	9	17	2
7	4	18	1
8	5	19	7
9	2	20	<u>3</u>
10	6	Total number of defects	<u>100</u>
11	4		

SOLUTION The control limits are calculated as below: The central line of the chart is located at $\bar{c} = 100/20 = 5$ defects per sheet.

$$\text{Upper control limit} = \bar{c} + 3\sqrt{\bar{c}} = 5 + 3\sqrt{5} = 11.69$$

Lower control limit = $\bar{c} + 3\sqrt{\bar{c}} = 5 - 3\sqrt{5} = 0$ (in case this value is negative, take it as equal to zero). As upper control limit reveals, all such samples with defects more than 11.6 per sample are considered to be outside the control limits. Figure 9.6 shows that all samples are under control as all samples are within the limits.

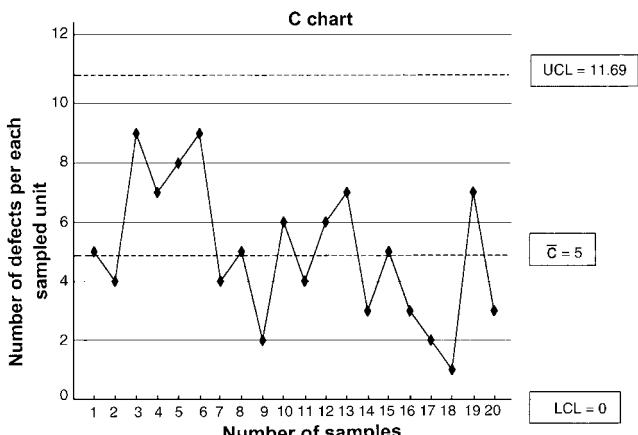


FIGURE 9.6 c chart for defects

'p' chart 'p' chart is used where there is data about the *number of defectives per sample*. It is also called fraction defective chart or percentage defective chart. Here, each item is classified on 'go or no go' basis, that is, good or bad (defective). Data collection costs and efforts are relatively less under this method. Hence, if the sample size is larger, the results could be better.

The following are the formulae to compute the control limits for p-chart:

$$\text{Upper control limit} = \bar{p} + 3 \frac{\sqrt{\bar{p}(1 - \bar{p})}}{n}$$

$$\text{Lower control limit} = \bar{p} - 3 \frac{\sqrt{\bar{p}(1 - \bar{p})}}{n}$$

$$\text{where average defective } (\bar{p}) = \frac{\text{Total number of defectives found}}{\text{Total number of pieces inspected}}$$

and 'n' refers to number of pieces inspected per day.

EXAMPLE 9.5 For each of the 14 days, a number of magnets used in electric relays are inspected and the number of defectives is recorded. The total number of magnets tested is 14,000. The following are the particulars of the number of defectives found every day.

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

SOLUTION Compute the total number of defectives; it is 1400.

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

Percentage defective $= (\text{Number of defectives found every day}/\text{Number of pieces inspected every day})$.

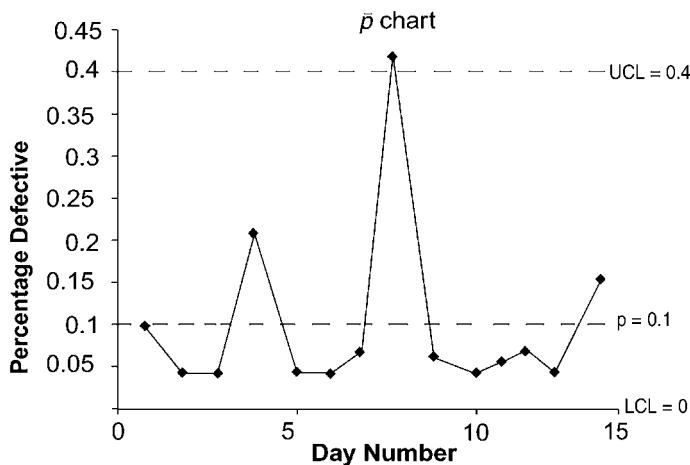


FIGURE 9.7 \bar{p} -chart

The percentage defective has to be worked out for all the weeks as below:

Day Number	Percentage defective	Day Number	Percentage Defective
1	$100/1000 = 0.1$	8	$420/1000 = 0.42$
2	$50/1000 = 0.05$	9	$60/1000 = 0.06$
3	$50/1000 = 0.05$	10	$40/1000 = 0.04$
4	$200/1000 = 0.2$	11	$50/1000 = 0.05$
5	$50/1000 = 0.05$	12	$70/1000 = 0.07$
6	$50/1000 = 0.05$	13	$40/1000 = 0.04$
7	$80/1000 = 0.08$	14	$140/1000 = 0.14$

$$\text{Average percentage defective } (\bar{p}) = \frac{\text{Total number of defectives found}}{\text{Total number of pieces inspected}}$$

$$= \frac{1400}{14000} = 0.1$$

$$\text{Upper control limit} = \bar{p} + 3\sqrt{\frac{\bar{p}(1 - \bar{p})}{n}} = 0.1 + 3\sqrt{\frac{0.1(1 - 0.1)}{1000}} = 0.4$$

$$\text{Lower control limit} = \bar{p} - 3\sqrt{\frac{\bar{p}(1 - \bar{p})}{n}} = 0.1 - 3\sqrt{\frac{0.1(1 - 0.1)}{1000}} = 0$$

Construct p chart plotting percentage defective an Y axis while taking sample numbers on X axis. A close examination of all the percentage defectives from Figure 9.7 reveals that for the ninth week, the sample is above the upper control limit. This indicates a significantly high percentage defective, which implies that there is an assignable cause on the manufacturing process. Such cases may also result due to a lapse from the inspection department or the sample size being quite different from the average used to calculate the limits. Control limits are very sensitive to detect the presence of assignable causes on the production process.

Evaluation of control charts for attributes When such charts are prepared for a process, a dramatic and quick improvement in quality may follow. There can be several reasons for such an improvement. First, these charts may provide tangible evidence that management is truly committed to quality. Second, these charts may provide an operator with useful information to do his job better.

Acceptance Sampling

Acceptance sampling is a technique of deciding whether to accept the whole lot or not, based on the number of defectives from a randomly drawn sample. It is the process of ensuring the quality of the products at the point of sale. In other words, it is intended to guarantee the customer that the lot meant for sale does not contain defective products.

It is widely used in buying food products such as rice, wheat, and other agricultural produce. Before buying, the random samples drawn from the bags of, say, rice or wheat, are tested. If the quality of the samples drawn

looks good or free from defects, then according to the requirement the entire bag or a part of it can be bought. If the quality is not good, one would shift to another bag. In other words, the entire bag is rejected on the basis of the results of the samples drawn.

Acceptance sampling is used when

- the cost of inspection is high in relation to the damage cost resulting from passing a defective product
- 100 per cent inspection is monotonous and causes inspection errors
- the inspection calls for destroying the products manufactured as in the case of bombs, and others

Why is acceptance sampling preferred? Acceptance sampling is much preferred because it is economical to carry out. Despite some additional costs for designing and administering the sampling plans, the lower costs of inspecting only a part of the lot result in an overall reduction in cost.

In addition to this main advantage, there are some others worth considering:

- The smaller the number of inspection staff, the less complex and less costly it is to administer
- There is less damage to the product because, at times, the handling process associated with inspection itself may be a source of defects
- The lot is disposed of in a shorter time so that scheduling and delivery are improved
- The problem of monotony and inspection errors resulting from 100 per cent inspection is minimised
- Rejection (rather than sorting) of non-conforming lots urges the organisation to look for preventive measures
- Proper design of the sampling plan commonly requires study of the actual level of quality required by the user and it is helpful for the overall quality planning

The *disadvantages* of sampling plans include sampling risks, greater administration costs, and less information about the product than is provided by 100 per cent inspection.

The process of acceptance sampling The buyer makes it clear to the seller/manufacturer that he can buy the entire lot only if the number of defectives in the sample taken, say, of 50 units, is two or less than two. In other words,

- if the number of defectives is zero, buyer will accept the lot
- if the number of defectives is one, he will accept
- if it is two, he will accept
- if the number of defectives is three, then he will reject the entire lot

Thus, based on the results of the sample drawn, the decision is taken either to accept or reject the entire lot. The probability of acceptance is high in case the number of defectives is lower.

Operating Characteristic (OC) Curve

The graphic relationship between the probability of acceptance $P(a)$ and the percentage defective (p) is called Operating Characteristic (OC) curve. The OC curve depends on three variables: the size of the entire lot (N), the size of the sample (n), and the number of defectives in the sample (c).

Figure 9.8 acceptance sampling is more effective when a prevention programme that achieves an acceptable level of quality of conformance precedes it. However, it should be noted that acceptance sampling does not

- provide refined estimates of lot quality
- provide judgements on whether or not the rejected product is fit for use

Sampling risks and the OC curve Sampling involves a risk that the sample will not adequately reflect the conditions in the lot and as a result the inspectors may miss some of the defectives. Both of these risks can be quantified.

Sampling risks are of two kinds:

Producer's risk The risk in getting good lots rejected is called the producer's risk. This is denoted by α .

Consumer's risk The risk in getting bad lots accepted is called the consumer's risk. This is denoted by β .

The operating characteristic curve for a sampling plan quantifies these risks. The OC curve for an attribute is a graph of the percentage defective in a lot versus the probability of acceptance for all possible values of p . It is assumed that an infinite number of lots are produced.

An acceptance sampling plan basically consists of a sample size (n) and an acceptance criterion (c). For example, a sample of 125 units is to be randomly selected from the lot. If five or less than five defectives are found from this sample, the lot is accepted. If six or more defectives are found, the entire lot is rejected. The sample of 125 could, by the law of chance, contain zero, one, two, or three, even up to 125 defectives. It is this sampling variation that causes some good lots to be rejected and also some bad lots to be accepted.

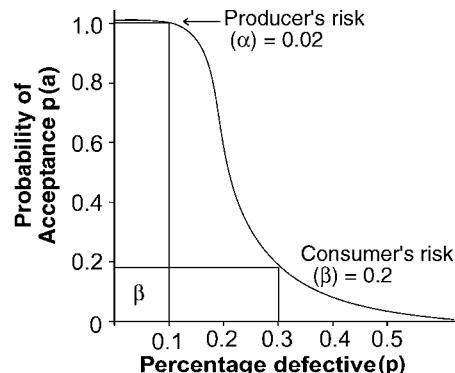


FIGURE 9.8 OC curve

Figure 9.8 shows an operating characteristic curve, that shows a 10 per cent defective lot has about 98 per cent chance of being accepted which implies producer's risk (α) of 0.02. Whereas a much worse lot, say 30 per cent defective, has just a 20 per cent chance of being accepted showing a consumer risk (β) of 0.2. By defining risks, quantitatively, the adequacy of the sampling plans can be judged. The OC curve for a specific sampling plan states about the chances for acceptance for a lot having a defined percentage defective.

The OC curve for a specific plan states only the chance that a lot having p per cent defective will be accepted by the sampling plan.

Parameters affecting acceptance sampling plans The degree of risk in sampling is based on three factors: lot size, sample size, and the acceptance number (see Figure 9.9). In Figure 9.9(a), the sample size

(n) and acceptance number (c) are held constant and the lot size (N) is changed. It can be noted that the lot size has marginal effect on the probability of acceptance.

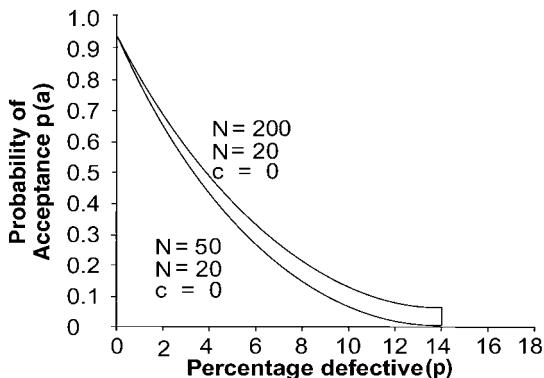


FIGURE 9.9a Effect of changing lot size (N) on OC curve

This shows that lot size is almost a dummy factor except in cases where it is substantially significant (i.e. 10 to 15 times the sample size and the sample is selected randomly). It is always better to have larger lot sizes to have a better OC curve in order to reduce the risk of error for costly products. The higher the cost of products, the more precise should be the OC curve. This is the reason why most sampling tables show lot size also as one of the parameters. (With an increase in the lot size, the absolute sample size increases while the ratio of sample size to lot size decreases). Other things remaining the same, mere lot size cannot be an effective variable to influence the probability of acceptance.

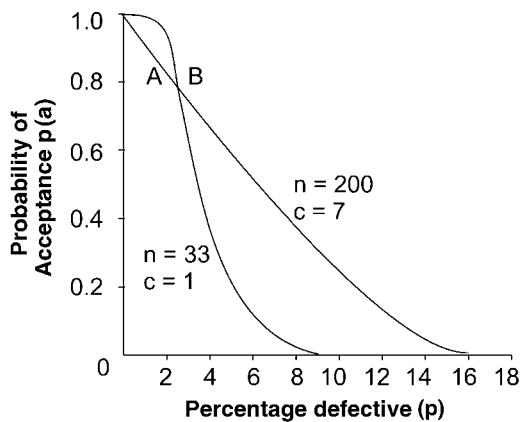


FIGURE 9.9b Effect of increasing sample size (n) and acceptance number (c) on OC curve

The effect of other parameters, that is, sample size n and accept number c is shown in Figure 9.9b. Any number beyond accept number is reject number. The following table shows that in a sample of 200 units (n), if the acceptance number (c) is seven, the reject number is eight. This implies that if the number of defectives in the sample of 200 units is less than seven, accept the lot. If the number of defectives is more than seven, reject the entire lot. Where the safety is the main consideration, the acceptance number should necessarily be zero. This means that even if there is one defective in the given sample, the entire lot, in such a case, is rejected.

Sampling plan	Sampling size (n)	Accept number (c)	Reject number
A	200	7	8
B	33	1	2

- The OC curve is concave upward when the acceptance number is zero. In other words, for lower values of n and c , OC curve is less steeper to start with but in due course it tends to be steeper. For higher values of n and c , it is very steep in the beginning but it tends to be less steeper afterwards.
- The probability of acceptance, for low values of p , increases when the acceptance number increases.
- To reach the ideal OC curve, it is necessary to increase the sample size and acceptance number together.

Quality indices for acceptance sampling plans The following are the different quality indices:

Acceptable Quality Level (AQL) AQL refers to that desired quality level or that percentage of defective at which the probability of acceptance is high. At lower levels of percentage defective, the probability of acceptance is high, and vice versa. In other words, if the acceptance quality level is high (which means that the percentage defective is low), the probability of acceptance is high. Given the value of acceptable quality level, the producer's risk can be determined, and vice versa.

Lot Tolerance Percentage Defective (LTPD) Lot tolerance percentage defective refers to that degree of percentage defective in the lot that makes the lot tolerable or acceptable. In other words, if the lot tolerance percentage defective is high, the probability of acceptance is low, and vice versa. Given the value of LTPD, the consumer's risk can be determined, and vice versa. It is that quality level, below which batches are considered unacceptable because the probability of acceptance is low.

Figure 9.10 depicts the producer's risk, consumer's risk, AQL, and LTPD on a given OC curve. From this figure, it can be noted that if the producer's risk is given (measured from the top of the OC curve) AQL can be determined. Given that AQL is 20 per cent, producer's risk can be determined as about 15 per cent and

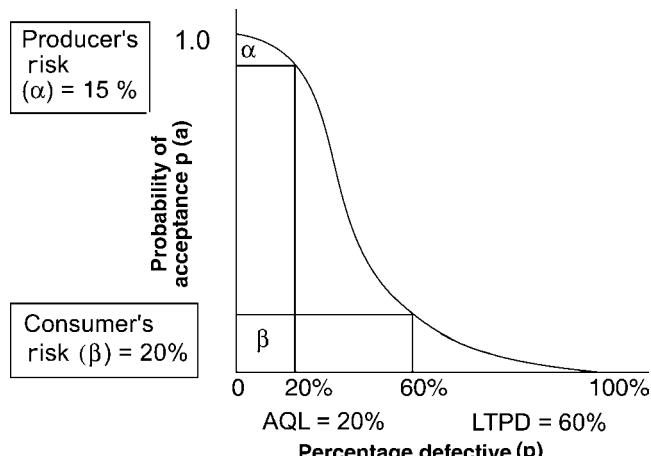


FIGURE 9.10 *Operating characteristic (OC) curve depicting producer's risk, consumer's risk, AQL, and LTPD*

vice versa. Similarly, if LTPD is given as 60 per cent, consumer's risk (measured at the bottom of the OC curve) can be measured as about 20 per cent. Similarly, if the consumer's risk (measured at the bottom of the OC curve) is determined, LTPD can be determined.

Ideal OC curve Figure 9.11 shows an ideal OC curve where it is desired to accept all lots having a quality level of 1.5 per cent defective or less and reject all lots greater than 1.5 per cent defective. All lots less than 1.5 per cent defective have a probability of acceptance of 1.0 (certainty); all lots greater than 1.5 per cent defective have a probability of acceptance of zero. Actually, however, no sampling plan exists that can discriminate perfectly; there always remains some risk that a good lot will be rejected or that a bad lot will be accepted. The best that can be achieved is to make the acceptance of good lots more likely than the acceptance of bad lots.

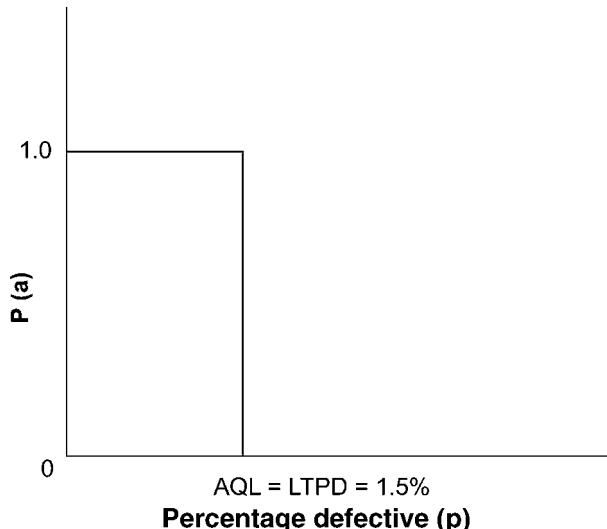


FIGURE 9.11 *Ideal OC curve*

The OC curve is said to be ideal when it is of a rectangle shape, implying that AQL and LTPD are equal as shown in Figure 9.11.

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

- (a) Single sampling plan,
- (b) Double sampling plan,
- (c) Multiple sampling plan, and
- (d) Sequential sampling plan. (Multiple and sequential sampling plans will be covered in the advanced courses on quality management.)

Single sampling plan Here, decision is taken to accept or reject the entire lot on the basis of the results of only one sample. If the number of defectives is less than the acceptance number then the entire lot is accepted. Otherwise, the entire lot is rejected. To illustrate, if $N = 1000$, $n = 50$, and $c = 3$, the number of defectives from a random sample of 50 should be 0, 1, 2, or 3. Then the entire lot of 1000 units can be accepted. If the number of defectives exceeds three then the entire lot is rejected.

Evaluation This method is simple to operate. However, the fact that the number of defectives in the sample selected is less does not mean that the entire lot is free from defectives. If the number of defectives in the sample is more for any reason, it is detrimental to the producer. Similarly, if the number of defectives in the sample is less and the remaining lot contains more defectives, it is a risk to the consumer.

Double Sampling Plan This plan protects both producer and consumer from their respective risks. Here, the decision to accept or not is based on the results of two randomly but successively drawn samples from the lot. Figure 9.12 presents a schematic operation of double sampling plan.

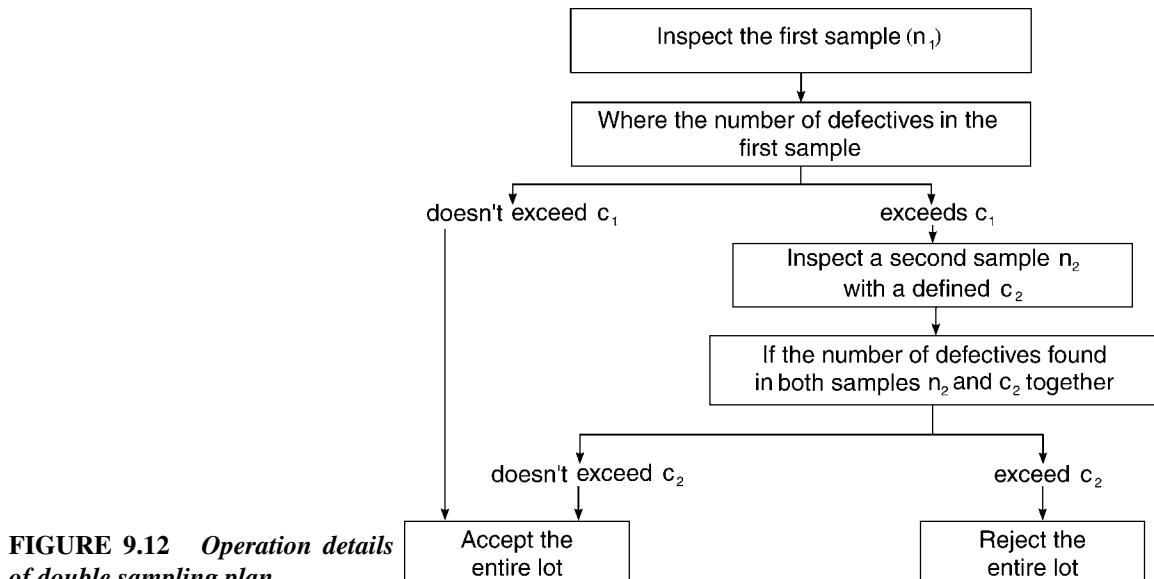


FIGURE 9.12 Operation details of double sampling plan

To illustrate, if $N = 1000$, $n_1 = 40$, $c_1 = 2$, check the number of defectives from the first sample of 40. If the number of defectives is 0, 1, or 2, accept the entire lot.

If the number of defectives is three, go for a second sample as per the following requirements: $n_2 = 50$, $c_2 = 3$. Here it is to be noted that c_2 includes c_1 . In other words, c_2 specifies the maximum number of defects for both samples put together. The lot can be accepted if the second sample of 50 does not contain any defectives. In other words, the total acceptable number of defectives, in both samples together, is three. Even if the number of defectives is one, reject the entire lot. It is because now the number of defectives from both the samples together is $(3 + 1) = 4$ (this exceeds $c_2 = 3$).

Evaluation The total amount of inspection required is less, because initial sample is smaller than that required by a comparable single sample plan. It protects the interests of the producer by providing him another chance, particularly where the first sample shows up more number of defectives. Thus, it protects the interests of the consumer also.

Double sampling permits smaller size samples to be taken. As a result, whenever the items or material inspected are well within or well beyond the acceptable quality levels, fewer items need to be inspected. In such cases, double is more economical when compared to single acceptance sampling plan.

Recently it is being widely felt that statistical quality control is no more a valid tool as it ensures the quality of the product or service just during the manufacturing process. Even acceptance sampling considers the quality only when the lots are ready for sale. These are not tenable because acceptance sampling procedures continue to focus on the process history and quality results. However, it is true that these techniques are slowly being replaced by supplier certification*.

*A certified supplier is one who, after extensive investigation, is found to supply quality material. It is not necessary to perform routine quality testing on each lot received.

Benefits of Statistical Quality Control

- (a) It helps to identify the causes for the variations in quality and minimise the same
- (b) It helps to control, maintain, and improve the quality standards
- (c) It facilitates the manufacturer to give guarantee for his products
- (d) It guides the manufacturer indicating when to initiate radical changes in the production setting
- (e) It reduces the wastage, scrap, cost per unit and inspection costs
- (f) When SQC is implemented, the employees also become quality-conscious and efficient

DEMING'S CONTRIBUTION TO QUALITY

William Edwards Deming was an American Professor widely credited with improving production in the United States during World War II. He is best known for his work in Japan. He taught the top management of organisations how to improve design (and thus service), product quality, testing and sales (the last through global markets) through various statistical methods. Deming contributed significantly to Japan becoming renowned for producing innovative high-quality products and becoming an economic power.

A number of Japanese manufacturers applied his techniques widely and achieved previously unheard of levels of quality and productivity. The improved quality combined with the lowered cost created new international demand for Japanese products.

Deming taught that by adopting appropriate principles of management, organisations can increase quality and simultaneously reduce costs (by reducing waste, rework, staff attrition and litigation while increasing customer loyalty). The key is to practice continual improvement and think of manufacturing as a system, not as bits and pieces.

In the name of Deming, an award called the Deming Prize was established, which is given to companies which show great quality in their products and services. TVS Group has been one of the corporates that bagged the Deming Prize for their quality!

Deming advocated that all managers need to have what he called a System of Profound Knowledge, consisting of four parts:

- (a) *Appreciation of a system*: understanding the overall processes involving all the stakeholders such as suppliers, producers, and customers of goods and services
- (b) *Knowledge of variation*: knowing the range and causes of variation in quality, and use of statistical sampling in measurements;
- (c) *Theory of knowledge*: understanding the concepts explaining knowledge and the limits of what can be known
- (d) *Knowledge of psychology*: knowing concepts of nature of the human and human behaviour

Deming's 14 points

Deming offered the following fourteen key principles for management and these have been extensively used for bringing about business effectiveness.

1. *Create constancy of purpose* Understand why you are in business. Work toward improvement of a product and service with a plan to become competitive and stay in business. Decide to whom top management is responsible.

2. *Adopt the new philosophy* As we are in a new economic age, minimise the levels of delays, mistakes, defective materials, and defective workmanship.
3. *Do not depend anymore on mass inspection* Focus more on preventing defects and defectives rather than wasting time on detecting defects. Create statistical evidence that quality is built in.
4. *Meaningful measures of quality along with the price* Let not the price be the deciding factor any more. Depend more on quality, meaningful measures of quality along with the price. If your vendors cannot qualify with statistical evidence of quality, dispense with them at once.
5. *Find problems to focus on appropriate solutions* As a member of a management team, work continually on the system focusing on design, incoming materials, composition of material, maintenance, improvement of machine, training, supervision, retraining, etc.
6. *Institute latest methods of training* Let your on-the-job training methods be as modern and latest as possible.
7. *Let the foreman speak on quality* If the foreman speaks about the barriers to quality instead of sheer numbers of components or products good or defective, the focus is not on quality. Letting him speak about quality will automatically improve productivity. See that the management team takes immediate action on reports from the foremen concerning barriers such as inherent defects, machines not maintained, poor tools, and fuzzy operational definitions.
8. *Drive out fear* Give right signals to the employees so that everyone works effectively for the company. Instil confidence that the organisation is working for their future. Let them not worry about retrenchments, lay-offs, lockouts, etc.
9. *Integrate the organisation into one* Break down barriers among departments. See that people in research, design, sales and production work as a team to foresee problems of production that may be encountered with various materials and specifications.
10. *Provide support at every level* Do not create numerical goals, posters, slogans for the workforce, asking for new levels of productivity if you cannot train the employees in that direction.
11. *No numericals quotas in work standards* Eliminate work standards that prescribe quotas based on numbers.
12. *Remove barriers* Take all the measures that remove barriers between the hourly worker and his right of pride of workmanship.
13. *Focus on Retraining* Institute a vigorous program of education and retraining.
14. *Facilitating organisation structure* Create a structure in top management that facilitates or pushes the organisation every day towards the achievement of the above principles.

SUMMARY

- ◆ Quality is defined as ‘fitness for use’. Quality may be quality of design or quality of conformance. In quality control, we are concerned with quality of conformance.
- ◆ Inspection refers to the measurement of an output and its comparison to the specified requirements to determine conformity.
- ◆ Statistical quality control refers to the process of applying statistical principles to the process of quality control.
- ◆ The elements of Statistical Quality Control are: process control and acceptance sampling.

- ◆ In process control, the quality of the products is ensured during the manufacturing process itself.
- ◆ The quality of process performance may be affected by chance causes or assignable causes.
- ◆ Process capability is the ability to achieve measurable results from a combination of machine, tools, methods, and people engaged in production.
- ◆ A control chart is a tool to determine whether the process is under control or not.
- ◆ A variable is one, the measurement of which changes from unit to unit, for example, length of a screw, and so on. In case of variables, the quality can be measured in terms of length, hardness, and so forth.
- ◆ \bar{X} and R charts are used to determine the quality of the variables.
- ◆ An attribute is one whose quality is determined on ‘go or no go’ basis.
- ◆ ‘c’ and ‘p’ charts are used to determine the quality of the attributes.
- ◆ One or more defects per unit make that particular unit defective.
- ◆ ‘c’ chart is used where the data is available about the number of defects per unit.
- ◆ ‘p’ chart is used where the data is available about the number of defectives in each sample drawn from the lot.
- ◆ Acceptance sampling is the process of accepting or rejecting the entire lot based on the results of the samples drawn from the lot.
- ◆ Operating characteristic (OC) curve is the graphic relationship between the percentage defective and the probability of acceptance.
- ◆ Sampling risks are of two kinds: producer’s risk and consumer’s risk.
- ◆ Producer’s risk (α) refers to the risk in getting good units rejected.
- ◆ Consumer’s risk (β) is the risk in getting the bad units accepted.
- ◆ Quality indices for acceptance plans are: acceptance quality level (AQL) and lot tolerance percentage defective (LTPD).
- ◆ AQL refers to that quality level which enjoys acceptability of the lot.
- ◆ LTPD refers to that percentage defective which makes the lot tolerable or acceptable.
- ◆ In case of an ideal operative characteristic curve, AQL is equal to LTPD. An ideal operating characteristic curve is rectangle in shape.
- ◆ Acceptance sampling is carried out through sampling plans based on single, double, multiple, or sequential samples.
- ◆ A single sampling plan is one where the entire lot is accepted or rejected based on the results of one sample drawn from the lot.
- ◆ A double sampling plan is one where the entire lot is accepted or rejected based on the total result of the two random samples drawn from the lot successively.

Annexure

Emerging Concepts in Quality

Total Quality Management (TQM)

The quality management process has undergone a sea change. Japanese products made it amply clear that it is only through quality that one can emerge stronger. Total Quality Management (TQM) is being extensively

used as a company-wide major task for making appropriate quality decisions. TQM includes:

- Statistical decisions on product quality
- Feedback of the quality information on the systems of product planning, process planning, and how these can be redesigned
- Negotiation with vendors of raw materials and components
- Feedback from consumers regarding product failures and other troubles, if any, suffered during product usage
- Company-wide involvement from top management level to the lowest levels through quality circles*.

The buyer needs to be assured of the quality. Quality assurance is the activity of providing confidence among all concerned that the quality-related activities are being performed effectively. Today, many public and private organisations maintain exclusive quality assurance departments. International quality assurance is, at present, made possible through ISO (International Organisation for Standards) 9000 certification series. These series gained international acceptance in view of the benefits derived by getting certified. Today, every company with ISO 9000 series certification is a blue-eyed company. It means that its certification speaks about the quality of its products and services globally. Particularly in an environment of globalisation, ISO certification enables a company to catch the attention of other global leaders. This may lead to tie-ups in the form of joint ventures, franchise agreements, and so on.

Reasons for Growth in International Trade

International trade in recent years has developed by leaps and bounds because of the following reasons:

- (a) Technological progress in transportation, communication, and informatics has been significant.
- (b) The trade barriers have been vanishing.
- (c) The former socialist countries started adopting liberalisation policies.
- (d) There has been an increasing trend in multinational manufacturing system. In this system, components and subsystems of production from companies in different countries are utilised by large manufacturing organisations for the production of equipment.
- (e) There has been an intense competition and increase in the cost of labour in Europe and North America. Hence, large manufacturers in these countries are increasingly relying on the developing countries for the supply of components and subsystems in the low and intermediate technology area.
- (f) Demand for a wide range of consumer products and services from enterprises in the developing countries is likely to rise. This has motivated domestic companies to improve their quality system to bring out better products and services.

ISO 9000 as a Quality System

In a multinational manufacturing system, the acceptability of the enterprises as suppliers from developing countries will depend upon whether they can meet international quality standards. These suppliers will have to give positive assurance about their ability to fulfil quality and delivery commitments. In such a market environment, suppliers consider ISO 9000 as a weapon with which they can conquer the export markets. Thus,

*Quality circles are self-managed small groups intended to identify the bottlenecks in the flow of work and overcome the same.

it has become a dire need to enter and sustain the business in export markets. It is an emerging requirement for the suppliers exporting to European Community nations.

Benefits of ISO 9000 quality system

- (a) It assures a consistent product performance.
- (b) It saves time and money. The quality of the product or service is closely monitored and inspected.
- (c) Certification under such a quality system shows that the company is committed for customer service.
- (d) It is a well designed, well implemented, and carefully managed quality system. So it provides confidence that the output of the process will meet customer expectations and requirements.
- (e) Such a certification offers a high degree of flexibility to the company. ISO 9000 is not a product standard, but a *quality system standard*. With this certification in hand, the company can plan to produce any product or service of its choice. It is bound to come out with a reliable quality.
- (f) The manufacturer need not pile up huge stocks. Thus, he can avoid inventory-carrying costs. With such a certification, the supplier can predict their customer's need through constant communication and detailed records of prior purchasing patterns.
- (g) It is a common quality language among the suppliers and the manufacturers.

It is based on the universal principles of quality management. Hence, it enjoys wider acceptability. It stands above language and custom.

ISO 9000:2000* in Brief

ISO 2000 is the revised version of ISO 9000:1994 which deals with quality management and quality assurance standards. Also, it provides the guidelines for selection and use of a particular standard. ISO 9000:1994 had the following quality systems:

- ISO 9001:1994 deals with quality systems to assure quality at different stages: design, development, production, installation, and servicing
- ISO 9002:1994 deals with quality systems to assure quality in the matters pertaining to production and installation
- ISO 9003:1994 deals with the quality systems to assure quality in final inspection and testing
- ISO 9004:1994 deals with quality management and quality system elements and the guidelines underlying the same

ISO 9000 series have undergone a change in the year 2000. The new quality systems are referred to as ISO 9001: 2000 series. ISO 9001: 2000 replaces ISO 9001:1994, ISO 9002: 1994, and ISO 9003: 1994. The old ISO 9002 and ISO 9003 series of standards have been discontinued. If a company is currently ISO 9002 or ISO 9003 certified, it has to become ISO 9001: 2000 certified. If the company is ISO 9001 certified, it has to update its quality system in order to meet the new ISO 9001:2000 requirements.

The purpose of ISO 9000 series is to provide the manufacturer a freehand in defining his own quality policy and develop his own quality manual based on the procedures and instructions needed. The ultimate objective is to create a quality system. The ISO 9000 series assure that any product coming out of the quality system is bound to be of good quality.

*ISO 9000:2000 means ISO 9000 series of the year 2000 version.

ISO 9000:1994 means ISO 9000 series of the year 1994 version.

It should be cautioned that quality certification is not an overnight process. It is a long-drawn process involving several critical issues such as creating quality awareness among the employees, retraining the quality workforce, restructuring the organisation based on global quality standards, and above all, a firm commitment to quality on the part of the top management.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Any measurable characteristic of a particular product or service is called
 - (a) Statistics
 - (b) Control
 - (c) Quality
 - (d) Performance
2. What refers to the process of applying statistical principles to solve the problem of controlling the quality control of a product or service?
 - (a) SMS
 - (b) PMS
 - (c) QC
 - (d) SQC
3. Which of the following is not a factor in the quality of design of a product?
 - (a) Reliability
 - (b) Duration
 - (c) Performance
 - (d) Ease of use
4. What refers to the process of checking whether the product meets the given quality specifications or not?
 - (a) Quality control
 - (b) Inspection
 - (c) Roving inspection
 - (d) Quality of conformance
5. Which of the following is not a purpose of inspection?
 - (a) Measure process capability
 - (b) Rate inspectors' accuracy
 - (c) Maximise the cost factor
 - (d) Determine process deviations
6. What gives added assurance about quality or against the production of a defective batch?
 - (a) Incoming inspection
 - (b) Set up approval
 - (c) Final inspection
 - (d) Process inspection
7. What kind of inspection is to be performed before delivering work in process to another processing department?

- (a) Finished products inspection
 - (b) Process inspection
 - (c) Toll gate inspection
 - (d) Set up approval
8. What is the other name for roving inspection?
- (a) Process inspection
 - (b) Fixed inspection
 - (c) Critical point inspection
 - (d) Final inspection
9. What aims to control and maintain the quality of the products in the manufacturing process?
- (a) Statistical control charts
 - (b) Process control
 - (c) Process capability
 - (d) Product design rate
10. Which of the following is not a use of a process capability?
- (a) Helps to choose the most appropriate process
 - (b) Serves as a basis to specify the requirements for quality performance for new machines
 - (c) Assists in analysing how the different processes are inter related
 - (d) Helps to choose the most appropriate process for the tolerances to be met
11. What refers to the process of ensuring the quality of the products at a point of sale?
- (a) Control charts
 - (b) Acceptance sampling
 - (c) Process control
 - (d) SQC
12. Which of the following is an advantage in acceptance sampling?
- (a) Greater administration costs
 - (b) Greater damage to the product
 - (c) Lot is disposed off in a shorter time
 - (d) Less information about the product
13. What is the disadvantage in acceptance sampling?
- (a) Cost of inspection is high
 - (b) Sampling risks
 - (c) Less damage is caused to the product
 - (d) Lot is disposed off in a shorter time
14. What refers to the risk involved in getting the bad lots accepted?
- (a) Sampling risk
 - (b) Producers' risk
 - (c) Consumers' risk
 - (d) Operating risk
15. Which of the following is not a parameter affecting the acceptance sampling plans?
- (a) Lot size
 - (b) Degree of risk
 - (c) Sample size
 - (d) Acceptance number

16. What refers to that desired quality level or that percentage of defective at which the probability of acceptance is high?
 - (a) SQC
 - (b) AQL
 - (c) Alpha
 - (d) Beta
17. What refers to that degree of percentage defective in the lot that makes the lot tolerable?
 - (a) AQL
 - (b) SQC
 - (c) LTPD
 - (d) Beta
18. Which of the following is not a benefit of Statistical Quality Control?
 - (a) Minimise the variations in quality
 - (b) Improve the quality standards
 - (c) Reduces inspection costs
 - (d) Increases cost per unit
19. Which ensures the quality of products during the manufacturing process itself?
 - (a) Product control
 - (b) Process control
 - (c) Statistical control
 - (d) AQL
20. What refers to the ability to achieve measurable results from a combination of machine, tools, methods and people engaged in production?
 - (a) Product control
 - (b) Process control
 - (c) Process capability
 - (d) LTPD
21. What is used where data is available about the number of defects per unit?
 - (a) OC curve
 - (b) c chart
 - (c) p chart
 - (d) N chart

Question II: Fill in the Blanks

1. Any measurable characteristic is called
2. Quality may be of two types: quality of design and
3. The product, the quality of which can be specified in terms of hardness, is called
4. The product quality characteristic which can be measured only in terms of 'go or no go' basis is called
5. The control chart for sample means is called
6. The difference between the minimum and maximum values of measurement of units in a given sample is called
7. Where the data given is about the number of defects per unit, chart can be used.

8. The ratio of the total number of defectives found and the total number of pieces inspected is called
9. Such causes, which may or may not affect the quality of the manufacturing process are called
10. Change in the shift or excessive wear and tear of a tool is the example for causes.
11. The operating characteristic curve is the graphic relationship between and
12. The risk involved in getting good units rejected is called
13. Consumer's risk can be defined as
14. In an ideal OC curve, and are equal.
15. The percentage of observations covered by $\pm 2\sigma$ limits in a normal distribution curve is

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Process control
2. Acceptance sampling
3. Process capability
4. Sampling risks
5. Operating characteristic curve
6. Variables and attributes
7. Confidence limits

Question IV

Answer the following:

- Q1. The percentage of water absorption is an important characteristic of common building brick. A certain company occasionally measured this characteristic of its product but records were never kept. It was decided to analyse the process with a control chart. Twenty-five samples of four bricks each yielded these results:

Sample number	\bar{X}	R	Sample number	\bar{X}	R
1	15.1	9.1	14	9.8	17.5
2	12.3	9.9	15	8.8	10.5
3	7.4	9.7	16	8.1	4.4
4	8.7	6.7	17	6.3	4.1
5	8.8	7.1	18	10.5	5.7
6	11.7	9.1	19	9.7	6.4
7	10.2	12.1	20	11.7	4.6

8	11.5	10.8	21	13.2	7.2
9	11.2	13.5	22	12.5	8.3
10	10.2	6.9	23	7.5	6.4
11	9.6	5.0	24	8.8	6.9
12	7.6	8.2	25	8.0	6.4
13	7.6	5.4			

Plot the data on an average and range control chart with control limits. Comment.

- Q2. Compute control limits for the following four days and state whether the percentage defective falls within the control limits for each day.

Date	Number of TV Components Inspected	Number Defectives
August 3	100	15
August 8	160	14
August 13	200	19
August 23	170	21

- Q3. The following data represents the number of defects found on each sewing machine cabinet inspected. Plot a control chart with control limits. Comment on the chart.

Sample number	1	2	3	4	5	6	7	8	9	10
Number of defects	8	10	7	9	6	7	8	9	4	5

- Q4. A PC assembly shop owner decided to use a control chart to monitor the number of defectives in all the PCs assembled every day. The data from the last 10 inspections, in one shift, is given in the following table. Which chart do you employ? Compute control limits and plot the chart. Also interpret the chart.

PC number	1	2	3	4	5	6	7	8	9	10
Number of defectives	4	3	6	9	6	7	12	9	14	8

You are free to assume any additional data, if required.

- Q5. The specification of a given plug is 0.600 ± 0.030 cm. Each plug is measured at 5 points along its length. Five samples of 7 units (X_1 to X_7) each are taken randomly from the manufactured lot. From the following readings, draw an appropriate chart and comment on the results.

<i>Sample Number</i>	1	2	3	4	5
X1	0.589	0.597	0.609	0.596	0.576
X2	0.605	0.627	0.635	0.635	0.603
X3	0.594	0.589	0.584	0.629	0.564
X4	0.584	0.589	0.598	0.589	0.586
X5	0.615	0.645	0.625	0.665	0.635
X6	0.620	0.610	0.621	0.622	0.624
X7	0.587	0.607	0.597	0.589	0.627

- Q6. Explain the concept of statistical quality control. Explain how you can construct control charts for the variables.
- Q7. What do you understand by acceptance sampling? Explain the concepts of single and double sampling plans.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. c | 2. d | 3. b | 4. d | 5. c |
| 6. d | 7. c | 8. a | 9. b | 10. c |
| 11. b | 12. c | 13. b | 14. c | 15. b |
| 16. b | 17. c | 18. d | 19. b | 20. c |
| 21. b | | | | |

Answers to Question II

- | | |
|----------------------------------|---|
| 1. <i>quality</i> | 10. <i>assignable cause</i> |
| 2. <i>quality of conformance</i> | 11. <i>probability of acceptance {P(a)}</i>
<i>and percentage defective (p)</i> |
| 3. <i>variable</i> | 12. <i>producer's risk</i> |
| 4. <i>attribute</i> | 13. <i>getting bad lot accepted</i> |
| 5. \bar{X} chart | 14. <i>acceptance quality level (AQL)</i>
<i>and lot tolerance percentage defective (LTPD)</i> |
| 6. <i>range</i> | 15. 95.45% |
| 7. <i>c chart</i> | |
| 8. <i>p chart</i> | |
| 9. <i>chance cause</i> | |

UNIT IV

Chapter 10: Materials Management

Chapter 11: Marketing: Concepts and Functions

10

MATERIALS MANAGEMENT

Learning Objectives

By the time you complete this chapter, you should be able to understand

- materials management as a process
- inventory control
- steps in the purchasing process
- store records
- ABC Analysis
- economic order quantity (EOQ)
- stock levels
- methods of pricing issues of inventory
- modern techniques in inventory management

INTRODUCTION

Materials management plays a very significant role in controlling the costs and reducing the wastage, particularly, in a manufacturing industry. It is, most often, observed that around 60–70 per cent of the price we pay for goods and services is towards the cost of materials. The rest is accounted for wages, salaries, overheads, and profits. This means that the material costs form a significant portion of the total cost. It needs to be closely monitored in terms of assessment of requirements, procurement, and issue of materials. Unless this is ensured, it will result in excessive costs of materials, which further leads to increased cost of production.

Definition of Materials

Materials refer to inputs into the production process, most of which are embodied in the finished goods being manufactured.¹ It may be raw materials, work-in-progress, finished goods, spare parts and components, operating supplies such as lubricating oil, cleaning materials, and others, required for maintenance and repairs.

Materials Management as a Process

Materials management is the process of planning, organising, and controlling the materials in a given organisation. Among some government organisations, it is better known as supply management. The armed forces refer to this as logistics management.

Materials, Inventory, and Stores

Materials is a broad term, which includes inventory and stores. Inventory refers to all the idle physical stocks, which have economic value. In other words, inventory covers the items in stores, in addition to the materials in transit and materials in process. Stores includes materials, supplies, and finished goods not required immediately for use or despatch to customers.

INVENTORY CONTROL

Inventory control is defined as the scientific method of providing the right type of material at the right time in the right quantities and at right price to sustain the given production schedules.

Inventory control is essentially concerned with two aspects: minimising investments for the organisation in the materials, and maximising the service levels to the customers and its own operating departments.

Objectives of Inventory Control

The following are the main objectives of inventory control:

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

Factors Affecting Inventory Control Function

Inventory control function gets increasingly complex due to the following factors:

- Sudden changes in the production plans
- Increases in the material prices
- Excessive storage costs
- Stock-out costs (cost of breakdown in the production line as a result of non-availability of inventory)
- Increasing lead time*

The Process of Inventory Control

The following are the stages in the process of inventory control:

- Formulate a clear-cut purchase procedure
- Classify, in a comprehensive manner, the items of inventory and codify the same

*The lead time is the difference between the point of placing order and the time of procurement of stocks.

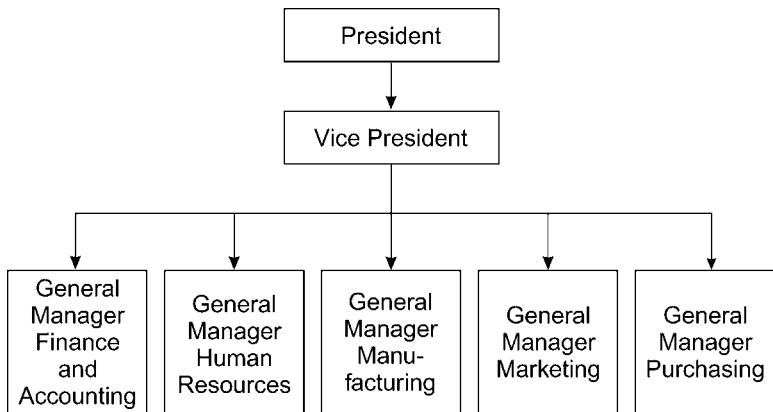


FIGURE 10.1 *Organisation structure of a medium sized company with purchasing as a top level function*

- Maintain store records to ensure continuous stock taking
- Minimise the costs of each order by determining economic order quantity (EOQ)
- Monitor each category of the stocks through ABC analysis
- Set stock levels for different items
- Replenish the stocks as and when required

These are explained in this chapter.

PURCHASING FUNCTION

Purchasing is a specialised job. In small and medium organisations, stores manager is authorised to look after this function. It depends upon the nature and size of the organisation to decide whether purchase function needs to be represented at the top level or not. In large organisations such as multinationals, this function is represented in the top and middle management. (See Fig. 10.1 and Fig. 10.2). In these organisations, purchasing is viewed as a strategic function affecting directly the corporate profitability. A significant volume of funds is committed in purchases of materials. The purchasing decisions also affect the working capital. Purchase organisation may be decentralised for better results, particularly where the organisation has plants or business centres at more locations in the country or abroad.

Objectives of the purchasing function The main objectives of the purchasing function are:

- To purchase the right quantity and quality of materials at the most economical rate at proper time
- To ensure continuous flow of supplies by maintaining effective relationships with the existing suppliers
- To explore and develop other sources of supply
- To obtain the best value for the money spent
- To maintain functional relations with other departments and provide up-to-date information and advice about the availability of alternate materials
- To train staff, make policies and procedures, and thus, evolve a sound organisation to achieve the above objectives

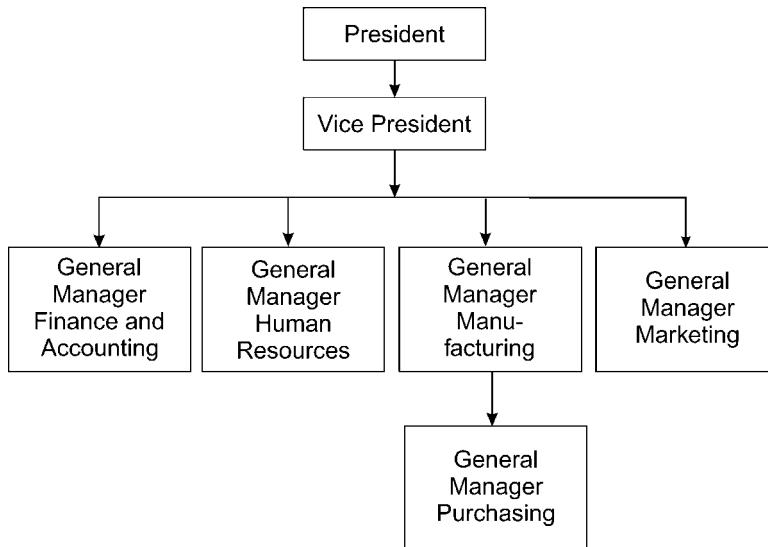


FIGURE 10.2 *Organisation structure of a medium sized company with purchasing as a middle level function*

Centralised vs decentralised buying function Whether to centralise or decentralise buying inventory is a question of policy. To decentralise the procurement function needlessly is to deny a firm some of its potential profit. Centralisation of inventory procurement is essential for attaining both optimum operating efficiency and maximum profit.

The buying function is said to be **centralised** when the entire responsibility of procurement of inventory lies with one single person. This person is held responsible/accountable by the top management for proper performance of purchasing activities.

On the other hand the buying function is said to be **decentralised** when personnel from other functional areas of business say production, engineering, marketing, finance, personnel decide on sources of supply, negotiate with vendors directly or perform any of the other major functions of buying inventories.

Profile of centralised and decentralised buying function The following table illustrates the profile of centralised and decentralised buying (that can be interpreted in terms of merits and demerits of each) function:

	Centralised buying	Decentralised buying
1. Responsibility	Unified responsibility	Multiple responsibility
2. Buying systems	Buying systems are standardised	Buying systems can be customised to suit to the respective department or plant
3. Buying efforts	Avoids duplication	Special efforts can be made to identify the materials of particular interest
4. Quantity discounts	Large scope to obtain quantity discounts as the materials are bought for the whole organisation	Very little scope to obtain quantity discounts as the purchase of each department/plant is relatively less in quantity

(Contd.)

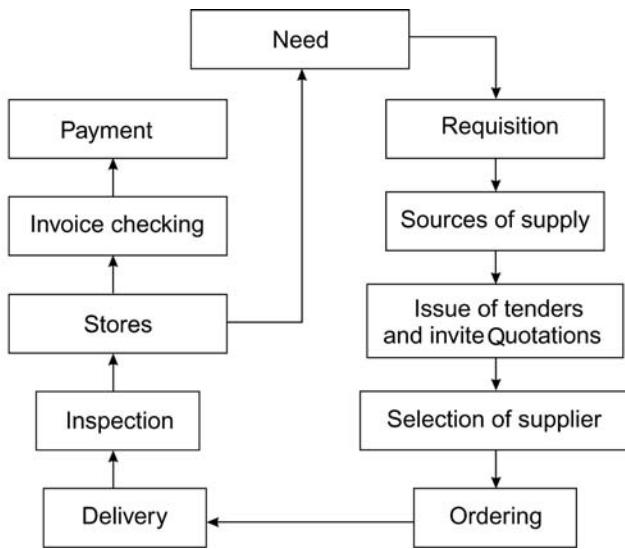
5. Services of buying specialists	Can be availed	Relatively less scope to avail the services of buying specialists; consequently the buying practices may end up being haphazard.
6. Transportation costs	A centralised buying policy may result in transportation savings through consolidation of orders and delivery schedules	Transportation costs are likely to be higher
7. For sales professionals	Provides relief for the sales people (Fewer people to call on, fewer orders to prepare, fewer shipments to make, fewer invoices to prepare, fewer financial records to maintain)	Complicates the task of a sales person. (Relatively more people to call on, more) orders to prepare, more shipments to make more invoices to prepare and more financial records to maintain)
8. Control of inventory	Inventory can be controlled more effectively as the stock levels, materials usage, lead time and prices for the entire company are known clearly	Control of inventory is relatively less effective as the professional touch is missing
9. Attention of line managers	Line managers can concentrate on their main activity (as there is some other professional to take care of materials procurement)	The attention of line managers gets disturbed, as they have to concentrate on issues related to materials also.
10. Number of orders processed	For the same quantity of goods bought, fewer orders are processed resulting in savings in expenses for purchasing, receiving, inspection, and accounts payable.	Relatively larger number of orders which means more expenses in terms of purchasing, receiving, inspection, and accounts payable.

Where decentralised buying function is feasible Complete centralisation is neither always possible nor always desirable. There are three types of situations that justify some decentralisation:

- (a) in case of companies that process single natural raw materials such as tobacco, textiles, leather goods etc.
- (b) in case of technology oriented firms that are heavily involved in research and development.
- (c) in case of multi-plant manufacturing firms.

Purchasing process The following are the logical steps in the purchasing process:

- (a) Requisitioning purchases
- (b) Exploring the sources of supply
- (c) Issuing of tenders and obtaining quotations
- (d) Opening of tenders and quotations and preparation of comparative statement
- (e) Negotiating over the purchase price and terms of supply
- (f) Placing purchase order
- (g) Receiving of materials along with the invoice
- (h) Checking inward invoice

**FIGURE 10.3** *The purchasing cycle*

- (i) Inspecting and testing materials
- (j) Forwarding the materials to stores
- (k) Checking invoice and passing of bills for payment

Figure 10.3 presents the above stages in the purchasing cycle in form of a flow chart. Let us discuss these steps in detail.

- (a) *Requisitioning purchases* The purchase department collects all requisitions for purchase of materials. Every purchase requisition should be in triplicate. The concerned department, which requires materials or supplies, keeps one copy of purchase requisition with itself, and of the remaining two copies, sends one to the purchase department and the other to the administration/accounts department. It is customary to authorise selected officials to make the purchases. For instance, the storekeeper is authorised to place order for all standard materials, the stocks of which require replenishment, based on stock levels. The head of the production department is authorised to place order for special materials, and the plant engineer is authorised to sanction the purchase of any capital expenditure such as special equipment, plant and machinery, and so on. However, all the supplies are routed to the departments through the stores department only.
- (b) *Exploring the sources of supply* It is the function of the purchase department to maintain the list of suppliers of every type of material. There could be alternate materials available as a result of technology development. The purchase department could explore such alternate materials that involve lower costs and additional functional benefits. Yellow pages, business directories and catalogues constitute good sources of reference.
- (c) *Issuing of tenders and quotations* The purchase department issues tenders to invite quotations from the selected suppliers. The tender mentions the particulars of details to be submitted. The details of price per unit, quantity to be supplied, time of delivery, discount, the terms of payment, and others, are furnished in the quotation. Normally the suppliers/vendors are shortlisted based on their past performance in terms of quality, delivery times, reliability, and so on. It is convenient for the purchase department to contact the selected suppliers and invite quotations from them for the selected materials.

The tenders are of two types: limited and open. In limited tender, the purchase department will contact a minimum of three selected suppliers from the approved list. Open tenders are issued by large organisations or government undertakings to buy material or equipment of large quantity and where large funds are involved. These are advertised in selected newspapers.

- (d) *Opening tenders/quotations* It is customary to announce the date of opening the tender. With the details of each of the quotation, a comparative statement is prepared. This facilitates the comparison of the specifications and prices of the materials. Orders are placed with those suppliers who offer the best quality of materials at the best price. Where the materials are of strategic importance, a purchase committee is constituted with all the specialists concerned. The function of the purchase committee ends with the recommendation of the materials to be bought and the possible source from which these can be bought.
- (e) *Negotiating* It is likely that the price may be competitive but the terms of delivery and other terms of payment may not be agreeable to both the parties. In such a case, the buyer and the supplier negotiate or bargain to arrive at a consensus regarding the purchase price and the terms of delivery.
- (f) *Placing purchase order* Once there is consensus between the buyer and the supplier on matters relating to price and the terms of delivery, the buyer releases the purchase order. Normally, five copies of purchase order are made. The copies are sent to the supplier, the receiving department, the accounts department, and the inspection department, and one copy is retained in the purchase department. More often, it is necessary to follow-up periodically to ensure the timely delivery of the materials.
- (g) *Receiving the materials along with the delivery note* The goods are supplied with a delivery note or dispatch advice. It is necessary to check the details of goods received with the concerned purchase order and then enter on the ‘goods received note’. Four copies of the ‘goods received note’ are made and one marked for each of the following: purchase department, the accounts department, the stores department, and the inspection department for further action.
- (h) *Checking inward invoice* Invoice is a statement showing the particulars of the supplier, the buyer of the goods supplied, the details of the materials supplied, and the amount payable after adjusting the advance paid and the discounts normally allowed. The buyer receives the inward invoice. Inward invoices are stamped and numbered on entry into the ‘inward invoice register’. The purchase manager has to sign these and then send these to the accounts department for making payment.
- (i) *Inspecting and testing materials* The purchasing department links up with the stores department to check the physical condition, quality, and quantity of the materials received. In case of any shortage or damage, the facts should be informed to the supplier. Steps should be taken to ensure that either the damaged material is replaced or not charged.
- (j) *Forwarding materials to stores* After inspection, the goods received are forwarded to the stores.
- (k) *Checking invoice and passing of bills for payment* Normally, the suppliers directly dispatch invoice to the accounts department. The accounts department sends it to the stores department for the verification of the quantity and price. After the stores department certifies, the accounts department passes the invoice for payment. Accordingly, either cash is paid or cheque is issued in the name of the supplier.

Purchasing: A rational decision The purchasing decisions should be based on clearly defined policies. Several factors such as the carrying costs, rate of obsolescence, opportunity costs, and so on, have to be considered here. It is necessary for every organisation to manage its purchasing process in a scientific manner. A rational purchasing decision yields the following multiple benefits:

- (a) Economical prices for the materials
- (b) Faster turnover of inventory

- (c) Continued supplies
- (d) Reduced lead times
- (e) Savings in transport costs
- (f) Reduced obsolescence in the materials
- (g) Improved vendor-supplier relationships
- (h) Better quality of materials
- (i) Efficient inventory control systems
- (j) Development of inventory information systems

Classify and codify the items of inventory It is necessary to classify and code the full list of items of the inventory with the indication of location and prices. Otherwise, in particularly large organisations, it is not possible to remember the vast number of inventory items.

Classification can be on the basis of department, product or service, nature, make or model, or quality of the materials. Further, it is convenient to identify the coded materials.

Codification is the process of assigning numbers or symbols, or a combination of both. Numbers can be assigned in a meaningful way. For example, the code 54321 may constitute 5 as the country code for India; 4 as the location code of Madras; 3 as the mechanical engineering department code, and 21 as the product code. For multinationals, the code could run to 8-digit or 10-digit numbers.

The following are the advantages of classification and codification:

- (a) Long description can be avoided
- (b) The products can be identified and issued accurately
- (c) Duplication is prevented
- (d) Items are standardised
- (e) Computerisation is facilitated
- (f) Pricing/costing is made easier
- (g) Inspection process is simplified
- (h) Secrecy of the materials is taken care of

STORE RECORDS

Store records facilitate the maintenance of accounts for each item of inventory. The position of inventory can be updated from time to time. There is no standard list of store records but a record may be designed to suit to the needs of the organisation.

The following are the store records in common use:

- (a) Material requisition note
- (b) Purchase order
- (c) Invoice
- (d) Goods received note
- (e) Goods returned note
- (f) Stores ledger account
- (g) Bin card

These are explained below:

Material requisition note Whenever the materials are required by a department/section, this form has to be filled in. This note provides information about the job number, description of the items required in terms

of number. It should be authorised by the head of the department/section. Whenever the materials are issued, the receiving person should sign the note.

MATERIAL REQUISITION NOTE				
No.		Date.....		
S. No.	Description	Quantity		Remarks
		No.	Weight	
Material issued by	Received by	Signature of indenter		Entered in material issued record by
Signature of storekeeper		Authorised by		

This is to be entered in the materials issued record, which is to be signed by the store-keeper.

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

VIVEK ENTERPRISES			
302 Kadam Towers, Hyderabad 500004			
Tel: 760 8625, Fax: 760 8620			
APGST Regn. No. 5761/95; CST Regn. No. 345467/95			
Business Solutions Ltd 213, 11-4-650 Sovereign Shelter Lakadikapul, Hyderabad 500004		Purchase order No.: 3245/2001 Date: 12.3.2001	
Delivery: At above address			
Please supply the following:			
Product code	Particulars	Quantity	Price per unit (Rs)
373839	10 cm mild steel rods square	5 tonnes	10,000
383930	1 cm aluminium window frame sheets	100 sheets	300
Authorised Signature		Date:	
Delivery: FOB			
Terms of Payment: Cash			

Invoice Invoice is a statement sent by the seller to the buyer mentioning the particulars of the goods supplied, net amount payable for the goods, and the terms and conditions governing the sale. It is a very important document because it shows the net amount payable by the buyer after all the discounts and the taxes, if any.

The delivery is stated here as free-on-board (FOB), which means that till the goods are loaded into the port of shipment, the supplier will bear the costs. It is free for the buyer till that point. To protect the interest

of the seller from any type of mistakes in the preparation of the above invoice, the clause of 'Errors and Omissions Excepted' (E. & O.E.) is included. In other words, all the invoices are subject to this clause which means that the mistakes, if any, in this invoice can subsequently be corrected by the seller at his end. The following is the model invoice:

INVOICE					
Business Solutions Ltd 213, 11-4-650 Sovereign Shelter Lakadikapul, Hyderabad 500 004 Account: ARP534 Telephone: 3396409 Fax: 3396410			Invoice No.: 75687 Date: 21.3.2001		
Invoice to: Vivek Enterprises, 302 Kadam Towers, Hyderabad 500 004 Ref: Your Purchase Order No.3245/2001 Deliver to: As above					
<i>Product code</i>	<i>Particulars</i>		<i>Quantity</i>	<i>Price per unit (Rs)</i>	<i>Total (Rs)</i>
373839 383930	10 cm mild steel rods square 1 cm aluminium window frame sheets		5 tonnes 100 sheets	10,000 300	50,000 30,000
Delivery: FOB Terms: net cash, if paid in next 10 days; afterwards, 18% interest per annum.			Total	80,000	
			Discount @ 10%	8,000	
			Subtotal	72,000	
			Sales Tax @ 4%	2,880	
E. & O. E.			Net payable	74,880	

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

GOODS RECEIVED NOTE					
Supplier's name and address.....			Purchase Order No.:		
Supplier challan No.:			Purchase requisition No.:		
Job No.:					
<i>S. No.</i>	<i>Quantity</i>	<i>Description</i>	<i>Quantity accepted</i>	<i>Quantity rejected</i>	<i>Remarks</i>
Checked by..... Rejections/Shortages: To be replaced/Not to be replaced			Dt.....	Store inspector's Signature..... (or receiving authority) Date of receipt	

Goods returned note Sometimes, a part or whole of the goods received may not be of acceptable quality, and hence, these have to be returned to the supplier. In this context, the goods received note is prepared. This is also called the ‘debit note’ because the suppliers’ or creditors’ account has to be debited by the amount mentioned in this debit note for the goods returned. In this example, the net amount payable by Vivek Enterprises is Rs 72,072 (Rs 74,880 – Rs 2,808).

VIVEK ENTERPRISES				
302 Kadam Towers, Hyderabad 500004				
Tel: 760 8625, Fax: 760 8620				
APGST Regn. No. 5761/95; CST Regn. No. 345467/95				
Business Solutions Ltd 213, 11-4-650 Sovereign Shelter Lakadikapul, Hyderabad 500 004 Ref: Your Invoice No. 75687			Debit Note No.: 3/2001 Date: 29.3.2001	
The following are returned due to damage in transit:				
Product code	Particulars	Quantity	Price per unit (Rs)	Total (Rs)
383930	1cm Aluminium window frame sheets	10 sheets	300	3000
			Less: Discount 10% Sub-total add: Sales tax @ 4% Total	300 2700 108 2808
Authorised Signature			Date:	

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

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

It reveals the latest balances at a given point of time. It can be used to tally the number of items in the stock with the physical quantity of the stocks.

*These methods are discussed later in this chapter.

STORES LEDGER ACCOUNT											
Material..... Code				Maximum Quantity							
				Minimum Quantity							
Dt.	Receipts				Issues				Balance		
	GR No.	Qty	Price Rs	Amount Rs	SR No.	Qty	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs

GR No.—goods received note number; SR No.—stock register number

The bin card is different from the stores ledger account. Bin card does not reflect the monetary value of the stocks whereas the store ledger account gives the total information about the quantities and their monetary values.

BIN CARD				
Product Name/Code				
Date	Quantity Received (Units)	Quantity Issued (Units)	Balance (Units)	Signature of Store keeper

ABC ANALYSIS—A TOOL OF INVENTORY CONTROL

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

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

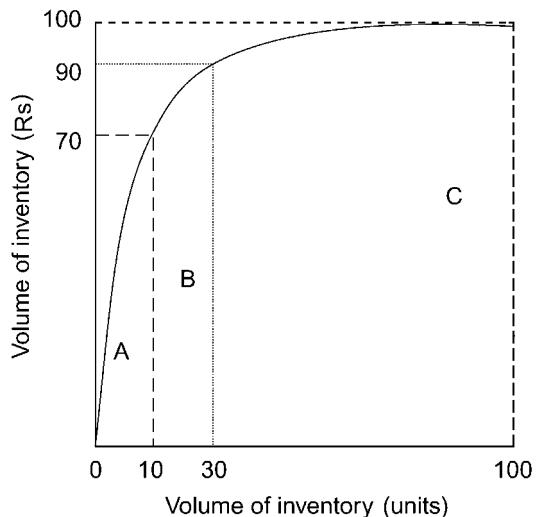


FIGURE 10.4 ABC analysis showing value and volume-wise inventory 'A' refers to high value items 'B' refers to medium value and 'C' refers to low value items

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

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

The following table summarises the concept of ABC Analysis:

Category	Value(%)	Volume(%)	Desired Degree of Control
A	70	10	strict
B	20	20	moderate
C	10	70	low

While these figures vary somewhat from one firm to another, the magnitude of variation is not great. Figure 10.4 presents the concept of ABC analysis, based on the cumulative values and volumes of each category of stocks arranged in the descending order of value.

ECONOMIC ORDER QUANTITY (EOQ)

Economic order quantity is defined as that quantity of material, which can be ordered at one time to minimise the cost of ordering and carrying the stocks. In other words, it refers to the size of each order that keeps the total cost low.

Given the annual demand, the cost of acquisition, and carrying costs, what should be the size of each order? This is EOQ. This concept is explained below:

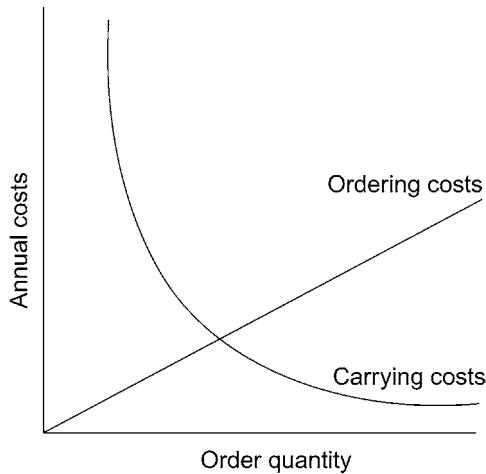


FIGURE 10.5 Relationship of inventory costs to Inventory level

Inventory costs The inventory costs can be classified into two categories: inventory ordering costs and inventory carrying costs.

Inventory ordering costs refer to the costs incurred to procure the materials. Particularly in large organisations, these costs are significant. Several departments such as purchasing and stores department, engineering department, computing department, and others, are associated with the procurement of inventory. It costs a lot to maintain these departments in terms of wages and salaries, other operating expenses such as stationery and supplies, and the cost of services such as computer time, telephone, fax, and so on.

Inventory carrying costs include insurance costs, property taxes (such as corporate tax for a storage premises etc.), storage costs, cost of obsolescence and deterioration, and the opportunity costs of invested funds. Normally, all these work out to 20 to 30 per cent of the total value of inventory. Carrying costs per year are computed as a percentage of average inventory value. The more the inventory is, the more are the inventory carrying costs.

The special feature of inventory costs is that they do not depend upon the volume of inventory. They are the function of the number of orders placed during a given time period. The more the number of orders, the more are the procurement costs.

Figure 10.5 illustrates the relationship of inventory costs to inventory level.

Figure 10.5 reveals that acquisition costs get lower with every increase in the order quantity and the carrying costs increase with increase in the order quantity.

Determining the Economic Order Quantity Given the annual requirement of inventory, the question—what should be the size of each order?—is best addressed by the economic order quantity. The economic order quantity is that quantity of the order, which minimises the related material costs, the ordering costs, and the carrying costs. Consider that the sum of ordering costs and carrying costs is the total cost. EOQ is that order quantity at which the total cost is minimum. This is graphically represented in Figure 10.6.

Here, we assume that the material prices and transportation costs are constant for a given range of order quantities. In other words, the quantity discounts, which are normally available for large size orders, are not considered here.

EOQ can be determined by the algebraic method also.

Algebraic method of determining EOQ Let us define the economic order quantity variables as below:

A = Annual Demand(A)

S = Size of each order (units per order)

O = Ordering cost per order

C = Carrying cost per unit

Step I: Find out the total ordering cost per year

Total ordering cost per year = Number of orders placed per year × Ordering costs per order

$$= \frac{A}{S} \times O$$

Step II: Find out the total carrying cost per year

Total carrying cost per year = Average inventory level × Carrying cost per year

$$= \frac{S}{2} \times C$$

Step III: Determine economic order quantity (EOQ)

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

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

$$2AO = S^2C$$

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

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

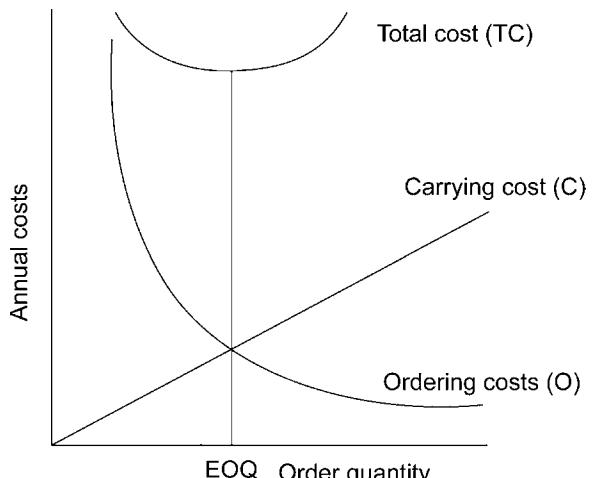


FIGURE 10.6 Graphic representation of EOQ

where S is the size of the economic order quantity, A is the annual demand in units, O is the ordering costs per order, and C is the carrying cost per unit.

Illustration 1:

A biscuit manufacturing company buys a lot of 10,000 bags of wheat per annum. The cost per bag is Rs 500 and the ordering cost is Rs 400. The inventory carrying cost is estimated at 10 per cent of the price of the wheat. Determine economic order quantity.

SOLUTION

$$\text{Annual demand } (A) = 10,000 \text{ bags}$$

$$\text{Ordering costs per order} = \text{Rs } 400$$

$$\begin{aligned}\text{Carrying costs per unit } (C) &= 0.10 \text{ per cent of the unit price of wheat} \\ &\quad (\text{i.e., 10 per cent of Rs } 500)\end{aligned}$$

$$= \text{Rs } 50$$

$$\begin{aligned}\text{EOQ} &= \sqrt{\frac{2AO}{C}} \\ &= \sqrt{\frac{2 \times 10,000 \times 400}{50}} \\ &= \sqrt{\frac{80,00,000}{50}} \\ &= \sqrt{160,000} \\ &= 400\end{aligned}$$

The economic order quantity = 400 bags.

$$\begin{aligned}\text{The number of orders to be placed during the year} &= \frac{\text{Annual demand (in units)}}{\text{EOQ (in units)}} \\ &= \frac{10,000}{400} = 25\end{aligned}$$

In the above case, the company has to place 25 orders to optimise its ordering and carrying costs. The same can be verified from the following table:

(1) No. of Orders per Year	(2) Order Size in Bags	(3) Average Inventory (order size/2)	(4) Carrying Cost @ Rs 50 per Bag $4 = (2) \times (3)$	(5) Ordering Cost @ Rs 400 per order	(6) Total Cost per Year $(6) = (4) + (5)$
1	10,000	5000	250,000	400	250,400
20	$10,000/20 = 500$	250	12,500	8,000	20,500
25	$10,000/25 = 400$	200	10,000	8,000	18,000
30	$10,000/30 = 333.3$	166.65	8,333	12,000	20,333
40	$10,000/40 = 250$	125	6,250	16,000	22,250

The table shows that we can optimise the total costs (ordering and carrying costs) at Rs 18,000 if the size of each order is 400 bags. It is economical for the company to place 25 orders during the year to meet the annual requirement of wheat.

Illustration 2:

The following information is about the shock absorbers used by an automobile workshop:

Annual demand: 4800 units

Unit price: Rs 300

Cost of placing an order: Rs 50

Storage cost: 3 per cent per annum

Interest rate: 15 per cent per annum

Calculate EOQ and also find the number of orders to be placed.

SOLUTION

Annual demand (A) = 4800 units

Ordering costs per order (O) = Rs 50

Carrying costs per unit (C) = Storage cost (3% p.a.) + Interest rate (15% p.a.)

= 18% p.a. of the unit cost

= 300×0.18

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 4800 \times 50}{300 \times 0.18}} = \sqrt{\frac{480000}{54}} = \sqrt{8888.88} = 94.28 \text{ units}$$

Number of orders required to be placed = $4800/94.28$
= 50.91 or 51 orders.

METHODS OF PRICING THE ISSUES OF INVENTORY

It is necessary to value the stocks at the end of the accounting period. There are different methods followed in different industries at different points of time for this purpose. The methods include FIFO, LIFO, simple average method, weighted average method, base stock price method, standard price method, and others. While each of these methods has its own advantages, it is up to the organisation to choose the appropriate one considering its requirements.

The following four methods are discussed here:

- (a) First in First out (FIFO)
- (b) Last in First out (LIFO)
- (c) Simple average price method
- (d) Weighted average price method

First in first out (FIFO) In this method, the material received first will be issued first at the price at which it is received. To price the issues of stock, we use the first price at which the stock is bought. We follow this price until all of the stock that was bought at this price is exhausted. The next price used is the next oldest until all the stock at that price is issued and so on. Under this method, the balance of stock, at any time, is from the most recently procured stock. It is valued according to its price.

The advantages of this method are:

1. It is easy to calculate and easy to understand.
2. Closing stock value is almost close to the most recent prices.
3. This is particularly good in times of fall in the prices. It is because the material charged to the job/product is high and the stock is valued at a low price.

The disadvantages of this method are:

1. There is a danger that material charged to the job/product will be low and the stock is valued at a high price when the prices are in the increasing trend
2. This method tends to show higher profits than other methods, particularly in times of rising prices.

Last in first out (LIFO) In this method, the material received last will be issued first. The stock on hand is, hence, made up of the earlier purchases. In other words, the closing stock is not valued at the recent prices.

This method is particularly good when the prices are on the increasing trend. Closing stock can be valued at the lower prices. Also, this method is better because the charge to production is closely related to the current price level.

The advantages of this method are:

1. It is easy to calculate and understand
2. Goods are issued at the latest prices

The disadvantages of this method are:

1. Since goods are issued in the reverse order from that in which they are received, it looks illogical.
2. Closing stock is not valued at the recent prices.

Simple average price method In this method, the stocks are issued at an average price. The average price is determined by dividing the sum of the prices (at which the goods are received) by the number of prices available. For instance, consider that the following stocks are received during the month at the prices shown below:

January 12 500 units @ Rs 10 each

January 23 200 units @ Rs 8 each

Here the simple average price is $(10 + 8)/2 = 9$

Each issue is priced at Rs 9 till this stock is exhausted as long as these stocks are in the store. At any given time, whatever receipts are present in the store, the relevant prices are considered to determine the simple average price. In other words, the quantity values are not considered here in determining the simple average price.

The advantages of this method are:

1. This method is easy to calculate and understand.
2. This method neutralises the price differences. The stock is valued at the average price.

The disadvantages of this method are:

1. It considers only the prices, not the quantities of stocks. All receipts, irrespective of the quantity of each, are given equal importance, which is not fair.
2. Where there are large fluctuations, the average price is not close to any of the prices available.

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

$$\text{Weighted average price} = \frac{W1.P1 + W2.P2 + W3.P3}{W1 + W2 + W3}$$

where $W1$, $W2$, and $W3$ refer to the quantities of each of the three receipts and $P1$, $P2$, and $P3$ are the prices of each of the receipts. Under this method, the quantity of each of the receipt is called the weight. Hence, the average price so computed is called the weighted average price. Weighted average is calculated after each time a purchase is made.

The advantages of this method are:

1. The extreme fluctuations in the prices at which the materials are received are neutralised
2. It is realistic since it considers the quantities of each of the receipts

The disadvantages of this method are:

1. It is relatively difficult to calculate and understand
2. The prices at which issues and stocks are valued are different from the actual prices

The effect of the different methods of valuing the stocks on stock valuation, cost of production, and profit can be summarised as below:

<i>Method</i>	<i>Effect on stock Valuation</i>	<i>Effect on cost of Product</i>	<i>Effect on Profit</i>
FIFO	Normal	Understates	Overstates
LIFO	Understates	Normal	Normal
Weighted	Average	Average	Average
Average Method			

Illustration 3:

- Jan. 1 Received stock 500 units @ Rs 10 each
 Jan. 4 Received stock 800 units @ Rs 9 each
 Jan. 8 Issued stock 500 units
 Jan. 13 Received stock 700 units @ Rs 11 each
 Jan. 25 Issued stock 1000 units
 Jan. 28 Found 10 units damaged and decided to write off the same

Determine the value of each of the issues of the stock and the closing stock under each of the following methods: (a) FIFO method (b) LIFO method (c) Simple average method (d) Weighted average price method.

(a) First in first out method

STORES LEDGER ACCOUNT									
Material..... Code.....							Maximum quantity.....		
							Minimum quantity.....		
Date				Receipts			Issues		
Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs.	
Jan.1				500	10	5,000			500
4				800	9	7,200			500
8							300	10	2,000
							800	9	7,200
13				700	11	7,700			200
							800	9	2,000
25							700	11	7,200
				200	10	2,000			700
				800	9	7,200			11
28							10	11	110
							690	11	6,890

The value of closing stock under this method is Rs 6,890.

This method is good when the prices are in the falling trend. It is because the material is charged to production at high prices, while the stock is valued at a low price.

(b) Last in first out method

STORES LEDGER ACCOUNT									
Material..... Code.....							Maximum quantity.....		
							Minimum quantity.....		
Date				Receipts			Issues		
Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs.	
Jan.1				500	10	5,000			500
4				800	9	7,200			500
8							300	9	2,700
							500	10	5,000
13				700	11	7,700			500
							500	9	4,500
25							700	11	7,700
				700	11	7,700			500
				300	9	2,700			200
28							10	9	90
							500	10	5,000
							190	9	1,710
									6,710

The value of closing stock under this method is Rs 6,710.

When compared to FIFO, the stock is valued at a lower level. Particularly in times of rising prices, LIFO is better because stock is valued at lower prices. In other words, the remaining stocks are from the stocks received earlier. The issues are made out of the latest stocks received.

(c) Simple average method

STORES LEDGER ACCOUNT									
Material..... Code.....						Maximum quantity.....			Minimum quantity.....
Date	Receipts			Issues			Balance		
	Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs.
Jan.1	500	10	5,000				500		5,000
4	800	9	7,200	300	9.50*	285	1,300		12,200
8							1,000		11,915
13	700	11	7,700				1,700		19,615
25				1000	10♦	10,000	700		9,615
28				10	10◊	100	690		9,515

Here the stocks are valued at an average price. If the prices are fluctuating from time to time to a moderate extent, averaging the prices works out well to determine the prices at which the issues are made or stocks are left. Though this method carries the defects of the concept of arithmetic mean[⊗], it is very simple to administer.

(d) Weighted average method

STORES LEDGER ACCOUNT									
Material..... Code.....						Maximum quantity.....			Minimum quantity.....
Date	Receipts			Issues			Balance		
	Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs	Qty.	Price Rs	Amount Rs.
Jan 1	500	10	5,000				500		5,000
4	800	9	7,200				1,300		12,200
8				300	9.38*	2,814	1,000		9,386
13	700	11	7,700				1,700		17,086
25				1,000	10.05**	10,050	700		7,036
28				10	10.05♦	100.5	690		6,935.5

$$*(10 + 9/2 = 9.5)$$

$$♦(10 + 9 + 11)/3 = 10$$

$$◊(10 + 9 + 11)/3 = 10$$

[⊗]Arithmetic mean fluctuates widely in case of extreme values.

$$*(500 \times 10) + (800 \times 9)/500 + 800 = (5000 + 7200)/1300 = 12200/1300 = 9.38$$

$$^{**}1786/1700 = 10.05$$

$$♦7036/700 = 10.05$$

Here, the stocks are valued at weighted average price, which is based on the quantities and their respective prices. This method is preferred, particularly where the price fluctuations are wild and extreme. The effect of these fluctuations on the pricing of issues and closing stocks is neutralised under this method.

Perpetual Inventory Control

The system of recording balances at the end of each of the receipts and issues is called perpetual inventory control. This is also called ‘continuous stock taking’. It facilitates the regular checking of stocks. The stores ledger account and bin cards are the valuable documents that facilitate this process. The balance as per the store ledger account should necessarily agree with the physical quantity of stocks. The stock verification is done on a day-to-day basis, and hence, the store need not be closed for stock verification or stock taking. It further facilitates the reconciliation of differences between the stock figures as per the books and the stores.

INTEGRATED MATERIALS MANAGEMENT

The process of centralising the functions of materials management is called integrated materials management. It is general thinking that it would be effective if the material function is organised at one level or department. The growing rate of business/industrialisation does not endorse, any more, the centralisation of this function. The size of the business more often determines the need for centralisation or decentralisation.

Benefits The benefits of centralising the functions of materials management in large organisation are:

- (a) economies of scale such as benefits resulting from large-scale buying (better discounts, best quality at the most competitive prices etc.)
- (b) no duplication in purchases
- (c) centralised monitoring of requirements of the whole organisation
- (d) better allocation of scarce materials across all the departments
- (e) representation of materials management function at board/policy level
- (f) adherence to the company rules and regulations
- (g) better opportunities for career development

In modern times, the material management function has become more complex. The handling costs are on the rise. The business centres have spread across the length and breadth of the country. Particularly, in organisations with multiple plants in different locations or multiple business centres, the entire flow of materials into, through, and from the operating system, cannot be controlled from one single or central function. It needs to be decentralised.

Though the above list of advantages of integrated materials management looks impressive, in practice, the decentralised set-up offers the following additional benefits:

- (a) Larger scope for division of labour or functional specialisation
- (b) Higher degree of flexibility, particularly where the manufacturing units are diversified and dispersed over a large geographical area across different continents
- (c) Close monitoring of inventory requirements and focusing on vendor development for industry specific materials
- (d) Minimisation of procurement and supply delays

Stock Levels and Inventory Control

The process of determining stock levels and controlling inventory requirements in accordance with these levels is called inventory control. It is necessary to determine the stock levels to monitor the consumption of stores periodically. The importance of operating supplies such as oxygen in proper quantities in the case of a surgical theatre need not be over-emphasised. Any type of non-availability of such supplies leads to an abrupt breakdown in the services leaving the customers without services. In such a case, it is imperative that minimum stock levels are always ensured to provide adequate care to the patients.

'Stock-out' and its implications When there is no sufficient stock to meet the production schedules, it is referred to as stock-out. A stock-out situation is not desirable. It may lead to breakdown in production, and consequently, the labour may get frustrated. It may spoil the image of the organisation, and thus, affect the business and profits also. In a stock-out situation, it may be necessary to urgently buy small, replenishment quantities of stocks at extra costs to sustain the production process. Though this implies that surplus stocks are necessary, they should not be so much as to result in increased storage costs, which further imply lower profits.

Determining stock levels The stock levels can be determined given the rate of consumption, lead time (time lag in delivery), maximum and minimum levels of consumption at a given point of time, say, a week, month, and so on. Considering these factors, normally there are three stock levels: maximum level, reorder level, and minimum level. These are explained below.

Maximum level Materials need not be stored beyond the maximum level. In other words, the factory does not require more materials than this level considering its rate of present consumption. The maximum level should be as low as possible. The higher the maximum level, higher is the need for working capital for materials.

Maximum level is determined as given below:

$$\text{Maximum level} = \text{Reorder level} + EOQ - \text{Minimum quantity of anticipated usage in lead time}$$

Minimum level Minimum level represents the level below which the stocks should not normally be allowed to fall. If the materials fall below this level, it may lead to a break in the production schedule for want of stocks. The minimum level is determined as follows:

$$\text{Minimum level} = \text{Reorder level} - \text{average usage for Average lead time}$$

Reorder level At this level, the process of placing orders for repurchase should be initiated. This level is higher than the minimum level to cover any sudden increase in the rate of consumption or unexpected delays in replacing the stocks. This level should be lesser than maximum level to prevent carrying out excess stocks. This is a definite action level whereas minimum and maximum levels are the levels at which the management would be warned about the likely dangers of stock-outs or over-investment respectively. Reorder level is calculated as given below:

$$\text{Reorder level} = \text{Maximum usage} \times \text{Maximum lead time}$$

Figure 10.7 presents the different stock levels, rate of consumption, and the lead time. As it can be seen, the vertical line represents the procurement of stocks and the slope indicates the rate of consumption. The lead time is the difference between the point of placing the order and the time of procurement of stocks.

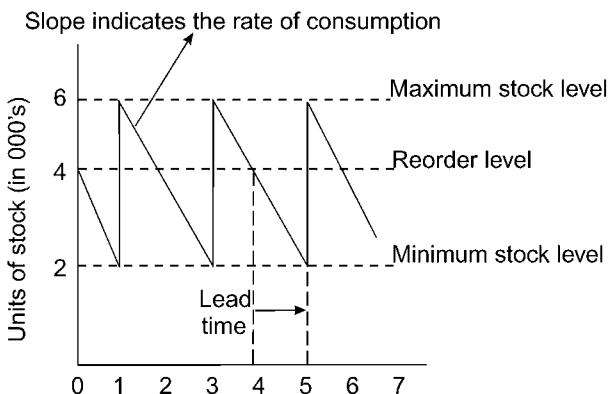


FIGURE 10.7 Stock levels, rate of consumption, and lead time

Illustration 4: Computation of different stock levels

The following data relates to a particular component:

Normal Usage	220 units per day
Minimum Usage	100 units per day
Maximum Usage	280 units per day
Lead time	10–20 days

It is observed that the economic order quantity for this component is 3000 units.

SOLUTION

$$\begin{aligned}\text{Reorder level} &= \text{Maximum usage} \times \text{Maximum lead time} \\ &= 280 \times 20 \\ &= 5600 \text{ units.}\end{aligned}$$

$$\begin{aligned}\text{Minimum level} &= \text{Reorder level} - \text{Average usage for average lead time} \\ &= 5600 - (220 \times 15) \\ &= 5600 - 3300 \\ &= 2600 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Maximum level} &= \text{Reorder level} + \text{EOQ} - \text{Minimum quantity of anticipated usage} \times \text{lead time} \\ &= 5600 + 3000 - (100 \times 10) \\ &= 8600 - (1000) \\ &= 7600 \text{ units}\end{aligned}$$

MODERN TECHNIQUES IN MATERIALS MANAGEMENT

Most of the modern material-intensive manufacturing organisations observe the following modern materials management techniques:

(a) Just-in-time (JIT) system Just-in-time system (JIT) is described as undertaking production by procuring material stocks in staggered quantities as and when required, rather than in anticipation of needs. The main focus here is to maintain minimum stocks at any given point of time. The main objective of the JIT system is low inventory. Hence, the timely supply of materials has paramount importance. This does not mean the stocks on hand are zero but minimal stocks are kept on hand to take care of contingencies such as poor quality materials or workmanship. In fact, in cases where JIT is practised, such type of contingencies are totally eliminated.

The following are the pre-requisites for the successful functioning of the JIT system:

- (i) Reliable vendors must be available. They should be reliable in terms of their commitment to supply the required materials with the consistent quality at the required time.
- (ii) The time needed for setting up the machines must be reduced to minimum so that production can be undertaken in the required quantities.
- (iii) All other bottlenecks must be eliminated to prevent production breakdowns/holdups.

For better results, organisations develop close and long-term relationships with few vendors/suppliers. Many organisations allow access to the vendors to their inventory systems so that the vendors keep track of the day-to-day material requirements and plan their supplies at the right time, accordingly. It is also rewarding in the long-run to train each key worker in more than one skill and train them to perform more than one operation. Many multinationals, including the Japanese, set up new factories in India on this basis with few job classifications. The number of organisations practising JIT in India is on the rise and this includes even the large retailers.

The following are the benefits of the JIT system:

- (i) Optimum use of working capital (lower stock levels require less working capital)
- (ii) The bottlenecks in the production can directly be addressed
- (iii) It enhances the competitive edge of the organisation by keeping the stock handling costs lower

(b) Material requirement planning (MRP) systems MRP is an internal production process designed to ensure that the materials (including raw materials, components, sub-assemblies, supplies for the production operations, maintenance, and repair purposes) and parts are available as and when required.

In the MRP system, the starting point is the master schedule of production plans from which the process works backwards to develop both, a timetable for deliveries and an optimum quantity of the required materials. In other words, the quantity and timing requirements of a derived or dependent demand are determined for the materials used in the manufacturing operation, which has an autonomous demand.

Consider the following examples to understand the concept of derived demand and autonomous demand.

- The demand for a scooter is autonomous or independent. The resultant demand for its components and spare parts for assembly is called derived or dependent demand. By estimating the demand for the scooters at different points of time, we can estimate the need for the spares and other components at any given point of time.
- Take the case of a patient who joins a hospital for a cardiac operation. Suppose that providing surgical/general treatment is the main business for the hospital. In the process, the hospital has to take care of several allied activities such as providing accommodation, diagnostic tests, anaesthetics, surgical facilities, and post-operation care facilities so as to satisfy the total requirements of the patient. The demand for these allied services is called dependent or derived.

In these two cases, the product or service as required by the customer can be seen as the final output of the system which is critically dependent on the given facilities. These facilities are dependent on the customer's final requirement. If the total number of customers is given, the demand for these related facilities can be determined. It is exactly for this purpose that the material requirement planning technique is used. It is mainly concerned with the scheduling of allied activities and the management of inventories at every stage.

The MRP system formulates a schedule for all dependent materials/facilities. In this process, we consider all the expected shortages due to capacity limitations. It is necessary to monitor this closely on a periodical basis to ensure that there is no deviation between the actual and the estimated demand. Effective information systems constitute an essential prerequisite for the effective functioning of the MRP systems.

(c) Vendor rating and development The vendors are rated on the basis of their reliability in terms of quality, quantity, price, and consistency in the quality. Such selected vendors are given special training and facilities for better performance. For instance, these facilities include financing of cold storages, transport vehicles, computing infrastructure, and so on.

(d) Value engineering (VE) or value analysis (VA) Value analysis is essentially a cost reduction technique. It is defined as the process of determining the functional value/worth in relation to the cost of a given product or service. The main idea is to concentrate on the basic function of the product and spend as much as required for this purpose. In other words, it focuses on eliminating the unnecessary costs.

It is also called value engineering because it involves a systematic effort to drop unnecessary costs from the total cost of a given product. In case of products with complex designs and expensive components, the possibility is explored to replace them with simple design items at lower costs without sacrificing or impairing the product safety, quality, or performance. Value analysis is more useful for products made on a large scale where a small savings on each component can result in a substantial reduction in overall costs.

The success of the value analysis programme depends on design analysis, cost analysis, and the commitment of the top-level management in terms of quality circles, providing specialised staff for this purpose.

Utility of value analysis The following examples illustrate the utility of value analysis:

1. When the principles of value analysis are applied to the task of serving tea, providing a saucer along with the tea cup adds to the cost with no significant addition to the utility for the consumer. It may be noticed that the price of tea could be reduced further if the expenditure on saucers and their cleaning is avoided.
2. When the principles of value analysis were applied to the mailing system in one of the states in USA, it was concluded that the high costs of processing, mailing, and postage could drastically be reduced. A value analysis team including an operating personnel, a buyer, a systems analyst, and an equipment supplier studied this entire mailing operation from a functional point of view. The revised mailing system resulted in saving the government in excess of \$350,000 per year.

The major changes suggested, in this exercise include

- redesign of many of the forms used. This resulted in a significant reduction in the number of forms utilised
- offering to download a number of forms at the customer end. This resulted in the saving in labour and costs of producing the forms, maintaining the stocks, and mailing. However, a moderate number of forms were made physically available in case of enquiry in person or by post

- use the computerised mailing system. This made it possible to insert several documents going to the same address in one envelope. This reduced the supply, labour, and postage costs.²

In both of these examples, the focus was the functional utility of the product or service. How to reduce costs and maintain quality, ensuring the functional value at every stage? This is the crux of the issue of value analysis.

(e) Supply-chain management It is increasingly recognised that good supply-chain management facilitates the organisations to improve their efficiency and increase customer service. The focus, here, is outsourcing, which means that the company prefers to buy stocks from outside rather than manufacturing on its own. Considering the core competencies, it is no more advisable to manufacture everything on its own, particularly when these are available in the open market at competitive prices. This being the philosophy, modern organisations are more committed to support and manage these supply-chains for better management of inventory.

The main task here is to organise, integrate, and operate the entire materials management function by developing reliable supplier/vendor base. Some of the tasks in the supply-chain management end up in the JIT system and also vendor development. All these are the sub-systems of the inventory management system.

In the supply-chain management, the procurement of inventory and delivery schedules are continuously monitored in the light of capacity planning and the production facilities. Companies such as Maruti have not increased the area allotted to the incoming materials storage despite the fact that it has doubled its production over the previous years. It is because the company could successfully stagger supply from multiple sources ensuring more frequent supplies from vendors located nearby. At every stage it was ensured that the customers get better products.

SUMMARY

- ◆ Materials refer to the inputs that go into production. They include raw materials, work-in-progress, finished goods, and supplies to take care of maintenance and repairs.
- ◆ The cost of inventories is around 70 per cent of the cost of production, and hence, any attempt to reduce the costs will directly enhance profitability.
- ◆ Materials management is the process of planning, organising, and controlling the inventory. Its main purpose is to provide the right materials at the right time at the right place and from the right supplier.
- ◆ The critical factors affecting inventory control include sudden changes in production plans, steep increases in the material costs, excessive storage costs, stock-out costs and increasing lead times.
- ◆ Inventory control is a process of (a) formulating a clearly defined purchase procedure, (b) classifying and codifying inventory, (c) maintaining store records, (d) practising EOQ and ABC analysis concepts to control the stores in a scientific manner, and (e) setting different stock levels.
- ◆ The purchasing process, particularly in large organisations, is an elaborate process. It covers many steps. They are: (a) obtaining purchase requisitions, (b) exploring sources of supply, (c) issuing tenders and quotations, (d) opening of tenders and quotations to prepare comparative statement, (e) negotiating terms and conditions of supply, (f) placing purchase order, (g) receiving materials along with invoice, (h) checking inward invoice, (i) inspecting and testing the materials, (j) forwarding the materials to stores, and (k) checking the invoice and passing it on to the finance department for final payment.

- ◆ Purchasing is a rational decision. It has several benefits in terms of reduced costs, higher inventory turnover, buying the materials at the best prices, reduced obsolescence, continued supplies, reduced lead times, and so on.
- ◆ The store records include material requisition note, purchase order, invoice, goods received note, goods returned note, stores ledger account and bin card.
- ◆ ABC analysis is an inventory control device based on the value and quantity of the materials. The A category consists of high value items (low in quantity). These need strict or high control. The B category consists of items of medium value (their quantity is average or medium). These are given medium degree of attention. The C category consists of items, which are of least value (money-wise) and are given a lower degree of attention.
- ◆ Economic order quantity (EOQ) refers to that quantity of the order, which minimises the ordering costs and carrying costs. The following formula is used to determine EOQ.

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

where A refers to Annual demand for the units, O refers to ordering costs and, C refers to carrying costs. Carrying costs can also be expressed as a percentage to the unit price.

- ◆ The issues of inventory can be priced according to different methods such as FIFO, LIFO, simple average price and weighted average price.
- ◆ FIFO means first in first out. The material received first is the material issued first at the corresponding price.
- ◆ LIFO refers to last in first out. Here, the material received last will be the material issued first at the corresponding prices.
- ◆ Simple average price considers the average of the prices at which materials are available in store. Issues are priced accordingly. Here the quantity of the stocks is not considered.
- ◆ Weighted average price method considers the price calculated on the basis of the price and quantity of the stocks available. In other words, while calculating the average price, the quantities of each of the receipts is considered. The weighted average price is calculated as given below:

$$\text{Weighted average price} = \frac{W1.P1 + W2.P2 + W3.P3}{W1 + W2 + W3}$$

where $W1$, $W2$, and $W3$ refer to the quantities of each of the 3 receipts and $P1$, $P2$, and $P3$ are the corresponding prices of each of the receipts. Under this method, the quantity of each of the receipt is called weight. Hence, the average price so computed is called weighted average price.

- ◆ Perpetual inventory control is also called continuous stock taking based on stores ledger account and bin card. Every receipt and issue is recorded and the balance of stock is calculated at the end of each transaction.
- ◆ The centralisation or decentralisation of the material management function is a strategic decision to be taken based on the merits of the case.
- ◆ Stock levels are determined to monitor the stocks very closely. These levels, if monitored closely, will minimise the stock-out costs.
- ◆ Stock levels include the maximum level, reordering level, and minimum level.

- ◆ The modern materials management techniques include the just-in-time system, material requirement planning system, vendor rating and development, value analysis and supply-chain management.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Which of the following refers to inputs into the production process?
 - (a) Materials
 - (b) Work in progress
 - (c) Spare parts
 - (d) Components
2. What refers to the process of planning, organising and controlling the materials in a given organisation particularly armed forces?
 - (a) Supply management
 - (b) Materials management
 - (c) Logistics management
 - (d) Operations management
3. What refers to all the idle physical stocks which have economic value?
 - (a) Items in stores
 - (b) Inventory
 - (c) Materials in transit
 - (d) Materials in process
4. What refers to the scientific method of providing the right type of material at the right time in the right quantities and at the right price to sustain the given production schedules?
 - (a) Stock control
 - (b) Materials control
 - (c) Inventory control
 - (d) Disaster control
5. Which of the following is not an objective of inventory control?
 - (a) Ensure economy of costs
 - (b) Avoid accumulation in materials
 - (c) Maximise investments in materials
 - (d) Maintain adequate inventories
6. Which of the following is a factor affecting inventory control function?
 - (a) decreases in material prices
 - (b) decreasing lead time
 - (c) excessive storage costs
 - (d) gradual changes in production plans
7. Which of the following is not an objective of the purchasing function?
 - (a) Explore and develop other sources of supply
 - (b) Ensure interrupted flow of supplies
 - (c) Obtain the best value for money spent
 - (d) To train staff, make policies and procedures

8. Which of the following is not a feasible situation that justifies decentralisation?
 - (a) Companies that process single natural raw materials
 - (b) Technology oriented firms
 - (c) Services oriented firms
 - (d) Multi plant manufacturing firms
9. Who receives the inward invoice?
 - (a) Supplier
 - (b) Vendor
 - (c) Consumer
 - (d) Buyer
10. Which of the following is a benefit reaped for a rational purchasing decision?
 - (a) Increased lead times
 - (b) Slow turnover of inventory
 - (c) Increase in transport costs
 - (d) Reduced obsolescence in materials
11. What is the process of assigning numbers or symbols or a combination of both?
 - (a) Classification
 - (b) Codification
 - (c) Duplication
 - (d) Computerisation
12. Which of the following is an advantage of classification and codification?
 - (a) Easy availability of materials
 - (b) Complex inspection process
 - (c) Complex process of issuing products
 - (d) Standardisation of items
13. What facilitates the maintenance of accounts for each item of inventory?
 - (a) Journals
 - (b) Store records
 - (c) Ledgers
 - (d) Maintenance records
14. What is the slip attached to the bin where the goods are stocked?
 - (a) invoice
 - (b) material requisition note
 - (c) bin card
 - (d) stores ledger account
15. What refers to the costs incurred to procure materials?
 - (a) Inventory carrying costs
 - (b) Inventory ordering costs
 - (c) Stock order costs
 - (d) Stock out costs
16. What refers to that quantity of material which can be ordered at one time to minimise the cost of ordering and carrying the costs?
 - (a) Carrying cost
 - (b) Cost of acquisition

- (c) Economic order quantity
 - (d) Economic quantity
17. Which of the following is a method of pricing the issues of inventory?
- (a) First in last out
 - (b) Last in last out
 - (c) Simple average price method
 - (d) Last in first out
18. What refers to the process of centralising the functions of materials management?
- (a) Perpetual inventory control
 - (b) Integrated materials management
 - (c) Simple average price control
 - (d) Weighted average price control
19. Which of the following is a benefit of centralised integrated materials management?
- (a) Duplication in purchases
 - (b) Diseconomies of scale
 - (c) Decentralised monitoring of requirements
 - (d) Better allocation of scarce materials
20. Which of the following is not a benefit of decentralised set up of integrated materials management?
- (a) Minimisation of procurement delays
 - (b) Larger scope for division of labour
 - (c) High degree of flexibility
 - (d) No functional specialisation
21. What refers to the process of determining the functional value/worth in relation to the cost of a given product or service?
- (a) Vendor Rating
 - (b) Value Analysis
 - (c) JIT
 - (d) Supply chain management

Question II: Fill in the Blanks

1. Inputs that go into the production process are called
2. Materials may consist of raw materials,, and finished goods.
3. Normally the cost of materials takes 70 per cent of of the product.
4. The process of assigning numbers to the different materials is called
5. The time taken to replenish the stocks is called
6. The method of stock control classifying the stocks on the basis of their respective value and volume is called
7. That quantity of order at which the total cost is minimum is called
8. The LIFO method of valuing the issues and closing stocks of inventory is good in times of prices.
9. The method that considers the quantity and price of the respective stocks for valuing the issues is called

10. The method of pricing the issues that neutralises the price differences is called
11. Maintaining stocks beyond level leads to blocking of the working capital for no reason.
12. One of the examples for stock-out costs is
13. Economic order quantity is based on the aggregate of and
14. The process of estimating requirements of materials for different component parts of the final product or service is called
15. The system of delivery of materials/components immediately before they are due to be processed is called
16. The technique of reducing the costs analysing the functional worth of a product is called
17. The statement just containing the quantity particulars of materials is called
18. The system of providing the right material in the right quantity at the right time is called
19. The accounts department compares and with the invoice before issuing the cheque.
20. The process of recording stores balances after every receipt and issue is called

Question III: Short-answer Questions

Write short note on the following (in not more than six lines each):

1. Economic order quantity
2. Stores Ledger account
3. FIFO
4. Integrated materials management
5. Stock-out costs
6. Material requirement planning
7. Vendor rating
8. Inventory management
9. Negotiation
10. Classification and codification

Question IV: Essay Type Questions

1. Explain the objectives of purchasing function. How do you organise the purchasing department?
2. Explain the stores documents with appropriate illustrations.
3. What do you understand by economic order quantity? Derive a formula to determine it.
4. Given the following particulars of receipts and issues of stocks, prepare a stores ledger account under (a) FIFO, (b) LIFO, and (c) weighted average methods.

Component: Shafts

- | | |
|---------|--|
| March 1 | Received 800 units @ Rs 4 per unit. |
| 8 | Received 300 units @ Rs 6 per unit |
| 14 | Issued 500 units |
| 18 | Received 400 units @ Rs 5 per unit |
| 22 | Issued 900 units |
| 29 | There was a shortage of 20 units in the stock verification |

Determine the price at which the component is issued and the value of the closing stock under each of the above methods.

5. Reddy Laboratories provides the following information of purchases and issues of a bulk drug raw material for the month of March, 2000. Prepare Stores Ledger Account under (a) FIFO, and (b) LIFO.

<i>Date</i>	<i>Receipts/Issues</i>
March 1	Received 2000 kg @ Rs 25 per kg
3	Received 5200 kg @ Rs 24 per kg
4	Issued 1400 kg
10	Received 800 kg @ Rs 26 per kg
19	Received 600 kg @ 27 per kg
24	Issued 1720 kg
28	Received 1000 kg @ 30 per kg
30	Issued 760 kg

6. Determine EOQ in each of the following cases:

- (a) The annual demand for an item is 20,000 items. The cost of holding one unit in stock for a year is Rs 0.30 and an order costs Rs 30.
- (b) A supermarket sells 20,000 packets of wheat at Rs 20 per packet annually. Delivery costs are Rs 50 per order and the cost of holding a unit in stock is 15 per cent of the total cost.
- (c) The cost of placing an order is Rs 500. It is estimated that 2000 units will be used in the next 12 months. The inventory carrying costs are 10 per cent per annum and the price per unit is Rs 150.
- (d) The following information is related to a cement company: Annual demand—24,000 units; unit price—Rs 24, cost of placing an order—Rs 40, storage costs—3 per cent per month, and interest rate 1 per cent per month.
- (e) The annual demand for ready-made T-shirts of Wardrobe Ltd Hyderabad is 50,000 per year. The cost of placing an order is Rs 800 and the cost of carrying one unit in inventory for one year is Rs 10, which includes cost of insurance, storage costs, and other related costs.

7. Determine the various stock control levels with the following information:

Normal usage — 5000 units per day

Minimum usage — 2400 units per day

Maximum usage — 7700 units per day

Lead time — 10–20 days

EOQ — 8,000 units

8. Explain materials management as a process.

9. The following data has been supplied by a retail shopkeeper in Abids.

Jan 19 Opening stock of 4000 units @Rs 600 each
 Feb 7 Bought 200 units @ Rs 720 each
 Mar 4 Sold 72 units @ Rs 1200 each
 April 18 Bought 200 units @ Rs 750 each
 May 15 Sold 50 units @ Rs 1200 each

Prepare stores ledger accounts and show how the stock records would appear under (a) FIFO, (b) LIFO, and (c) weighted average price method.

10. The following transactions occurred in the purchase and issue of a material during January to March.

Jan 2 Bought 8,000 units @ Rs 400 per unit
 Jan 18 Bought 1,000 units @ Rs 500 per unit
 Feb 5 Issued 4,000 units
 Feb 10 Bought 12,000 units @ Rs 600 per unit
 March 2 Issued 2,000 units
 March 16 Bought 9,000 units @ Rs 550 per unit
 March 25 Issued 6,000 units

Prepare Stores Ledger Account under LIFO.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. a | 2. c | 3. b | 4. c | 5. c |
| 6. c | 7. b | 8. c | 9. d | 10. d |
| 11. b | 12. d | 13. b | 14. c | 15. b |
| 16. c | 17. d | 18. b | 19. d | 20. d |
| 21. b | | | | |

Answers to Question II

- | | |
|---|---|
| 1. materials | 4. codification |
| 2. work in progress | 5. lead time |
| 3. total cost | 6. ABC analysis |
| 7. economic order quantity | 14. material requirement planning |
| 8. rising | 15. just-in-time |
| 9. weighted average method | 16. value analysis/value engineering |
| 10. simple average method | 17. bin card |
| 11. maximum level | 18. inventory control |
| 12. loss of reputation or labour problems or break down in production | 19. goods received note: purchase order |
| 13. carrying costs and ordering cost | 20. perpetual inventory control |

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11

MARKETING: CONCEPTS AND FUNCTIONS

Learning Objectives

By the end of this chapter, you should be able to explain

- the concepts of marketing and selling
- marketing functions
- the core marketing concepts and their applications
- channels of distribution

INTRODUCTION

Marketing is an essential function of a modern organisation whether it deals in products or services. Gone are the days when a good product was sold on its own. In other words, marketing constitutes an essential function of modern business organisations. There is also a danger of getting bad or poor quality products marketed by strong networking. However, the customer is the king to decide what is good quality or otherwise. In this chapter, the core concepts of marketing, its functions, and channels of distribution are discussed.

Definition of Marketing

The concept of marketing has been defined in various ways by different experts.

*Philip Kotler*¹ Marketing as a societal process by which individuals and groups obtain what they need and want through creating, offering, and freely exchanging products and services of value with others.

*Peter F. Drucker*² The aim of marketing is to know and understand the customer's requirements so well that the product or services, designed accordingly, are sold by themselves. Ideally, marketing should prepare a customer to buy.

*William J. Stanton*³ Marketing is a total system of interacting business activities designed to plan, price, promote, and distribute products and services that satisfy the wants of the present and potential customers.

*E.F.L Brech*⁴ Marketing is the “process of determining consumer demand for a product or service, motivating its sales and distributing it into ultimate consumption at a profit”.

Malcolm McNair Marketing “creates and delivers the standard of living to the society”.

From the above definitions, it can be observed that marketing is the process of identifying the customers' requirements and satisfying them efficiently and effectively. It is also viewed as a system of integrated business

activities designed to develop strategies and plans to satisfy the customer needs in the given market segments or targets. The marketing activity not only creates the standard of living but also delivers it.

Many examples illustrate this viewpoint. The emergence of new services in the field of information technology such as internet, e-commerce, and others, has added a new dimension to the concept of marketing by bringing the customers all over the world in close contact with the sellers. The world started embracing these services in view of the fact that they facilitate access to information about people, events, products, services, from all over at minimum effort and affordable costs. For instance, e-commerce focuses particularly on convenience and savings, both for the producers and consumers.

Marketing versus Selling

Selling refers to the act of transferring the ownership of the goods and services from the seller to the buyer. Marketing refers to the whole process encompassing the entire range of activities starting from identifying the customers' requirements to satisfying these in a mutually beneficial manner (to both the seller and manufacturer, and the consumer). Marketing concept represents the business philosophy that essentially aims at generating profits by recognising and satisfying the customer needs. Selling is product-oriented whereas marketing is consumer-oriented. In other words, selling is only a tip of the marketing iceberg. The following table summarises the differences between the concepts of marketing and selling.

	<i>The marketing concept</i>	<i>The selling concept</i>
Focus	Customer needs-oriented	Product-oriented
Means	Integrated marketing	Promoting sales
End objective	Profits through customer satisfaction	Profits through enhanced sales

Selling is preoccupied with the seller's need to convert the products into cash. Marketing is preoccupied with the idea of satisfying the customer needs by means of the product and the whole cluster of things associated with creating, delivering, and finally consuming it. Integrated marketing comprises all such business activities designed to develop strategies and plans to satisfy the customer needs.

Utilities of Marketing

Marketing creates four types of utilities: form, place, time, and possession utilities. While selling provides only possession utility, marketing encompasses all these utilities. The main purpose of marketing is to earn maximum profit by adding the maximum value to the customer at the minimum cost. The value addition can be maximised by processes such as packaging, branding, standardisation, grading, and so on.

The development of a product involves the creation of form utility. The other utilities facilitate the flow of form utility in the form of the product to the ultimate customer, for a profit. Profit is the ultimate result of consumer satisfaction. This is possible only when products or services are made available in the right form, right time, and right place, and in such a way that enables the consumer to obtain its possession.

Business and Marketing

The term 'business' denotes any activity aimed at making profit. Marketing is one of the many functions of business, which include production, finance, HRD, and others. Marketing is concerned with the creation and satisfaction of customer needs to achieve the aims of business itself.

Customer as the focus of marketing

The following statements, which often appear in corporate advertisements, directly address the customer as the focus of marketing.

- You are the Maharaja. (Air India)
- The complete man. (Raymonds)
- We've been thinking of you. (WIPRO)
- We value your trust. (State Bank of India)
- Meeting diverse customer needs worldwide. (HINDALCO)
- In the service of people. (Life Insurance Corporation of India)
- Have it your way. (Burger King)
- Putting the people first. (British Airways)
- Connecting people (Nokia)
- Where India shops for value (Pantaloons)

This list is only illustrative. These outline how the industrial houses prefer to organise their activities around the needs of the customer.

In other words, ignoring the customer needs may not only be counterproductive but also suicidal.

Marketing constitutes the eyes and ears of a business, and links the business with its environment and informs on events that can influence the business operations. Marketing is a philosophy, an attitude, or way of life for every business, wherein both the financial and non-financial resources are mobilised to create, stimulate, and satisfy the customer needs at a profit. Profit is not, however, the sole objective of any business unit. It is one of the many objectives of the business. The profit objective cannot be realised in isolation. It has to be integrated with other objectives to generate profits from customer satisfaction.

Marketing Starts and Ends with the Customer

Since marketing is concerned with satisfying the customer needs, it starts with identifying the customer needs or even collecting the related data. Marketing can be effective when there is a continuous flow of information relating to customer perceptions, competitor's strategies, government policies, and business trends. In the light of this information, product is conceived, produced, and sold to the customer. The marketing does not end here. The marketing department should seek the level of customer satisfaction with these products. If any changes are considered necessary to provide additional value to the customer, such information has to be provided to the production department. Tying up with related products and services may, more often, offer great value addition to the customer. For instance, if you buy a PC, a few software programmes are offered free. Marketing, thus, constitutes the most decisive function of every business organisation.

MARKETING FUNCTIONS

Studying marketing through its functions is called the *functional approach* to the study of marketing. The marketing functions comprise: buying, selling, transportation, storage, standardisation, grading, financing,

risk taking, and market research. An analysis of these marketing functions explains how changes are caused by shifting, combining, or eliminating activities from one agency to another. The functional approach provides a short cut to learn the entire gamut of marketing activity. However, there is one limitation of the functional approach to the study of marketing, which is that it does not focus on the application of each of these functions to specific business operations. The other approaches to the study of marketing are outlined in Annexure 2 of this chapter.

Marketing functions direct and facilitate the flow of goods and services from the producer to the end user. The marketing process starts and ends with these functions. The following analysis reveals that there is no consensus on the functions of marketing.

JF Pyle defines marketing as a process of concentrating functions and dispersing functions. The concentration functions aim at bringing the goods together with all the related facilities at the marketing centres. The dispersing functions focus on sending the goods, after sale, along with the related services to the customer. The concentration functions include buying or assembling, transportation, storing, grading, financing, and risk bearing. The dispersing functions include selling, transportation, storing, grading, financing, risk bearing, and dividing. It can be noted that there are certain common functions in both the sets as these have to be performed in both buying and selling.

Marketing functions (Pyle's classification)

<i>Concentrating functions</i>	<i>Dispersing functions</i>
(a) Buying	(a) Selling
(b) Assembling	(b) Transportation
(c) Transportation	(c) Storing
(d) Storing	(d) Grading
(e) Grading	(e) Financing
(f) Financing	(f) Risk-bearing
(g) Risk-bearing	

Clark and Clark define marketing as a process involving three stages—concentration, equalisation, and dispersion—primarily concerned with the flow of goods from the producer to the consumer. This is an improvement over Pyle's classification in the sense that it adds an additional set of functions, that is equalisation, which means adjusting the supply in terms of quantity and quality to meet the changing demand levels. The list of functions proposed by Clark and Clark are:

Marketing functions (The list of functions as proposed by Clark and Clark)

<i>Concentration</i>	<i>Equalisation</i>	<i>Dispersion</i>
(a) Buying	(a) Storage	(a) Selling
(b) Assembling	(b) Grading	(b) Transporting
(c) Transporting	(c) Transporting	(c) Grading
(d) Financing		(d) Financing
(e) Riskbearing		(e) Risk-bearing
(f) Storage		

Another classification as put forth by Converse, Hugey and Mitchell represents the viewpoint of the economists that utilities constitute the essence of the marketing process, and hence, the marketing functions can be classified based on the utilities.

Marketing functions (as suggested by Converse, Hugey and Mitchell)

<i>Time and place utilities</i>	<i>Possession utility</i>	<i>Form utility</i>
(a) Transportation	(a) Determining the needs	(a) Formulating policies
(b) Storing	(b) Creating demand	(b) Financing
(c) Packing	(c) Finding buyers and sellers	(c) Supervision
(d) Dividing	(d) Negotiating	(d) Accounting
(e) Grading	(e) Transfer of title	(e) Securing information
(f) Order assembly	(f) Equalisation	(f) Risk-taking

The marketing functions can be broadly categorised as follows:

Marketing functions

<i>Functions of exchange</i>	<i>Functions of physical distribution</i>	<i>Facilitating functions</i>
(a) Selling (demand creation)	(a) Transportation	(a) Financing
(b) Assembling (buying)	(b) Storage and warehousing	(b) Risk-taking (c) Standardisation (d) Marketing research and information

This classification is considered better because it covers all the essential functions of marketing. It provides an overall idea about the marketing process.

Functions of Exchange

- (a) *Buying and assembling* Buying is one of the primary functions of marketing. Buying raw materials as required by the specifications of the customers' requirements or assembling the spare parts as per the needs of the customer is the essential step in the marketing process. Different intermediaries carry out this function till the product reaches the customer. The producer buys the raw materials, the wholesaler buys the finished product from the producer, the retailer buys from the wholesaler, and so on. At times, the raw materials or spares are bought from different suppliers and from different places. Maintaining a database relating to the prices and the suppliers is a crucial aspect of the buying function.

Buying and assembling are two distinctly specialised functions. Where inputs are large in size and occupy larger area in terms of floor space, they are brought separately and assembled into finished or semi-finished products. Assembling function, thus, saves transportation costs and efforts. Consider the example of PCs. There is a separate market for assembled sets of PCs. Branded PCs may be very costly, which only institutions can afford to buy. Assembled PCs are available for lower prices. Most of the individual buyers opt for assembled sets as they can be conveniently configured or

customised as per individual specifications. Thus, the assembling function offers a specific opportunity to seek special markets in terms of quality, quantity, prices, date of delivery, and other terms and conditions.

- (b) *Selling* Selling is another important function and involves transfer of title to goods. Selling is a highly specialised job. Selling may be of two types: personal and impersonal. In personal selling, one finds a sales person speaking about the product and why one should buy it. In case of impersonal selling, it is the advertisements, hoardings, and others, that speak about the products or services of the organisation.

It is only through selling and realising profits that the organisation survives. Demand creation is one of the complex jobs of the marketer. The government regulations and the limitations set by the legal enactments further restrict the freedom of the seller. The emergence of e-business has not undermined the importance of selling, but on the other hand, it has supplemented the efforts of the marketers. Teleshopping and internet shoppes have facilitated the job of the sales professionals easier. However, a sales professional is an indispensable link in the chain of marketing.

Functions of Physical Supply

These functions facilitate the organisation to carry out the functions of exchange more effectively. Functions of physical supply facilitate the processes of buying and selling. There are two functions under this category: transportation, and storage and warehousing.

- (a) *Transportation* This function provides place utility for the products by transporting the goods wherever they are required. Particularly where the markets are dispersed and the manufacturing points are concentrated around the supply points of raw materials, transportation function has a significant role to play. The transportation function is so prominent that it can make or mar the markets. However, the efficiency of the transportation function depends on many factors such as the quality of roads, availability of diesel/power in case of steamers, diesel engines, electric trains, and so on.

The developments in communication technology have strengthened the efficiency of transportation systems. The movements of the cargo vehicles can be monitored on the personal computer and the buyer or seller can be informed accordingly about the movement of goods and the approximate loading/unloading time. Thus, the transportation function is capable of creating time utility also. Improvements in the means of transport have led to low costs and efficient services to the customer.

- (b) *Storage and warehousing* These two functions are supplementary to each other. In other words, one cannot exist without the other. The products are stored in warehouses. Particularly, where the production is seasonal or when the consumption is seasonal but the production is continuous, it is necessary for the products to be stored during the year and released as per the demand in the market. These functions provide time utility. In other words, the products are released and utilised as and when the markets need them. It facilitates a continuous flow of these products to the market throughout the year.

Warehousing makes the storage function more effective. Warehouses can be set up at the points of production. Food Corporation of India, for example, set up warehouses (also called godowns) in each district to store the produce from the crops closer to all the production points throughout the country. The stocks are supplied from these godowns to all the villages in the district. In other words, warehousing can be on a centralised or decentralised basis. Storage function tends to adjust the supply to demand so as to equalise it in the best interest of the manufacturers, middlemen and consumers. Hence, transportation, storing, and warehousing are called equalisation functions.

Facilitating Functions

These are supporting functions to marketing, and thus, have a direct relationship with the marketing process.

- (a) *Financing* The marketing/production activity may be financed by own funds or borrowed funds. It is money that keeps the marketing activity going. In other words, without finance, the entire marketing activity comes to a standstill. The producers, wholesalers, retailers, and even customers need finance to buy. Today, most of the financing companies offer credit facilities to different segments of the society to buy goods and services. Particularly, where the economy is based on the credit facilities, the importance of finance need not be elaborated. Credit facilitates enhance the volume of sales, the goodwill of the consumers, and spread the sales through out the month or the year.

The requirements of finance may be for a short-term, medium-term or long-term period. There are apex financial institutions such as nationalised and private commercial banks, private lending organisations, cooperative banks, and others. These have specialised schemes for agricultural finance, working capital finance, seed capital finance, venture capital finance, and so on. The terms and conditions of each of these schemes differ from the other.

- (b) *Risk-taking* Risk is an integral part of business, and thus, without risk, there is no business at all. The marketer prefers to minimise the risk associated with the business activity, particularly, when the economy is associated with innumerable risks. Risks arise out of one or more of the following sources:
- Due to social hazards (such as theft, burglary, bad debts, war etc. These are called social risk)
 - During the course of transportation (transportation risk)
 - Due to spoilage due to decay, deterioration, delay, or accidents (physical risk)
 - Due to the fluctuations in the prices of the commodity caused by the changes in their demand and supply or in the currency rates (economic risk)

One can protect oneself from physical risks by careful handling of goods. The social and economic risks can be shifted to professional agencies such as insurance companies, which provide different schemes such as fire insurance, theft/burglary insurance, transportation insurance, accident insurance, and others. Even the economic risks can be shared or offset by entering into 'hedging contracts'. Hedging contract is one where a buyer/seller enters into agreement with each other to buy/sell goods at a given price at a future date. However, this requires specialised knowledge, on the part of the buyer and seller, of the markets and the products.

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

Standardisation and grading further eases the customer from examining the goods, and thus, saves time in the process. Hence, it adds time utility to the marketing process. Establishing standards and maintaining them is considered as a highly specialised and ethical function of the marketing process.

- (d) *Market information and research* Modern marketing requires a lot of information accurately, adequately, and promptly. Strategically, this information becomes the basis for any decision-making. Where to sell, how much to sell, when to sell, at what price, in what form, how other competitors are selling—all these are strategic issues, which need to be decided based on authentic information

not only about the organisation but also that of its competitor. This has, further, led to the need for market research. However, today, market research has become an independent branch of marketing in view of its specialised focus. It is through marketing research that the producer can keep abreast with the ever-changing customer needs, tastes and preferences, competitor's strategies, and so on.

21st Century: Chinese aggression again?

It sounds true, when you peep into the markets, though not in politics.

The markets, all over the world, are dumped with Chinese products, at almost one-fourth costs, ranging from small size locks to scooters.

Experts certify that these products are of good quality. The growing demand for these products is a valid testimony to this. But how is China able to produce these goods at such cheap prices?

It is reported that China has a good industrial infrastructure, in general. The capital, power, and labour, in particular, are available there at relatively very low prices. Government provides capital at cheaper interest rates. Power costs lower. China is known for its size of population and the labour is abundant. Moreover, the labour laws, do not favour the workers. The workers begin work each day at 8 AM and work for 14 hours every day, seven days a week. They are provided shelter in the plant premises where they sleep for the night. There are other factors, such as the following:

- Most of the industrial units in China have huge economies of scale. For instance, where the Indian plants can make 3,000 to 7,000 leather garments a month, Chinese ones can make between 30,000 to 1,00,000 garments in the same period.
- The huge scale of production reduces the cost of production per unit substantially. The Chinese can make shoes of a particular design at Rs 120. It costs Rs 750 to manufacture the same in India.
- Take the case of batteries. If our manufacturing cost is Rs 4, it is retailed at Rs 7 after adding various duties. Here the labour cost could be around 25 per cent of the manufacturing cost. Whereas the consignment of batteries from China reaches India at 55 paise and is retailed at Rs 1.50.

This list is only illustrative. Computers, electronic toys, stationery items, gift items, and others, would make the list endless. It is generally observed that many Chinese products are available at 15 per cent of costs.

From this, it is evident that where the products are intended for mass manufacture (for instance, several million units in one lot), China has time-tested and proven skills. We are yet to develop infrastructure for such mass manufacturing capacities. No doubt, we have creative and high value-adding manpower capable of designing and producing products and services, as in case of software, for higher end markets also. Equal emphasis to strengthen mass manufacturing infrastructure is the need of the hour.

(Contd.)

Experts say that India can be a strong base, in the 21st century, for global manufacturing. To achieve this, we need to develop a vision and clear thinking in this direction. We need to redefine our labour laws pragmatically to build large industries, make the industrial system more proactive, develop skilled labour, and industrial infrastructure, and spend more on appropriate technologies.

However, there is something to be learnt from China about building the mass manufacturing capabilities.

To sum up, the marketing process can be understood by examining the nature, scope, and limitations of each of the functions of marketing.

However, it is to be noted that the functional approach to the study of marketing is not a modern approach. The decision-making approach is gaining more ground of late. In this approach, the focus is not on routine functions, but on the strategic issues. The following list outlines some of them:

- How to search out buyers and sellers
- How to tailor the goods or services to the market needs
- How to create customers
- How to win the customers? At what prices, can the customers be wooed
- How to transport or store the goods optimising the costs and utilities involved
- How to conclude a sale
- How to know whether the customer is happy with the products and services
- How to ensure brand loyalty or repeated sales from the customers

The application of principles of management to the marketing process has given rise to the evolution of marketing management. Marketing management, in the words of Philip Kotler, is the art and science of choosing target markets and getting, retaining, and growing customers through creating, delivering, and communicating a superior customer value.

Marketing research organisations

There are highly specialised market research organisations such as ORG-Marg which address their activities to suit the corporate needs. They conduct surveys on a regular basis to highlight several issues such as consumption patterns in rural/urban India, rural profiles, urban profiles, how the fast moving consumer goods penetrate into the markets, brand preferences, brand loyalties, market shares of different companies for different products, impact of demographic factors on marketing pattern, impact of certain government policies on markets, and so on.

This data provides valuable insight for the companies and enables them to formulate their activities broadly. However, the professional companies conduct their own need-based surveys and collect data to support their marketing activities.

Marketing management, thus, encompasses the whole process of analysis, planning, implementation, and control of marketing activities so as to satisfy the individual customers and the organisational objectives of the firm.

The core concepts of marketing management have been outlined in Annexure II of this chapter.

PRODUCT LIFE CYCLE

A product is a physical good or service or, more often, a combination of both. It is capable of satisfying the buyer's needs. It has certain tangible and intangible attributes that a seller offers to a potential buyer.

It is very interesting to observe the changes in the sales of the product or service once it is launched. It is not necessary that it will have uniformity in case of every product or service. The sales vary over a period of time. In most of the cases, sales levels will grow up to a particular point of time, and remain static at some level, beyond which the sales start declining particularly when a new product that satisfies the customer's needs better emerges. Recall the case of gradual disappearance of gramophone records as consumers favoured the superior quality and convenience of CD recordings. Similarly, you might have observed how wood-based stoves have become a rare sight even in town centers with the emergence of electric or pressure cookers.

The concept of product life cycle describes these common patterns of sales growth and decline, that can be observed over the lifetime of a product. Despite the fact that this pattern may not be uniform for every product and service, the study of product life cycle concept provides interesting insights into the likely sales trends, thereby enabling the marketer to plan his activities strategically.

Stages in Product Life Cycle

Every product or service has a defined life cycle with distinct stages.

These stages include

- Introduction
- Early growth
- Rapid growth
- Maturity
- Saturation
- Decline

Figure 11.1 presents the six critical stages a product passes through from the time of its introduction to decline over a period of time.

In fact, it is a very testing time for the manufacturer and he should show large degree of patience to explain, convince, and face the apprehensions of the potential buyers.

Early growth When the results of usage of product start flowing into the market and the results are encouraging, more and more buyers come forward to try. The sales revenue remains very low till this point of time. This is also a very critical stage as the manufacturer cannot avail scale economies. The unit costs tend to be relatively high with increased promotion expenditure, lower capacity utilization and relatively lower levels of scale economies. In view of this, it is quite common that many products end up in loss at the introductory stage. Unless the firms identify adequately in advance the sources of cash to bank upon, it will be a tough time for the manufacturer to pass through this stage. The mortality rate of the products at this stage of product life cycle is very large. In other words, some customers have used this product and found that it is not satisfactory and hence they do not even recommend to others in their friend's or relative's circle. Consequently, very few

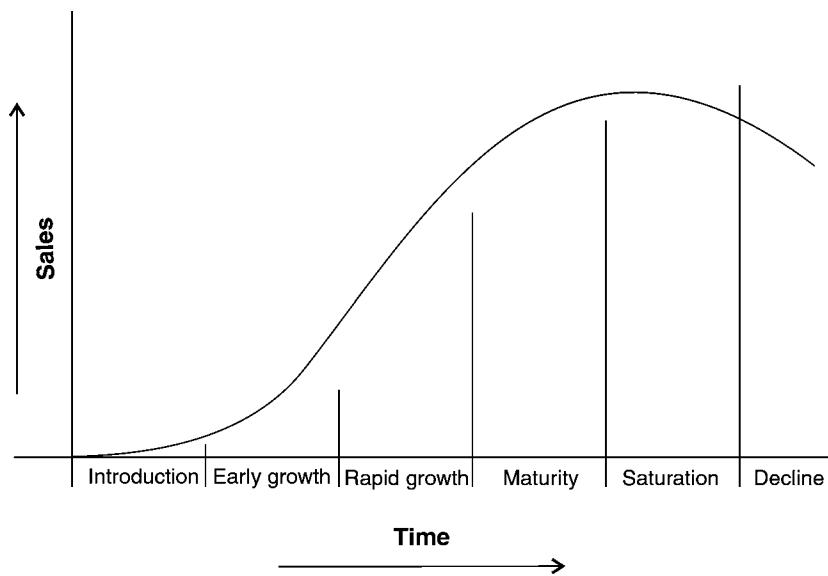


FIGURE 11.1 Stages in product life-cycle

products pass to next stage successfully while most others succumb at this stage. Only such products that offer customers genuine benefits will survive and move into much more rapid growth.

Rapid growth A new product enters the stage of rapid growth when it satisfies the needs of the customers. The sales start picking up with repeat purchases and also by a word of mouth publicity, coupled with continued promotion outlay from the manufacturer's side. As new customers get attracted to the product for the first time, sales soar, sales revenues increase faster than costs, and profits start accruing. This trend attracts the attention of the competitors who release a similar product copying the best features of the new product. Increase in competition does not deter the manufacturer in the rapid growth stage as the total size of the market is growing. Even the new competitors can increase their sales and trade profitably by attracting new customers instead of resorting to price-cutting practices. With the increase in number of customers, the market starts moving towards maturity.

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

Characteristics of the Product Life Cycle

Introduction This stage follows just after the launch of the product. At this stage the sales are likely to be very slow. Most of the buyers do not come forward as the product is new and untested. There would be a lot of resistance from buyers to pick a product, that is relatively new to the market. Very few innovative and risk-taking buyers come forward to try products just introduced into the market through price differentials, add-on facilities, life-time service offers, exchange offers, and so on are thrown out of the market. At the stage of maturity, profits can be substantial or high as sales revenues are high and costs are quite low. The firms can take maximum advantage of economies of scale in both production and promotional activity.

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

Decline When sales of a product tend to fall, such a stage is called decline. When a product ceases to satisfy the customer's needs in relation to those available in the market, it is no more preferred. As a result, its competing products offering superior benefits take over the market. This leads to weakened profitability. It is at this stage, some shift their attention to other products choosing to leave the market altogether, while some others curtail some of their promotional expenses, reduce their number of retail outlets and focus on any remaining buoyant segments of the market.

Changes in the Focus of Marketing Strategies based on Product Life Cycle

The emphasis of marketing varies considerably depending on the stage in the product life cycle.

Introduction stage At the introduction stage, the firm that launches a new product should attempt

- to create wide product awareness and encourage product so that the more profitable growth stage can be entered as soon as possible
- to start off with a fairly basic product form, which satisfies core customer needs but offers a minimum of additional features
- to add certain additional features later as customer tastes and preferences start to develop and distinct market segments start to emerge
- Skimming price involves charging high initial price, with a view to reducing it as the market grows, while *penetration price* involves setting a lower price than is likely to be maintained over the long-term, so as to expand the market as quickly as possible
- to encourage selected number of distributors to sell new products
- to follow a fairly selective promotional activity aiming at both distributors (to encourage them to stock the product) and end user markets (offering incentives to try the product) to follow skimming price or penetration price on the basis of the nature of product and the likely competition;

Growth stage At the growth stage, the firm should attempt to

- maximize his own market share in the face of new competitors entering the growing market
- sacrifice some short-term profitability by way of incurring high costs to improve product features and distribution intensity, and in extending promotional activity to reach mass markets
- establish a strong brand image (through effective advertisement campaigns¹) that will become a valuable asset during maturity
- reduce prices slightly to reach the more price sensitive potential customers particularly when the market moves towards maturity

Maturity stage At maturity stage, the manufacturer has to

- focus on more profitability

¹Advertising reinforces the brand loyalty, whereas sales promotion can atmost encourage buyers to switch across from competitors.

- modify the product lines or extend the same to include latest versions that appeal to the specific needs of segments within the total market
- match prices in general to beat the competition, but not at the cost of profitability
- spend more on sales promotion instead of resorting to price-cutting

Decline stage At the decline stage, the manufacturer has to

- minimise marketing expenditure
- use his resources, especially cash, to support new, cash-hungry products at the introduction or growth stages in their life cycles.
- cut prices and rationalise the product range and retain only those items that appeal to the larger and more profitable remaining segments in the market.
- withdraw distribution licences from the least effective distributors
- reduce promotional expenditure to a minimal level.

The speed at which the above steps should be initiated depends on the rate of decline in the product demand and on the reactions of competitors. In case the competitors make an exit faster, the firm can continue for longer period.

CHANNELS OF DISTRIBUTION

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

Utilities

The channel intermediaries involve the transfer of goods from the seller at a given place to the buyer in a different place. Thus, they provide place utility to the marketing process.

They bring goods to the consumer when he wants them. The wholesaler buys goods from the manufacturer, stores them, if necessary, and sells to the retailers for onward sale to the ultimate customer. Thus, they add time utility also.

They bring goods to the consumer in a convenient shape, unit, size, style, and package. The wholesalers, more often, buy the entire stock from the manufacturer, grade and standardise according to various parameters, and then sell in small quantities as required by the retailers. Thus, they add convenience value (the customer can buy such a quantity and grade of goods as convenient to him). Also they facilitate the transfer of ownership, and hence, add possession utility.

Factors Affecting the Choice of Channel of Distribution

There are several factors that affect the choice of a channel. The requirements of the market have to be identified: what the customer wants and in what quantities. If the manufacturer is entering the market afresh, he has to determine the market share he is aiming at, taking into account the amount he can spend to achieve this market share. The marketer has to carefully choose how he would get his goods sold to the potential customers most economically and efficiently. The following are the factors that affect the choice of a channel:

- *The type, size, and nature of customer's demand* If the customer wants small quantities, long channels are preferred and vice versa

- *The nature of company's business* Choose the channel according to the nature of business activity such as agricultural products, industrial products, services, and so on.
- *The type of product sold* The goods may be consumer goods (such as bread), consumer durable goods (TV or refrigerator), or producer or industrial goods (engines, shock absorbers, bearings), and others.
- *The price of the unit of sale* If the price of one unit is as high as that of an aeroplane, the producer can contact the consumer directly
- *The profit margins and mark-ups* These, together with the extent of the seller's product line (single or multiple product line), play a role in attracting distributors to handle the goods.
- *Degree of competition* If the competition is intense, the manufacturer has to arrange for even door-to-door selling or retail outlets such as automatic vending machines (as in case of Coca-Cola or Pepsi) at prominent, busy, and crowded places.

Can internet replace channels of distribution

Thanks to the advances in computer software technology and Internet, today we are in a position to keep track of movements of materials or stocks from point to point. The companies can listen to and keep track of customer's specific requirements even during the product development process. Through the Net, we can handle the distribution management related activities competently and minimise the conflicts between the channels. As the number and scope of non-conventional channels increase, the significance of the Net also increases. The contribution of the Net in promoting the relationship-driven product-distribution management has been quite outstanding.

Internet also facilitates solving the customer complaints immediately. Thus, the Net can supplement the efforts of the intermediaries but may not totally replace them at least in the foreseeable future.

If Internet fails, even occasionally, the entire system is likely to collapse. Do we have enough technology to prevent Net failures and enough resources to bring the Net within the reach of the common man?

Why Do Manufacturers Favour Intermediaries

The following are certain benefits, which the markets achieve by employing intermediaries:

- (a) *Reduced overall investments* When distribution is given away to the channel intermediaries, the producer can maintain his production activity with reduced investments. Many producers lack enough financial resources to carry out direct marketing because opening of retail outlets in so many numbers will require more finance and, also, it is a difficult task.
- (b) *Economies of scale* Each individual producer may not have enough number of products and quantity of production to sustain an independent distribution network by himself. So in such a case, it is beneficial for the producers to opt for intermediaries.
- (c) *Additional finances for production* Producers can afford to establish their own channels. But they may not desire to do so. They may not be interested to take up distribution, which involves huge finances. Such producers, who have additional funds, would like to pump the same in production activity, which is a familiar route for them to make additional profits.

- (d) *Local market knowledge and specialisation* Marketing intermediaries are swift in conducting marketing transactions, have larger contact and access to market-related data for specialised products and services, and are widely experienced in the field. The producer may not get so much useful data on his own, due to the production capacity or capital constraints. Most of the producers prefer to tie up with the local market intermediaries for distribution of their goods and services so that they can peacefully concentrate on the production matters.
- (e) *Transactional efficiency* It may be difficult to buy a little quantity of each of the varieties manufactured by different producers. The basic benefit the intermediaries provide is to assort the heterogeneous products of many producers in a meaningful way as desired by individual customers.
- (f) *Manageable quantities or sizes* Sometimes, the intermediaries take a large consignment of goods and break it down into more manageable units for the next distribution or customer in the chain.

However, involving the intermediaries is not always beneficial. It deprives the manufacturer from developing and maintaining direct contact with the customer. A producer dependent on intermediaries may not have any control over the marketing methods and may, hence, be forced to share his revenue with the intermediaries.

Types of Channels of Distribution

- (a) Manufacturer → consumer
- (b) Manufacturer → wholesaler → consumer
- (c) Manufacturer → retailer → consumer
- (d) Manufacturer → wholesaler → retailer → consumer

Manufacturer → consumer This is a direct marketing channel where the manufacturer contacts the customer directly without involving middlemen or intermediaries. This route is mostly followed by the manufacturers of industrial goods* such as aeroplanes, turbo-engines, ships, and other high-value capital goods. However, this method is being followed by consumer product** manufacturers also through Internet, mail order operations, and door-to-door selling. It is common sight to find the representatives of the manufacturers going from house to house to sell their products, which are normally used in the households. The reasons for direct channels are basically as follows:

Industrial markets Industrial markets are characterised by relatively less number of customers. The manufacturers of industrial goods need technical advice and logistic support during and after the sales. It is very likely that negotiations on price between the manufacturer and the consumer take a long time. Particularly, where the products are custom-built in nature, there should be a continuous contact with the customers.

Consumer markets The consumer markets involve lower costs to move products from producer to customer. Presence of other intermediaries may add to the costs. Manufacturers can control their sales efforts better when they take care of marketing on their own without relying on middlemen.

Teleshopping[†], Internet, e-business, and e-commerce are the recent major technological inventions, which facilitate and strengthen the direct link between the manufacturer and the customer.

*Industrial goods are those, which are used to make another good or service.

**Consumer products are those, which are used for ultimate consumption.

[†]Placing orders through telephone.

Manufacturer → wholesaler → consumer This channel is primarily used in the case of industrial goods and high-value consumer durable products. The wholesaler, who may also be called as distributor in this channel, carries out the functions of retailing to large customers who may in themselves be the manufacturers also. The wholesalers in this channel buy goods from many manufacturers, stock, and subsequently, sell them through internet or directly to the customers in a wider geographical area. An example of the use of this method can be observed in the computer hardware industry. Large wholesalers in Singapore buy various types of computer hardware in large quantities, directly from the manufacturers or producers. They resell the same to those who make or assemble computers. When the wholesaler sells through internet, this may provide a major price advantage to the customers. This also reduces the cost of selling for the wholesalers. For instance, Sony, USA organises its internet sales of its products including computers through its website—Chap1hA1.Rmcand .

How to reach the customer from the lower income classes

A study by the National Council of Applied Economic Research (NCAER), in 1998, identified inadequate infrastructure, low incomes, and different life styles as the key reasons for the low penetration of products and the low consumption by the lower income class. It was suggested that by coming with low, priced products, marketers could tap that potential. But the real challenge is not in manufacturing such products but in enabling the poor segments to become customers.

In the words of C.K. Prahalad, a renowned management consultant: “India cannot progress without creating a consumer class out of the poor”.

Channels of distribution will play the most strategic role in stimulating demand. Subsidies can not be any more a solution. It is the need of the hour for the corporates to reach this segment in innovative ways, eg., with small packs of the products at lower prices (without compromising on the quality!), which the consumers of this segment can afford.

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

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

The intermediaries provide valuable services to the manufacturers and consumers. This makes their presence indispensable in the distribution chain. From the manufacturer, the wholesalers buy the products in bulk quantities, store them, if necessary, break them down into manageable quantities, which are capable of being sold to the final customer or used for further processing. The wholesalers independently undertake advertising and promotional activities for the manufacturers. They sell in small quantities to the retailers, and arrange credit and other logistic support both to the manufacturer and retailer.

The retailers are in direct contact with the customer. They display the stocks of many manufacturers, but in smaller quantities. They may also provide credit facilities to the customer. They maintain wide variety of a range of products. They can assess the requirements of the customers. The manufacturer and wholesalers rely on retailers for information on the changing needs and preferences of the customers.

SUMMARY

- ◆ Marketing is the process of identifying the customer requirements and satisfying them efficiently and effectively. Marketing is different from selling.
- ◆ Marketing is concerned with creating four forms of utilities: form, place, time, and possession utilities.
- ◆ Marketing starts and ends with the customer.
- ◆ Functions of exchange include buying and assembling, and selling.
- ◆ Functions of physical supply include transportation, storage, and warehousing.
- ◆ Facilitating functions cover financing, risk-taking, standardisation and grading, marketing information and research.
- ◆ A product is a physical good or service or, more often, a combination of both. It is capable of satisfying the buyer's needs.
- ◆ The Product Life Cycle comprises the following stages:
 - (a) Introduction (b) Early growth (c) Rapid growth (d) Maturity (e) Saturation (f) Decline.
- ◆ When the product's sales growth slows down, it is called *maturity*.
- ◆ When the sales growth slows down to zero, such a stage is called *saturation*.
- ◆ When sales of a product tend to fall, such a stage is called *decline*.
- ◆ The focus of marketing strategies change based on product life cycle.
- ◆ Channels of distribution refer to the means of reaching the customer through the intermediaries such as wholesalers, retailers, and other agencies, if any.
- ◆ The factors affecting the choice of channels of distribution include the type, size, and nature of customer's demand, the nature of the company's business, the type of product sold, the price of the unit of sale, the profit margins, and the degree of competition.
- ◆ The manufacturers favour intermediaries for various reasons such as reduced investments, economies of scale, additional investments in production, local knowledge and specialisation, transactional efficiency, and breaking the bulk into small manageable units as customers need.
- ◆ The important channels of distribution include the following:
 - (a) Manufacturer–Consumer
 - (b) Manufacturer–Wholesaler–Retailer–Consumer
 - (c) Manufacturer–Wholesaler–Consumer
 - (d) Manufacturer–Retailer–Consumer

Annexure I

The other approaches to the study of marketing include:

Product or commodity approach This approach facilitates the product-related study covering issues such as sources of supply, marketing organisations and policies, involvement of intermediaries, characteristics and extent of market, and so on.

Institutional approach This approach describes and analyses the functioning of different institutions engaged in marketing. It explains the activities of the producers, wholesalers, agents, retailers, and facilitating institutions engaged in the marketing process.

Decision-making approach This approach facilitates the study of how marketing professionals take decisions considering the controllable factors such as prices, advertising, personal selling, and others, and the uncontrollable factors such as government policy, social, economic, and cultural factors in the economy. This approach is emerging as very prominent.

Legal approach This concentrates on how the transfer of titles takes place in a legal way considering the regulatory aspects in the marketing environment.

Economic approach This approach focuses on the primary problem areas for an economist, that is, value, price demands, supplies factors, and how these affect the marketing decisions.

Annexure II

Core Marketing Concepts

To understand and appreciate the modern marketing process, knowledge of the following core marketing concepts is essential.

Target markets and segmentation These refer to the specific set of the customers the seller is looking for. For instance, if you want to give coaching for the common-entrance-examinations (engineering) for next year, you need to look for class XII students studying mathematics, physics, and chemistry.

Needs, wants, and demands of the customers Needs refer to the basic requirements of human beings. Wants satisfy the needs in specific term. A thirsty man can quench his thirst either by water or a cold drink. Here quenching thirst is his need, and cold drink is his want. Demand is a want for the good or service, supported by the willingness and ability to pay for it. Every need cannot constitute a demand. If thirsty man doesn't have enough money to buy a cold drink, his want doesn't constitute demand for the cold drink company.

Exchange Goods or services are exchanged for money. Negotiation (trying to arrive at mutually agreeable terms) skills felicitate the exchange to materialise.

Relationships and networks Today, marketing is not viewed as an exercise that concludes with one transaction. Hence, the organisations strive hard to build long-term and mutually satisfying relations with strategic parties such as customers, vendors, employees, ad agencies, scientists, distributors, and others, in order to earn and retain their business. This is made possible by delivering goods of high quality at fair prices all through.

Media for marketing Media brings the seller close to the customer. There are different communication media such as newspapers, magazines, radio, TV, mail, telephone, hoardings, posters, CDs, audio tapes and the Internet. Apart from these, there are dialogue channels such as e-mail and charge-free phone calls, which provide an opportunity to interact.

Distribution channels These refer to delivering the physical product or service to the buyer or user. These channels include all the trade channels such as distributors, wholesalers, and retailers. It is a strategic issue to choose the best mix of all these channels for optimising the sales. The purpose of creating distribution channels is to reach the customer swiftly, and hence, it need not always be restricted to the chains involving traditional links such as wholesalers and retailers. Sometimes, certain government or non-government

agencies such as post offices, banks, and insurance companies also can be roped in to provide certain selling services. Application forms for the common-entrance-examinations for engineering are made available through these outlets. Such strategies ensure quality service to the target segments.

Supply chain Some times, the seller may not like to do everything for himself. If his core-competence is to design, he would confine his activities to the designing function. All the other activities such as manufacturing would be entrusted to other professional business organisations. In other words, the requirements of the business can be outsourced, particularly, when they can be obtained cheaper and better this way. Outsourcing involves a number of vendors who are rightly chosen on the basis of their past performance and credibility/reliability. A small breakdown at a vendor's factory may affect one's manufacturing schedules. The chain of such vendors or suppliers constitutes supply chain. Whether to outsource or not is a strategic decision. For instance, Maruti-Suzuki confines its shop floor operations to assembly and manufacture of certain critical components. Most of its spares are outsourced from different reliable vendors all over the country. Outsourcing is viewed as an opportunity.

Competition It includes all the actual and potential rival offerings, and substitutes that a buyer might consider.

Marketing environment This constitutes all the factors relating to social, economic, cultural, political environment, and all these factors individually and collectively are capable of making a market or affecting it.

Marketing mix Marketing is a mixture of four P's: product, price, promotion, and place. The following table outlines, as identified by Kotler*, what each of these factors deals with:

Marketing Mix			
<i>Product</i>	<i>Price</i>	<i>Promotion</i>	<i>Place</i>
(a) Variety/choice	(a) Listed price	(a) Sales promotion	(a) Distribution channels
(b) Quality Specifications	(b) Discounts	(b) Advertising	(b) Coverage
(c) Design	(c) Allowances	(c) Personal selling	(c) Assortments
(d) Features	(d) Payment period	(d) Publicity	(d) Locations
(e) Brand name	(e) Collection period		(e) Stocks
(f) Packaging			(f) Transport
(g) Sizes			
(h) Related services			
(i) Returns/exchange			
(j) Warranties			

Choosing the right mix is a strategic decision for the marketing manager.

The product factor aims at *satisfying the customer needs*. Decisions relating to products include several issues such as variety, quality, design features, brand name, packaging, sizes, and others. Certain policy decisions relating to returns and warranties, and so on have to be considered. For instance, whether the goods

*Philip Kotler, *Marketing Management: Analysis, Planning, Implementation, and Control*, Prentice-Hall of India Ltd., 9th Edition, 1997, p. 92.

are to be accepted when returned for any reason, whether warranty** should be provided on the products sold to win the confidence of the customer or not, and so on.

The price factor aims at providing the products or services at the *right price* to the customer. Regarding the price factor, the issues that optimise the sales are: What should be the listed price? How much cash discount can be given? What should be the margins for negotiations? What should be the average payment period and what should be the credit terms.

The promotion factor aims at *reaching the right customer* by enhancing the awareness about the products and services of the company. The issues that influence the volume of sales are: what should be the percentage of personal selling efforts (direct marketing, sales force etc.) and non-personal selling (advertising through different media) efforts?

The place factor ensures delivering the product or service to the customer in the most *convenient* manner. The type of channels, extent of coverage, locations, and the necessary transportation facilities are some of the key issues that need personal attention of the marketer while considering the place factor.

To be successful, one requires a strategic marketing mix that meets the customer needs economically and conveniently.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Who said these words ‘Marketing creates and delivers the standard of living to the society?’
 - (a) Philip Kotler
 - (b) Malcolm Mc Nair
 - (c) EFL Brech
 - (d) William J Stanton
2. What refers to the act of transferring ownership of the goods and services from the seller to the buyer?
 - (a) Marketing
 - (b) Production
 - (c) Selling
 - (d) Promotion
3. Selling is _____ oriented where as marketing is _____ oriented.
 - (a) product, process
 - (b) consumer, product
 - (c) product, consumer
 - (d) process, product
4. Who defined marketing as a process of concentrating functions and dispersing functions?
 - (a) JK Pyle
 - (b) Peter F Drucker
 - (c) EFL Brech
 - (d) Malcolm Mc Nair
5. Which of the following is a dispersing function according to Pyle’s classification?
 - (a) Storing

**Warranty is a legal assurance that the money will be returned in case product does not provide the functional utility.

- (b) Selling
 - (c) Financing
 - (d) Grading
6. Which of the following is a concentration as proposed by Clark and Clark?
- (a) Buying
 - (b) Grading
 - (c) Selling
 - (d) Making
7. Which of the following is a possession utility as suggested by Converse, Hugey and Mitchell?
- (a) Financing
 - (b) Negotiating
 - (c) Grading
 - (d) Supervision
8. Which of the following is a facilitating function?
- (a) Buying
 - (b) Grading
 - (c) Storage
 - (d) Selling
9. What refers to where a buyer/seller enters into agreement with each other to buy/sell goods at a given price at a future date?
- (a) Specific contract
 - (b) Futures contract
 - (c) Spot contract
 - (d) Hedging contract
10. What is the stage when sales of a product tend to fall?
- (a) Saturation
 - (b) Decline
 - (c) Maturity
 - (d) Rapid growth
11. What refers to the ways and means of reaching the customer through the intermediaries?
- (a) Marketing strategies
 - (b) Distribution
 - (c) Channels of distribution
 - (d) Growth stage
12. Which of the following is not a factor affecting the choice of channel of distribution?
- (a) Degree of competition
 - (b) Nature of company's business
 - (c) Type of product sold
 - (d) Operating profit
13. Which of the following is a benefit which the markets achieve by employing intermediaries?
- (a) Diseconomies of scale
 - (b) Increased overall investment
 - (c) Transactional efficiency
 - (d) Generalisation

14. What refers to the process of identifying the customer requirements and satisfying them efficiently and effectively?
 - (a) Selling
 - (b) Marketing
 - (c) Production
 - (d) Operation
15. Which of the following is not a function of exchange?
 - (a) Buying
 - (b) Selling
 - (c) Assembling
 - (d) Financing
16. Which of the following is not a function of physical supply?
 - (a) Storage
 - (b) Warehousing
 - (c) Grading
 - (d) Transportation
17. Which of the following is not a facilitating function?
 - (a) Financing
 - (b) Risk trading
 - (c) Storage
 - (d) Research
18. Which of the following is not a form of utility concerned with marketing?
 - (a) Place
 - (b) Time
 - (c) Form
 - (d) Proficiency
19. Which is the risk that occurs due to social hazards?
 - (a) Physical risk
 - (b) Social risk
 - (c) Economic risk
 - (d) Transportation risk
20. What is the risk that occurs due to spoilage due to decay, deterioration, delay or accidents?
 - (a) Physical risk
 - (b) Social risk
 - (c) Economic risk
 - (d) Transportation risk

Question II: Fill in the Blanks

1. The process of identifying the customer requirements and satisfying them efficiently and effectively is called
2. The marketing concept focuses on profits through customer satisfaction whereas the selling concept focuses on profits through

3. Such business activities designed to develop strategies and plans to the satisfaction of the customer needs constitute
4. Marketing creates four utilities. They are (a) form (b) time (c) (d) possession utilities.
5. Marketing professionals believe that profit is the result of
6. Place utility is provided by function of marketing.
7. Storage function is also called function.
8. The risk arising out of burglary is an example of risk.
9. The process of trying to arrive at mutually agreeable terms between the buyer and the seller is called
10. The practice of buying goods or services from outside vendors when they can be obtained cheaper is called
11. That factor in the marketing mix that aims at satisfying the customer needs is called
12. That factor in the marketing mix that makes the product reach the right customer is called
13. The strategic decision of the right mix of product, place, promotion, and price is called
14. The goods, which are used for ultimate consumption are called
15. In case of railway wagons, type of channel of distribution is preferred.
16. The economic risks can be shared or offset by entering into contracts.

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Marketing versus Selling
2. Utilities of marketing
3. Functional approach to the study of marketing
4. Functions of exchange as given by Clark and Clark
5. Risk-taking, as a marketing function
6. The activities of ORG-Marg
7. Market segmentation
8. Manufacturers and intermediaries: Their linkages
9. Decline
10. Saturation
11. Maturity

Question IV: Essay Type Questions

1. Define marketing. How is it different from selling? Explain how marketing starts and ends with the customer.
2. Identify and briefly discuss the functions of marketing.
3. What are the factors that determine the choice of the channels of distribution? Illustrate.
4. Mention and evaluate the prominent channels of distribution.
5. Discuss the various stages in product life cycle? Why is it essential for the marketeer to know about the stages in product life cycle of his product or service?

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. b | 2. c | 3. c | 4. a | 5. b |
| 6. a | 7. b | 8. b | 9. d | 10. b |
| 11. c | 12. d | 13. c | 14. b | 15. d |
| 16. a | 17. c | 18. d | 19. b | 20. a |

Answers to Question II

- | | |
|---------------------------|-----------------------|
| 1. marketing. | 9. negotiation. |
| 2. sales volume. | 10. outsourcing. |
| 3. integrated marketing. | 11. product. |
| 4. place | 12. promotion. |
| 5. customer satisfaction. | 13. marketing mix. |
| 6. transportation. | 14. consumer goods. |
| 7. equalisation | 15. producer-consumer |
| 8. social | 16. hedging |

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UNIT V

Chapter 12: Human Resource Management

Chapter 13: Functions of Human Resource/Personnel
Manager—I: Manpower Planning

Chapter 14: Functions of Human Resource/Personnel
Manager—II

12

HUMAN RESOURCE MANAGEMENT

Learning Objectives

By the time you study this chapter, you should be able to explain

- the concept of personnel management
- the role of the personnel manager
- what a personnel policy is
- genesis of human resource management (HRM)/human resource development (HRD)
- the concept of HRD
- differences between personnel management and HRM
- Importance of HRM

INTRODUCTION

This unit deals with the basic concepts underlying human resource management (HRM). HRM is an extension of personnel management. Among all the factors of management, it is the human factor that is very dynamic, and this is to be carefully identified, developed, nurtured, and honed to achieve organisational goals. Gone are the days when organisations could be considered as successful with mere product-orientation. Particularly during the 1990s, the economic changes compelled the industries to get more competitive and the industries realised that focussing on the human resource factor is a better strategy to gain a clear edge over others, more so in times of survival and expansion. This chapter deals with the basic concept of personnel management and the related aspects including recent developments.

Importance of managing human resource Managing human resource is one of the key functions of business organisations. Human resource management has, in recent years, become a pervasive and influential approach to the management of employees in market-oriented economies. The very fact that some of the leading corporates such as the Nagarjuna Group have started referring to the human resources department as the ‘human potential department’ stands testimony to this reality.

HUMAN RESOURCE MANAGEMENT (HRM)

Human resource management is the process of managing the human resources of an organisation in tune with the vision of the top management. In other words, it is through the human resources that the management attempts to convert its vision and mission into action. HRM is a strategically-driven process. It represents an

intensely-unified and holistic approach. HRM directly addresses the business-related issues. HRM functions in the Indian industries include the following:

- Empowering employees and institutionalising employee involvement
- Focussing on productivity and team-building
- Developing flatter organisational structures
- Developing a more people-sensitive management style and organisational culture
- Developing human resource information systems
- Strengthening of organisational communications
- Evaluating self-appraisals and providing feedback

Human resource management encompasses several concepts and functions of management with respect to human resources both at the micro and macro levels in an organisation. The related concepts are personnel management, industrial relations, and the most widely-referred function of human resource development.

Genesis of HRM/HRD

In the last two decades, the markets became intensely competitive with massive cost cutting, especially for labour. Employment laws began to reflect new economic priorities, and as such, the protective framework of legislation for trade unions and their members was drastically reduced. To cope with the challenges thrown up by the liberalised economic policies all over, the business organisations resorted to large-scale structural changes. As a result, the concept of human resource management (HRM) emerged stronger. Some of the policy-making functions of the earlier personnel function are now transferred to HRM/D. Consequently, HRM/D is closely linked to the top-level management and the personnel at the operative level. Today, the terms HRM and HRD are generally used interchangeably. In the Indian industry, the term HRD is widely prevalent, whereas in the west, it is HRM. Today, the role of the personnel manager or manager (industrial relations) is viewed just to supplement the efforts of the human resource manager.

HUMAN RESOURCE DEVELOPMENT (HRD)

TV Rao, one of the pioneers of the HRD movement in India, views HRD as a continuous and planned process. It is not a one-time effort. In the context of organisations, HRD is viewed as a process to help employees

- to acquire and sharpen their capabilities to perform better
- to enable them to discover and exploit their own inner potential and utilise the potential for their own and/or organisational development
- to develop an organisational culture that reflects strong superior-subordinate relationships, teamwork, and collaboration contributing to the professional well-being, motivation, and pride of the employees

HRD is necessary

- to make organisational dynamics growth-oriented or to succeed in a fast changing environment
- to make organisations grow dynamic through the efforts and competencies of its human resources
- to make personnel policies in such a way so as to keep up the morale and motivation of employees

According to the HRD philosophy, the employees must continuously acquire capabilities, and sharpen and use them. Organisations should develop ‘enabling culture’ wherein the employees take initiative and risks in the process of achieving their goals, experiment, innovate, and make things happen.

Since the roots of HRM are deep in the traditionally well-managed personnel function, it is necessary to first discuss what the personnel function is, and then analyse in what way HRM is an improvement over the personnel function. The following sections deal with the changing role of the personnel manager; nature and definition of the personnel function; personnel policy; the differences between the personnel and the HRM functions; and the importance of personnel function, particularly in the context of globalisation.

PERSONNEL MANAGEMENT AND INDUSTRIAL RELATIONS

Personnel management is a process of managing people enabling them to contribute their best for the attainment of organisational goals. A personnel manager is primarily concerned with taking care of the human relationships in the organisation.

The role of the personnel manager broadened with every change in the industrial economy all over the world. Personnel management function was supplemented with industrial relations function. Industrial relations refer to the relations between the employees and the management. One of the measures of ensuring industrial peace and productivity, in not only the organisation but also in the country as a whole, is to maintain cordial industrial relations.

In small organisations, the personnel manager looks after both personnel and industrial relations function. Where the number of employees is larger, as in the case of public sector units, it is customary to have a separate manager for industrial relations function.

Definition

*Flippo*² defines personnel management as the planning, organising, directing, and controlling of the procurement, development, compensation, integration, and maintenance of people (that is employees) for the purpose of contributing to the organisational goals.

This definition identifies clearly the functions of personnel manager. It focuses on the management of human resources and their administration separately. The purpose of all these functions is to assist in the accomplishment of basic objectives by

- formulating a personnel programme, which is determined in advance (planning)
- designing the structure of relationships among jobs (organising)
- getting the employees to willfully accept the responsibilities (directing)
- regulating the activities in accordance with the personnel plan (controlling)
- obtaining proper kind and size of personnel necessary to achieve the corporate goals (procurement)
- enhancing the skills of the employees by training and development (development)
- designing a salary package which is fair, adequate, and equitable (compensation)
- creating an environment integrating individual interests and organisational interests (integration)
- sustaining and improving the working conditions through administration of health, safety, and welfare measures (maintenance).

According to the Institute of Personnel and Development, UK (formerly known as the Institute of Personnel Management), Personnel Management has the following features:

- (a) Personnel management is a responsibility of both the line and the staff managers
- (b) It is concerned with the people at work and with their relationships within an enterprise
- (c) It aims to achieve both efficiency and justice

- (d) It seeks to bring people in an organisation together and weave them into an effective group
- (e) It enables each person to make his own best contribution to the organisation to succeed both as an individual and as a member of a given group
- (f) It seeks to provide fair terms and conditions of employment and satisfying work

Personnel management is concerned with the men at work and managing their group relationships. The basic idea is to maximise their personal contribution towards the achievement of the objectives of the organisation.

The National Institute of Personnel Management (NIPM) New Delhi defines personnel management as the task of dealing with human relationships within an organisation covering three aspects, namely, welfare, personnel, and industrial relations.

These aspects involve the following functions:

- The welfare aspect, which involves ensuring healthy and safe working conditions and amenities such as canteens, crèches, housing, schools, recreation, and so on. Even personal problems of workers are attended to.
- The labour or personnel aspect, which involves the tasks of recruitment, selection, remuneration, promotion, formulating incentives, productivity, and others.
- The industrial relations aspect, which involves the tasks of negotiation with trade unions, settlement of industrial disputes, joint consultation and collective bargaining, and so on.

Pigours and Myres³ view personnel management as a method of developing the employee potential that maximises job satisfaction and brings out the best among the employees of the organisation.

Features of Personnel Management

From the above definitions, the following can be identified as the prominent features of personnel management:

- (a) Personnel management is concerned with managing people at all levels in the organisation
- (b) It is concerned with employees both as individuals and as a group
- (c) It is a method of helping the employees to identify and develop their potential
- (d) It is a method of channelising this potential for the attainment of organisational goals
- (e) It is a method to solve, intelligently and equitably, the problems of organisations pertaining to the management of human resources
- (f) It is a way of thinking and philosophy of management to optimise the utilisation of human resources
- (g) It is required in every organisation in the form of the services of the personnel manager

Role of the Personnel Manager

The role of the personnel manager has undergone a sea change over a period of the last few decades: It started during the 1930s with the welfare function, assumed the tasks of manpower planning and recruitment during the 1950s, negotiation of industrial relations during the 1970s, and supplying the necessary human resources during the 1980s. The role of the personnel manager took a prominent take-off during the 1990s when it was realised that the personnel manager should be involved in building up the vision and corporate philosophy of

the organisation in a new capacity as the general manager (HRM). For this reason, today, the HRM function is identified as part of the top management.

Personnel Manager Line or Staff? The personnel manager is concerned with both the line and the staff functions. He is a line manager for certain functions such as staff selection, performance appraisal, grievance redressal and others. He is also a staff manager for certain advisory activities such as making personnel policies, maintaining or personnel records, and so on.

The senior personnel managers deal with matters relating to formulating personnel policies and strategies, employee counselling, and management of change. The junior personnel managers deal with the functions concerning the implementation of these policies and strategies.

Personnel manager as an integral part of the organisation The services of a personnel manager constitute vital inputs for all those who have a stake in the organisation. The personnel manager is an integral part of the organisation. The personnel manager strives

- to contribute to the achievement of organisational goals, as envisioned by the top management, by establishing and implementing a sound policy-framework for personnel matters
- to develop vision and culture for the organisation
- to advise the line managers appropriately on personnel matters
- to facilitate the administration of contracts for the employees (e.g. ensuring correct pay, other benefits, and perquisites)
- to counsel the employees on issues relating to grievance-handling procedures
- to ensure that the personnel in the organisation extend efficient and uninterrupted service as per the expectations from customers and suppliers

Personnel Profession: A New Order

Traditionally, the personnel function was characterised by the coordination efforts of conflicting interests of management and labour, lack of trust and mutual respect, the predominant concern to sustain confrontation in whatever form and for whatever purpose, and so on. The profile of personnel function in the current scenario is totally different. With more companies opting for ISO 9001 certification, a new order of mutual respect and trust is emerging in the management-union relations, which has been slowly changing the traditional nature and character of the personnel function, in general and the labour-management relations, in particular.

Personnel Policy

Personnel policy states how the employees should behave or conduct themselves in the organisation. A personnel policy is an expression of the values and beliefs of the organisation. It does not tell what the organisation intends to do (i.e., goals or major objectives). It tells how these goals are achieved. Personnel policy is a directive, usually written, to guide personnel department in accomplishing its objectives or functions. It covers all the strategic issues such as recruitment, selection, induction, training, promotion, safety, financial aid, employment conditions, discharge, health standards, and separation from service. It should be stable, clearly defined, dynamic, and flexible. It can be changed to meet the changing requirements of the organisation.

Commitment for quality: new order

Total quality management and ISO 9001 certification systems have transformed the profile of the industry, particularly, in terms of commitment and trust. These inculcate a high degree of commitment for quality among all employees across different levels in the organisation.

Today, many corporate enterprises have been developing a strong passion for quality. The reason is obvious: ISO 9000 certified companies find a ready acceptance globally for their products and services at the customer end. It also brings forth cost savings in its day-to-day operations.

Consequently, these organisations are restructuring themselves in such a way that they develop an atmosphere of trust, collaboration, and cooperation between and across their subunits making them strong and well-established. This has enhanced the quality of handling the issues relating to human resources management.

The following extracts from the policies of certain leading companies reflect the salient aspects of personnel policy:

- ‘The company will conform to the spirit as well as to the letter of the law in employment matters’
- ‘All vacancies will be advertised within the organisation’
- ‘All posts will be filled on merit’
- ‘There will not be any discrimination based on gender or nationality’
- ‘The company will always negotiate in good faith with trade union representatives’
- ‘The company will provide the employees, at all levels, the necessary training and development activities of mutual benefit to the individual and the company’
- ‘Pay levels will be maintained so as to compete with the best in the industry’
- ‘No organisational changes will be implemented without discussing these thoroughly with the employees, particularly, when these affect them’
- ‘Every employee will have a right to fair treatment in the matters of discipline’

The personnel manager is directly responsible for evolving a personnel policy and its implementation in a dispassionate manner. Such personnel policies that contribute to the employee development are considered healthy and keep the organisations flourishing.

PERSONNEL MANAGEMENT VERSUS HUMAN RESOURCE MANAGEMENT

Personnel management refers to the activities of a specialist responsible for devising and executing the personnel policies and strategies in the organisation. The personnel manager and his staff are primarily responsible to provide advice, guide, and assist both the management and the employees on employment matters. The personnel function encompasses entirely the role of the manager in managing people. In this wider context, it is recently being referred to as human resource management (HRM).

Personnel management function is often viewed as a function of the specialised staff while the HRM function is the responsibility of all the line managers in the organisation. This does not mean that HRM is

different from personnel management. HRM deals with all the personnel management functions in greater detail. The canvas of HRM spreads wide.

HRM is a broadened concept of personnel management and today it finds a role in formulating the organisation strategy and policy. Earlier, the top management used to dictate what it wants from its staff to the personnel manager. It was the responsibility of the personnel manager to get it done from the staff. Today, the scenario is different. The HR manager participates in the formulation of the organisation strategy and policy, on par with any other line manager. In other words, the personnel function has gained more respect and recognition with the evolution of the HRM concept.

According to G.A. Cole⁴, the goal of personnel management is employee-orientation while the goal of HRM is organisation-orientation. As the organisation interests are ultimate and supreme, personnel management is considered a part of HRM. Thus, HRM is a broader concept focussing the need to attain organisational goals through team-building, empowerment, and human resource-based competitive edge. To facilitate the individual employee to perform successfully in attaining the performance targets, the employee may be trained on the job and encouraged to develop competent leadership skills.

The main focus in HRM lies on the interests of the customers and shareholders and this forms the basis to decide how to manage the human resources. In a personnel management approach these determinants are clearly supplemented by a concern for fair treatment to the employees, employees are encouraged to play an interactive and participative role, and the remuneration is determined equitably.

Most often, personnel management is read along with industrial relations. Industrial relations mean the relations between the employer and employees. Industrial relations often constitute a barometer to indicate the effectiveness of the function of personnel management.

Storey⁵ brings out twenty-seven points of difference between personnel and industrial relations and HRM. These are discussed below under four heads:

- (a) *Beliefs and assumptions* It is the human capability and commitment that basically distinguishes successful organisers from the rest. The beliefs and assumptions the successful people hold are, hence, valuable. These issues unfold the basic differences between personnel and industrial relations (PIR) and HRM.

In personnel and IR, the terms and conditions are clearly defined in the contract with each of the employees. Rules governing the employment are identified clearly. It is also defined as to what the employer has to do and also what the employees have to do. The procedures are well laid-out to avoid confusion. The norms or customs set precedence for human behaviour. The staff are monitored closely. The nature of relations is pluralist, that is, the employer and employees are likely to have conflicting goals (the employer wants to minimise the costs, the employees demand wage revision); and the conflict is considered natural, and hence, it is institutionalised. In other words, should a conflict arise, how it is to be managed is also clearly defined.

In HRM, on the other hand, the aim is to go beyond the contract. The people do not like to be controlled by rules. They develop a sense of ‘can-do outlook’. The actions of management are justified by the business needs. The people tend to do all that is required to achieve the mission. They are governed by ‘values’ but not by ‘norms’. The efforts of the employees are nurtured. The nature of relations is unitarist, in the sense that the conflict or at least divergent views do not exist within the organisation because both the management and employees, called actors here, work towards the same goal, that is, the success of the organisation. Since the management takes care of the employee’s requirements directly, it is less likely that the interests of the management and the employees conflict with each other. In other words, conflict is de-emphasised.

These issues underlying beliefs and assumptions are summarised below:

<i>Dimension</i>	<i>Personnel and IR</i>	<i>HRM</i>
1. Contract	Careful delineation of written contracts	Aim to go beyond contract
2. Rules	Importance of devising clear rules/mutuality	'Can-do' outlook; Impatience with rules
3. Guide to management action	Procedures	Business needs
4. Behaviour referent	Norms/customs and practice	Values/mission
5. Managerial task vis-à-vis labour	Monitoring	Nurturing
6. Nature of relations	Pluralist	Unitarist
7. Conflict	Institutionalised	De-emphasised

- (b) *Strategic aspects* For better results, the business needs to be strategic. In personnel and IR, the key issue is the labour-management relations; initiatives are piecemeal: such as, looking for further instructions at every critical stage. The corporate plans seldom set pace for efforts. The consequence is obvious: the speed of decision tends to be slow.

On the contrary, HRM is characterised by a strategically-driven process. Hence, the focus is on the customer, the initiatives are integrated, not piecemeal, holding the corporate plans central to the efforts of the employees. This makes the decision-making process relatively faster.

The issues relating to the strategic aspects can be summarised as below:

<i>Dimension</i>	<i>Personnel and IR</i>	<i>HRM</i>
8. Key relations	Labour management	Customer
9. Initiatives	Piecemeal	Integrated
10. Corporate plan	Marginal	Central
11. Speed of decision	Slow	Fast

- (c) *Line Management* The initiatives of the line managers make a lot of difference. In personnel and IR, the management role is restricted to each transaction. The personnel/IR executives are most often viewed as specialists and are not involved, or seldom involved, in business operations. Communication, most often, is not direct. The degree of standardisation of any issue is fairly high. If you can negotiate for the benefit of the management, you are considered to possess the real skills of management!

Where sound practices of HRM are followed, the role of leadership is more change-oriented. The difference between the line and the staff managers is reducing day-by-day; the staff managers such as personnel or IR specialists are also integrated into the main business operations. Communication is more direct and purpose-oriented. The customisation (designing procedures as per the specific requirements of a given job) is preferred to standardisation. Every manager is a facilitating-agent, with the result the hard process of negotiation is not any more viewed as a prized management skill.

The issues relating to line management are summarised below:

<i>Dimension</i>	<i>Personnel and IR</i>	<i>HRM</i>
12. Management role	Transactional	Transformational leadership
13. Key managers	Personnel/IR specialists	General/business/line managers
14. Communication	Indirect	Direct
15. Standardisation	High (e.g. ‘parity’ an issue)	Low (e.g.‘parity’ not seen as relevant)
16. Prized management skills	Negotiation	Facilitation

- (d) *Key levers* The key levers offer a solution to the given problem, such as deployment of human resources, evaluation and rewarding of performance, and so on. These key levers are to be used to seek not merely compliance but commitment. Even if one key lever is missing, the focus is lost. As such, these answer the most critical and central issues of difference between personnel management and the HRM.

The issues related to key levers can be summarised as given below:

<i>Dimension</i>	<i>Personnel and IR</i>	<i>HRM</i>
17. Selection	Separate, marginal task	Integrated, key task
18. Pay	Job evaluation, (fixed grades)	Performance related
19. Conditions	Separately negotiated	Harmonisation
20. Labour management	Collective bargaining contracts	Towards individual contracts
21. Thrust of relations with stewards	Regularised through facilities and training	Marginalised (with exception of some bargaining for change models)
22. Job categories and grades	Many	Few
23. Communication	Restricted flow	Increased flow
24. Job design	Division of labour	Teamwork
25. Conflict handling	Reach temporary truce	Manage climate and culture
26. Training and development	Controlled access to courses	Learning companies
27. Foci of attention for interventions	Personnel procedures	Wide ranging cultural, structural, and personnel strategies

For example, in personnel, as Storey points out, selection of task or people is viewed as a separate and marginal task. The pay is evaluated by rigid procedures of job evaluation. The conditions of employment, for instance, are separately negotiated for every position. The management of labour is governed by collective bargaining contracts. Certain staff is specially trained to be the stewards for the organisation. There are many job categories and grades. The organisations restrict the flow of communication. The division of labour is more emphasised. As a means of management of conflict, quite often, temporary truce is reached. The learning process is restricted by controlled access to the courses. The personnel procedures restrict the scope for HR interventions.

In HRM, the situation is totally different. The selection of a task, for instance, is considered as an integrated or a key task. The pay is performance-related. (The traditional systems of yearly increments have vanished in the modern knowledge organisations). The work environment is more conducive and harmonious to enable the employees to contribute better. The trend of labour management is heading towards individual contracts. There is nobody as a steward to monitor others. Thus, the utility of stewards is marginalised. There are relatively low number of job categories and grades. In other words, the organisations are flat and lean. The increased flow of communication is ensured by necessary changes in the organisational structure. The jobs are designed to create teamwork. The priorities include managing and maintaining the organisational climate, and so on. The learning companies honour their employees' proposals by providing an unlimited access to learning opportunities. The focus of attention for interventions is the whole gamut of wide-ranging cultural, structural, and personnel strategies, and not merely the personnel procedures.

To sum up, HRM is an improved version of personnel management on many counts. It is often criticised that it is more academic and less relevant in the industrial environment. However, it is interesting to note that the human resource practices of successful organisations reveal that it is their frog-jump from personnel to HRM that made all the difference in their success. Such organisations are growing in number. These include public sector organisations such as the Steel Authority of India*, State Bank of India**, and others, and private organisations such as HDFC, Hindustan Lever, and many more.

IMPORTANCE OF HUMAN RESOURCE MANAGEMENT

In the past, the personnel departments were perceived as the 'health and happiness' crews. Their primary job activities involved planning company picnics, scheduling vacations, enrolling workers for healthy coverage and planning retirement parties. That has certainly changed during the past three decades.

Labour laws have placed many new requirements concerning hiring and employment practices on the employees. Jobs, in their nature, have also changed. They have become more technical and require employees with focussed skills.

Earlier, an employee performed a job in a specific department, working on particular tasks with others who did similar jobs. Today's employees work on project teams with various people across the organisation(s).

HRM function is viewed as very important because of its wide and varied contribution to the growth of the organisation in the long-run. Many entrepreneurs do not realise this. In their view organisational interests are main and HRM function is secondary. Very few entrepreneurs are aware of the fact that this 'secondary' function facilitates the performance of the 'main' function, in an effective manner. Without HRM, the organisation is like a blind person. In other words, the HRM function sets the direction for the organisation to perform better.

*The *turn-around* of the Steel Authority of India (SAIL), during 1983–84, by Mr Krishnamurthy is still a classic case-study of humane corporate turn-around in most Indian business schools. Mr Krishnamurthy spent several months speaking to his managers, employees, union leaders, customers, government officials, and others, to understand what ailed SAIL and steps needed to improve its performance. He then, based on his exhaustive discussions, prepared a document called 'Priorities for Action'. An extremely important step was then taken—he got this document mailed to all 2.5 lakh employees of SAIL. Senior executives discussed this document in six workshops of two days duration, with each workshop having about 80 executives. Mr Krishnamurthy attended each workshop and action plans were decided. Predictably, SAIL became a proactive organisation and could make full use of the liberalised business environment. Its strategy had been consistently focussed around inculcating quality and profit-orientation right from the shop floor at all its plants.

**State Bank of India is very famous for its *quality circles*. By conducting meetings of those pertaining to each section at the end of the day, it could identify the real bottlenecks for the smooth flow of the banking operations both within and outside the bank. When the bottlenecks were identified, the bank could take remedial measures to overcome these. With the result, the time taken for certain banking operations could drastically be brought down. This led not only to customer satisfaction but also to employee satisfaction.

The contribution of HRM can be observed from the following list which is only inclusive, but not exhaustive, of benefits.

- (a) It ensures that the right person is selected for the right job.
- (b) It develops the human resources through continuous training and development. A learning atmosphere is promoted in the entire organisation. This changes the frame of mind of the employees from ‘dictating’ to ‘receiving’.
- (c) It guides the management by participating in overall strategy and policy making, and in determining the right kind of human resource management practices that are suitable in a given context.
- (d) It increases the employee productivity.
- (e) It enhances the employee commitment to the organisation.
- (f) It ensures the right kind of work culture in the organisation. This is the first step to ensure discipline in the organisation.
- (g) It promotes an understanding between the management and workers. Thus, harmonious industrial relations are developed. This is a prerequisite for higher productivity.

HRM in the Context of Globalisation

The entry of multinationals has forced the organisations of Indian origin to develop international perspective. There are rapid changes in the technology, work culture, life styles, value system, communication system, and so on. These changes facilitate the movement of capital and labour, thereby, leading to the expansion of business all over the world. This further means that there is a need for mobile workforce, which is capable of successfully performing the given duties on a foreign land. This needs an understanding of the work procedures, language, culture, and customs of the host’s country. The existing work practices may have to be modified to suit to the foreign context. This is one of the jobs of HRM.

HRM is concerned with

- equipping the available staff in terms of necessary language and skill requirements
- modifying the management practices to accommodate the varying interests of a diverse workgroup
- meeting technology changes through adequate training and development
- minimising conflicts through defined policies and procedures

The global competition has increased the importance of improving the productivity of the workforce. This has resulted in the need for more number of HRM specialists — trained in psychology, sociology, organisation and management methods, work design, and law.

HRM and Top Management

Today, the HRM professional has a strong role to play in making an organisation successful. This has catapulted the human resource managers to the top-level management positions. Once a solitary individual heading the personnel function, today, the head of the department of HRD may be a vice-president sitting on executive boards and participating in the development of the overall organisational strategy.⁶ Figure 12.1 shows a simplified organisational chart presenting HRM areas with typical job titles.

From the organisation chart in Figure 12.1, it can be seen that the HRM manager is the vice-president of the company. This indicates the importance of HRM in today’s operations. There is one general manager for each of the four major departments: placements (looking after recruitment and selection), training and

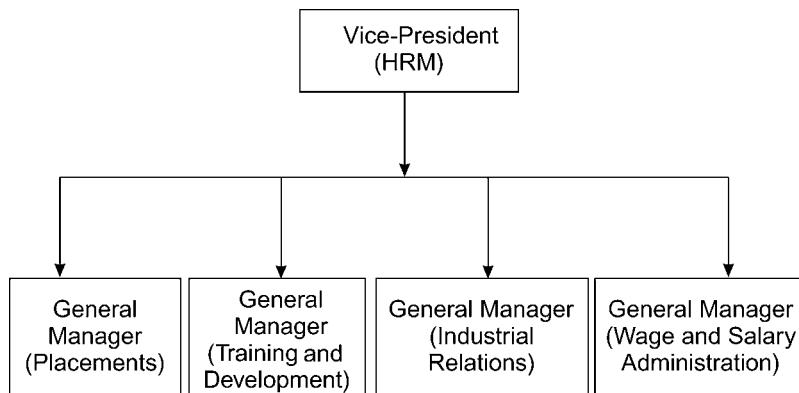


FIGURE 12.1 Sample HRM organisational chart

development, industrial relations and wage and salary administration. (These functions are discussed, in greater detail, in Chapter 14). The number of departments, however, varies depending upon the nature and size of the organisation.

SUMMARY

- ◆ Human resource management (HRM) and human resource development (HRD) are the extensions of the concept of personnel management.
- ◆ Personnel management seeks to bring people in the organisation together and enables each person to make his own best contribution to the success of the organisation.
- ◆ Personnel policy is an expression of the values and beliefs of the organisation.
- ◆ Personnel manager is both line manager and also a staff manager.
- ◆ Personnel management is viewed as different from HRM.
- ◆ HRM has a wider scope to focus on the need to attain organisational goals through team building, empowerment, and human resource-based competitive edge.
- ◆ The differences between personnel and industrial relations and HRM can be classified under four heads: (a) beliefs and assumptions, (b) strategic aspects, (c) issues relating to line management, and (d) key levers.
- ◆ The importance of HRM in the context of globalisation has been increasing day-by-day.
- ◆ The HR manager today finds a place in top-level management positions.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Which of the following refers to the process of managing the human resources of an organisation in tune with the vision of the top management?
 - (a) CRM

- (b) HRM
 - (c) HRD
 - (d) PM & IR
2. What is a strategically driven process?
 - (a) HRD
 - (b) PM & IR
 - (c) HRM
 - (d) CRM
 3. Which of the following is not a function of HRM?
 - (a) Focussing on team building
 - (b) Developing product sensitive management style
 - (c) Empowering employees
 - (d) Evaluating self appraisals
 4. What refers to the process of managing people enabling them to contribute their best for the attainment of organisation goals?
 - (a) HRM
 - (b) HRD
 - (c) Personnel Management
 - (d) Industrial relations
 5. What refers to the relations between the employees and the management?
 - (a) HRD
 - (b) Personnel Managament
 - (c) Industrial Relations
 - (d) HRM
 6. Who focused on Compensation, Integration and Maintenance of people in the organisation?
 - (a) Peter F Drucker
 - (b) Flippo
 - (c) Pigours & Myres
 - (d) Pyle
 7. The process of formulating a personnel program, which is determined in advance is called
 - (a) Planning
 - (b) Organisation
 - (c) Directing
 - (d) Controlling
 8. The process of creating an environment integrating individual interests and organisational interests is known as
 - (a) Development
 - (b) Compensation
 - (c) Integration
 - (d) Maintenance
 9. Which of the following is not a feature of personnel management?
 - (a) Aims to achieve efficiency
 - (b) Aims to achieve proficiency

- (c) Aims to achieve justice
 - (d) Concerned with people at work
10. Who defined personnel mgt as a method of developing the employee potential?
- (a) Clark & Clark
 - (b) MB Athreya
 - (c) Pigours & Myres
 - (d) Philip Kotler
11. Which of the following is not a feature of Personnel Management?
- (a) Is concerned with employees
 - (b) Is a method of helping employees
 - (c) Manages people at the lower level in the organisation only
 - (d) Is a method of channelising the potential
12. What is an expression of the values and beliefs of the organisation?
- (a) Induction
 - (b) Personnel Policy
 - (c) Recruitment
 - (d) Service
13. What refers to the activities of a specialist responsible for devising and executing the personnel policies and strategies in the organisation?
- (a) HRM
 - (b) PM
 - (c) IT
 - (d) HRD
14. Who referred to the goal of personnel mgt is employee orientation while the goal of HRM is organisation oriented?
- (a) GA Cole
 - (b) Pyle
 - (c) Flippo
 - (d) Pigorous & Myres
15. Which of the following is a benefit of HRM?
- (a) Decreases the employee productivity
 - (b) Decreases the employee commitment to the organisation
 - (c) Pre requisite for lower productivity
 - (d) Ensures that the right person is selected for the right job
16. Which of the following is not a concern of HRM?
- (a) Minimizing conflicts
 - (b) Meeting technology changes
 - (c) Accommodate varying interests of a common workgroup
 - (d) Equipping the available staff in terms of skill set
17. What is the nature of relations between management and labour, as stated by Storey, or personnel & IR and HRM?
- (a) Pluralist, Unitarist
 - (b) Unitarist, Pluralist

- (c) Personnel, Human
 - (d) Human, Personnel
18. What states how the employees should behave conduct themselves in the organisation?
- (a) Resources policy
 - (b) Finance policy
 - (c) Personnel policy
 - (d) Technology policy
19. What is not a function of a personnel manager?
- (a) Develop vision
 - (b) Develop objectives
 - (c) Develop cultures
 - (d) Advise line managers approximately
20. What is not a necessity of HRD?
- (a) Make organisational dynamics growth oriented
 - (b) Make industrial policies
 - (c) Succeed in a fast changing environment
 - (d) Make personnel policies

Question II: Fill in the Blanks

1. Personnel management can be defined as
2. Personnel policy means
3. Personnel manager is a line manager in the issues related to
4. The top management relies on personnel manager for developing for the organisation.
5. The operating functions of personnel management, as suggested by Flippo, are: procurement, development, compensation, and maintenance.
6. Total quality management and ISO 9000 developed an atmosphere of and among the labour and management.
7. The nature of relations between management and labour, as stated by Storey, is pluralist in personnel and IR. It is in HRM.
8. The key relations of labour management in personnel, according to Storey, shift their focus to in HRM.
9. The guide to management action in HRM is
10. constitute prized management skills in HRM.
11. An organisation is said to have an ‘enabling culture’ when its employees

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Changing roles of the personnel manager.
2. Personnel policy.
3. Name any four HRM activities in the Indian context.
4. What is personnel management?
5. What led to the development of HRM/D?

6. Is personnel manager line or staff manager? Support your answer with an example.
7. Discuss the importance of HRM.
8. Explain any four behavioural assumptions, as stated by Storey, to differentiate personnel and HRM.
9. Strategically explain how personnel management is different from HRM.
10. Define HRD. Why is it necessary?
11. Explain, in brief, how globalisation enhanced the need for the HRM function.

Question IV: Essay Type Questions

1. Explain the concept of personnel management. Analyse how it is maintaining its identity despite the strong wind in favour of HRD/M.
2. Differentiate personnel and industrial relations from HRM.
3. Define personnel management. Analyse how it continues to be an integral part of the organisation.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. b | 2. c | 3. b | 4. c | 5. c |
| 6. b | 7. a | 8. c | 9. b | 10. c |
| 11. c | 12. b | 13. b | 14. a | 15. d |
| 16. c | 17. a | 18. c | 19. b | 20. b |

Answers to Question II

- | | |
|---|--|
| 1. <i>that part of management concerned with people at work and their relationships within their enterprise.</i> | 7. <i>unitarist</i> |
| 2. <i>a directive to guide personnel department in the matters of recruitment, selection, transfer, promotion, and so on.</i> | 8. <i>customer</i> |
| 3. <i>staff selection.</i> | 9. <i>business needs</i> |
| 4. <i>vision and culture</i> | 10. <i>facilitation</i> |
| 5. <i>integration</i> | 11. <i>use their initiative, take risks, experiment, innovate, and make things happen.</i> |
| 6. <i>confidence and mutual trust</i> | |

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13

FUNCTIONS OF HUMAN RESOURCE/PERSONNEL MANAGER —I: MANPOWER PLANNING

Learning Objectives

By the time you study this chapter, you should be able to

- understand the concepts of job analysis, job description, and job specifications
- explain why the organisations need to maintain lower rates of labour turnover
- understand the concept of manpower planning as a process
- identify the components of manpower planning in detail
- understand how manpower plans are carried out

INTRODUCTION

The functions of personnel management are varied. From the stage of identifying the manpower requirements to the stage of ensuring that the employees contribute to the corporate goals, the personnel manager has to look after all the functions. In this process, the concepts of job analysis, job description, and job specification assist the personnel manager at every stage. In other words, job analysis forms the basis for carrying out a detailed manpower planning exercise.

Manpower planning gets affected if the labour turnover rate tends to be high. Hence, it is necessary that the labour turnover rates need to be monitored. This is the basic function of the personnel manager.

Considering the goals of the organisation, the personnel manager has to determine the manpower requirements at different levels and in different departments for a given period. Manpower planning is the primary function of the personnel manager. This chapter deals with the basic concepts of job analysis, labour turnover, and manpower planning.

JOB ANALYSIS

What is a job? A job is described as a collection of tasks assigned to a position in an organisation structure. To control the performance of the individual performing this job, it is necessary to identify the work context and also fix job responsibilities. This implies the need for analysing the job, describing the job, and specifying the requirements on the part of the person doing this job.

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

The following are the advantages of job analysis:

- (a) It helps to develop job description. Job description enables the interviewers to assess the requirements on the part of the interviewee to perform the job better.
- (b) It is an aid for assessing training needs.
- (c) It is an aid for assessing the performance of the employees.
- (d) It forms a prerequisite to job evaluation.
- (e) It is helpful to the management and also to the employees. It helps the management to view a job in a scientific manner. It enables individual employees to understand their main responsibilities.

JOB DESCRIPTION

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

Contents of Job Description

Job description includes:

- (a) job title and grade
- (b) to whom one has to report
- (c) what authority one has
- (d) definition of those for whom one is responsible
- (e) the main objectives
- (f) key responsibilities and tasks
- (g) reporting methods and requirements

These are illustrated in Exhibit 13.1. In other words, the job of a production manager is to set and maintain high standard of product quality and reliability. The marketing manager is concerned with designing marketing strategies to optimise sales. The job of a foreman is to maintain production and supervise the production staff under his control.

Advantages of Job Description

- (a) Job description forms the basis to identify the job specification
- (b) It explains the nature of duties of the job. It motivates potential candidates to apply for the job at the time of advertisement
- (c) This helps to evaluate or assess the performance of the employees
- (d) It is a valuable tool for designing employee-training programmes

Exhibit 13.2 presents a few extracts from some of the advertisements in the professional engineering journals. Here, in job 1, there is reference to commercial direction and business acumen as well as to technical issues. Direction implies that this job involves getting job orders and also showing the employees how to execute these job orders. This job requires management skills apart from technical skills.

Exhibit 13.1: Job description: Junior engineer

The junior engineer in the engineering department will manage engineering technicians and extend support to other members of the department. The key tasks of the person are:

- To coordinate the activities of the engineering technicians and provide engineering support to members of the engineering department.
- To test, assemble, and develop components and products, as instructed, in accordance with the requirements of the quality management system.
- To assist in the production of documentation for components and products including work instructions, bills of materials, and operating manuals.
- Any other appropriate tasks required of the engineering department.

Job Title:	Junior Engineer
Grade:	4
Responsible to:	Head of engineering department
Responsible for:	Coordinating the activities of technicians
Purchase authority:	None
Contract authority:	None
Reporting:	You will be required to produce a written progress report for the engineering department progress meetings.

Job 2 and job 3 are similar in the technical issues. They demand for specific technical knowledge. The job description underlined here also provides a basis to identify what qualifications the applicants need to possess to perform these jobs.

Exhibit 13.2: Job description for a few positions in engineering

Job 1. General Manager (Electronics) . . . provides technical and commercial direction within the engineering field. Matching business acumen with a detailed understanding of project management.

Job 2. Design Engineer . . . responsible for design, manufacturing, specification, installation, commissioning, and the provision of operational support, and has to pursue the creative application of new technology.

Job 3. Design/Development Engineer . . . responsible for new product design, analysis, development, testing, and client liaison.

JOB SPECIFICATION

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

As a part of covering job specifications, the recruitment advertisement should also provide, with reference to a given job, an outline of:

- The knowledge and understanding required for the job
- The skills/traits and abilities required for the job
- The necessary job-related experience
- The educational and technical qualifications

Job specification is a description of the human requirements of the job. It is necessary that the applicant must have the knowledge of the job description before he applies for a job.

Exhibit 13.3 outlines the job specification for the position of the Head of the electronics division.

Exhibit 13.3: Job specification

Emerging Technologies Limited

Requires

Head—Electronics Division

He will be:

- in the age group of 35–45
- Postgraduate in Electronics, preferably from a leading US University
- having 10 years experience in power electronics industry with the last 5 years in a senior position in Engineering/Development in a leading software company
- having experience in the execution of large projects for American/European entities in diverse technologies and commercial applications
- responsible for the techno-commercial evaluation and execution of all emerging technology projects and products
- accountable for the establishment and maintenance of the highest standards

LABOUR TURNOVER

Labour turnover refers to the number of employees leaving the organisation as against the total number of employees on the payroll per year. It is measured in terms of percentage as follows:

$$\text{Labour turnover rate} = \frac{\text{Number of employees leaving per year}}{\text{Total number of employees on pay roll per year}} \times 100$$

Labour turnover is a complex issue that disturbs, most often, the plans of the entrepreneurs. The rate of labour turnover indicates the changes in the labour force during a given period. In the interest of the firm, it is not desirable to have a high rate of labour turnover. A high rate of labour turnover indicates that the firm is not in a position to retain its labour.

Disadvantages of High Labour Turnover

As a result of high labour turnover, the organisations may suffer the following disadvantages:

Loss of output When the employee leaves with or without notice, the organisation has to make alternative arrangements for the new employees. It may take some time to identify a suitable person. During this period, there could be loss of output.

Additional training costs Taking a new person means the organisation has to again spend time on training. This means additional training cost.

Under-utilisation of equipment The machinery could be under-utilised because of the high rate of labour turnover.

Increased selection costs This increases selection costs, particularly where the selection process is long, involving different stages.

Additional overtime costs During the period of labour shortages, to meet the production schedules, the organisation may have to allow overtime work for its employees. This involves additional overtime costs.

Reasons for Labour Turnover

The employees may leave the organisation for any of the following reasons:

Resignations and voluntary exits At times, employees may leave the organisation on their own. They may be dissatisfied with the working conditions or the job itself. When they find a better job, they may resign also.

Discharges The employer may discharge or dismiss an employee on disciplinary grounds.

Layoffs A worker is said to be laid off when he is suspended from work because of a shortage of raw materials or a breakdown of machinery. However, during the period of layoff the worker is entitled for his wages, provided he does not take up work anywhere else.

It is the responsibility of the personnel manager to maintain a low rate of labour turnover. Retaining the employees at all levels has been a big challenge to the personnel manager, both in the domestic and the transnational companies.

As a part of meeting this challenge, the multinational companies such as Motorola* (see Exhibit 13.4) insist that their supervisors discuss with their staff every quarter regarding the specific requirements of the employees. Any negative answer is seen as a quality failure and this is to be corrected in the total quality way that is, by identifying and correcting the root causes.

Progressive companies realise the need to counsel their employees, including their family members, to perform better. This strategy sets right the behaviour of faltering employees and prevent them from leaving the organisation, as a result of frustration.

MANPOWER PLANNING

People are a key resource in any organisation, particularly more so in case of knowledge-based companies. While other resources such as finance, and so on, are meticulously planned and controlled, manpower still continues to be given the last priority. It is ideal that the companies plan its manpower requirements for at least three-years ahead.

*Motorola is a multinational providing integrated communications and embedded electronic solutions.

Exhibit 13.4: Questions the supervisor discusses with his team of staff at Motorola

- Is your job substantive and meaningful enough to contribute to the success of Motorola?
- Do you know how to perform the job satisfactorily?
- Are your skills being upgraded continuously?
- Do you have personal career-plan, and how far is it exciting and achievable? Are you working for it?
- Do you have any personal factors that lead to the stress on the job?
- Do you get feedback about your performance every 30 days? Is it helpful in improving your personal career-plan?

Manpower planning addresses the following issues:

- What kind of people and how many are required at every level in the organisation?
- Over what period of time are these people required?
- What is the present level of staff in the organisation?
- Is there an excess or a shortage of staff?
- If excess, how does the organisation intend to do away with the surplus staff?
- In case of shortage, how does the organisation intend to meet this shortfall? Through external or internal sources? (here, internal sources mean the kith and kin of the staff)
- What are the changes in the employment market and how far do these affect the availability of staff in the present context?

Definition

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

Manpower planning is, in other words, concerned with the flow of people into and sometimes out of the organisation. Its main objective is to acquire, utilise, improve, and retain effectively the human resources to achieve the targeted results at different levels in an optimum manner.

Importance

- (a) It directly contributes to the achievement of the corporate objectives
- (b) It enables the organisation to secure the right kind and quantity of human resources at different levels in it
- (c) It helps decision-makers in the search for the optimum strategy
- (d) It helps the line managers to highlight the existing or inherent problems in managing the human resources under their control
- (e) It provides an adequate basis to take meaningful and constructive decisions, and thus, ad hoc decisions relating to manpower management can be avoided

The manpower planning process includes the development of policies, systems, and procedures that will increase the chances of exercising effective control. The key resources such as managers, technologists, and other specialists cannot be developed overnight. It is a long-term continuing process. Manpower planning helps to identify the future needs of the business well in advance and also helps for the assessment of the long-term effects of current decisions. It should be carefully evaluated whether the surplus staff showed in a particular department in the short-run could be dispensed with by schemes such as golden handshake, and others. In the short-run, such strategies may look lucrative but considering the long-term interests, such a move could be suicidal to the organisation, unless it has talented people to replace the retiring staff. Hence, it is necessary to list out the long-term and short-term plans and evaluate, in detail, the issues of manpower planning against this background.

Manpower planning cannot be regarded as an isolated activity. It has its deep roots into the corporate goals. It is the duty of the personnel manager to develop manpower plans with a holistic approach as a part of the corporate plan. In other words, the manpower plans should be related to all other functional areas of business such as production, marketing, finance, and others. This involves formulation of flexible manpower policies, plans, and control procedures to suit the changing environment of the organisation.

Goals of Manpower Plan

A right manpower plan aims at the following:

- Obtain and retain the quantity and quality of the manpower it needs
- Make the best use of its manpower resources
- Be able to anticipate the problems arising from surplus or shortage of manpower

Manpower Planning Process

The manpower planning process is outlined in Figure 13.1. The manpower planning process starts with identifying the corporate goals and the available resources. In the light of this, each of the departments has to identify their targets and get the resources allocated. The departments have to identify and analyse their workload and assess their manpower requirements. In the light of these, they have to formulate succession plan and training programmes for the employee development, considering the rate of employee turnover. These will directly and indirectly quantify the manpower requirements. In case additional staff is required, plan for recruitment. If the staff is found to be in surplus, plan for discharge. Accordingly, the proposals are made to the top management. The senior management will review these proposals. After obtaining clearance from the top management, the departments evaluate the proposals in financial terms. The departments seek the management approval for the proposals and formulate action plans to implement the decisions. Action plans are evaluated and controlled in terms of departmental requirements and financial constraints.

The following four strategies constitute the essence of manpower planning:

- (a) Succession strategy
- (b) Staff development strategy
- (c) Recruitment strategy
- (d) Redundancy strategy

An integration of all these strategies for each of the departments within the organisation constitutes the overall *manpower strategy or plan*. The departments have to maintain a database that facilitates the execution of the

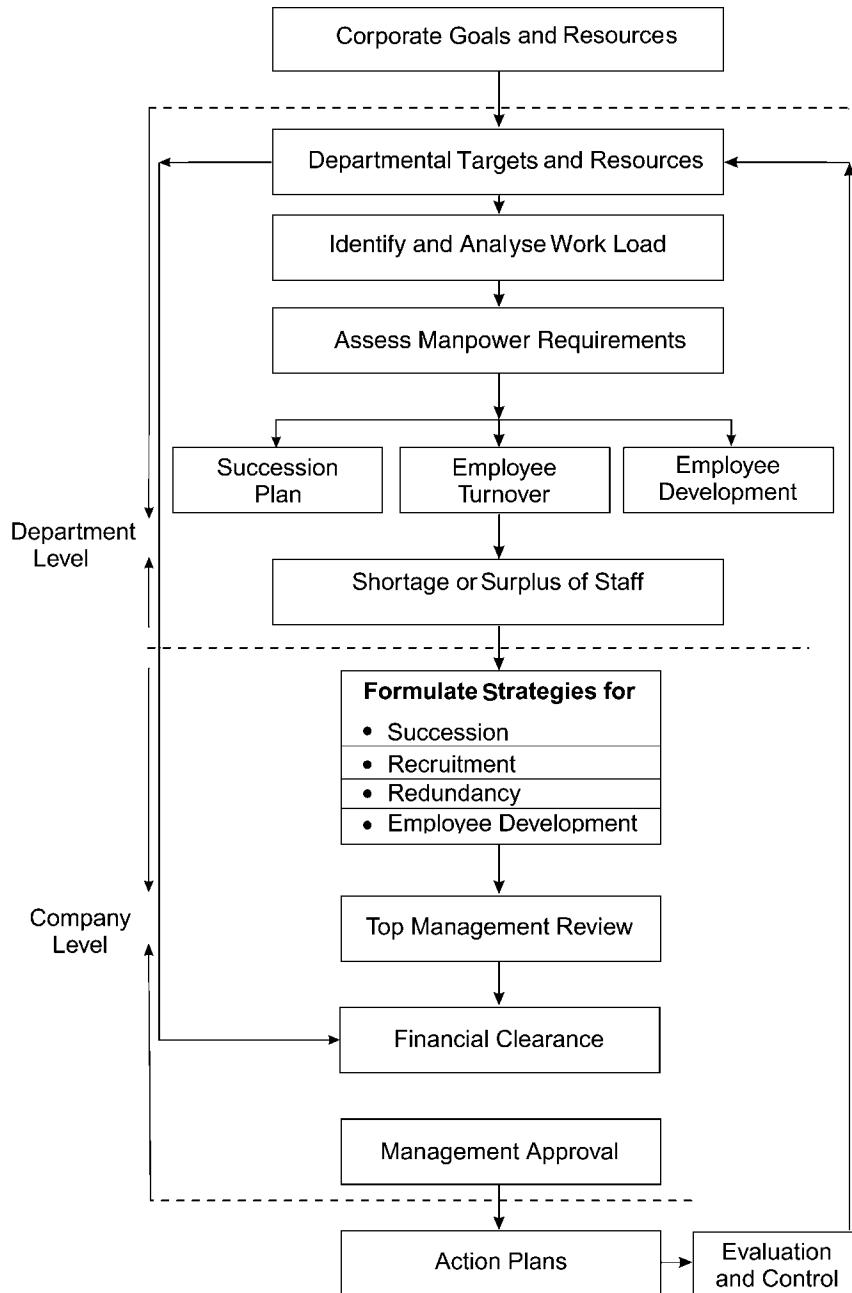


FIGURE 13.1 *Manpower planning process*

above strategies. Manpower forecasts are prepared on the basis of the perceived gaps in the human resource inventory and requirements.

Succession strategy Succession strategy involves identifying the career plans of the key positions (such as chief executive, executive directors, general managers, and the ones just below these) in the organisation. In other words, who will succeed whom in the event of promotion, transfer, retirement, or death of an employee? This is clearly identified.

For each department, the concerned manager is responsible to review the succession strategy. The top management reviews these departmental succession strategies for the whole organisation. During the review, all possible alternative names are considered, and other names not considered suitable may be challenged. Thus, an overall agreed succession strategy and an action plan for its implementation are evolved.

The top management authorises the individual managers to execute the succession strategies by delegating the necessary authority. The personnel manager should monitor the progress in this direction and submit quarterly progress reports to the top management.

The function of personnel manager starts with planning the necessary manpower for different departments for achieving the corporate goals. The number of staff in various departments of the organisation may be changing for different reasons: recruitment, promotions, transfers, resignations, retirements, and deaths. Hence, it is necessary to monitor the requirements and availability of each of the departments. The manpower planning process in Figure 13.1 is a simple model, which explains how current staff position is determined. Also, it outlines how the organisations can bridge the gap, if any, between the current staff situation and the organisational requirements, by recruiting new staff.

The main object of manpower planning is to make available the exact number of right staff for the right jobs for different departments. A manpower plan shows the flow of people through the organisation, and identifies the key actions to be taken at the operational level. Succession strategy makes the manpower plans more practical and realistic. This is an essential tool for every kind of organisation to plan its manpower requirements.

Staff development strategy It is the responsibility of the top management to consider and promote the training, development, and progress needs of the entire workforce. The individual managers will ensure that the staff development needs of work groups, for which they are responsible, are fully met.

When the managers review the performance of their work groups periodically, they come to know the additional needs for training and development. A formal system for performance appraisal has to be designed to assess the performance of each of the employees. During the review, the aspirations, experience, and training needs of each employee should be identified, agreed upon, and recorded. The personnel manager should collate, review, and summarise this data in order to prepare a company's training and development plan. This plan will include an implementation programme and also a detailed cost estimate. The cost estimate forms the basis of the company's training and development budget which will be submitted for approval to the top management.

When the financial clearance is received, it is the responsibility of the personnel manager to implement this in close coordination with the line managers. The line managers propose the need for training, but when it comes to the question of releasing the employee for training, they usually back out. The line managers complain that their regular production targets get disturbed in case they depute their staff for training programmes. A well-defined training policy may simplify the task of the personnel manager, or else, he has to put in a good degree of drive and tact to pursue and convince the line managers to relieve the employees for training purposes.

One method to ensure the accuracy and effectiveness of the staff development strategy is to establish a staff development committee, which will formalise the relevant procedures. Large organisations create a technical staff development committee with specific responsibility of technical skills in addition to the staff development committee.

Recruitment strategy Based on the formally-approved manpower plan, the recruitment strategy for the corresponding period will outline:

- How the additional staff are recruited in the required number and types, as and when necessary
- How the recruitment problems are to be taken care of

The recruitment strategy covers all the stages, that is, advertising the vacancy position, accepting the filled-in applications, screening the applications, shortlisting the applications, calling the shortlisted for interview, conducting the interview, selecting the right person for the right job, and placing him/her on the job for a probation period.

Is the staff recruited on a permanent basis or is it on a temporary basis? If it is at the senior positions vital for the operations of the business, it is advisable for the company to go for permanent positions. If it is at the lower levels such as draughtsman, secretarial, clerical, or any other appropriate grades, it can be on a temporary basis. However, careful planning will minimise the need for redundancies. Also, the sense of insecurity among the staff can be avoided.

Redundancy strategy Redundancy means dismissal or separation of an employee from the job because of change of product or organisational restructuring. Earlier, it was considered as a nightmare for both employer and employee to think in terms of dismissal or separation. With the changing business circumstances, the organisations trim their workforce to grow more competitive by lowering their labour costs. The realistic termination packages developed by the employers made not only the blow softer for the employee but also attractive financially.

Redundancy—the order of the day

With technological revolution and increasing degree of automation, redundancy has become the order of the day. Earlier, jobs were created in Government organisations and the public undertakings to accommodate people with appropriate qualifications. The number of jobs created was one of the parameters to evaluate the success of a political leader or a commercial or government organisation.

Today, the scenario is different. It is increasingly realised that organisations, including Government organisations, need to be flat and lean to enhance their competitive edge and try every strategy to reduce their direct wage bill and also the employee related overheads.

This trend is evident from the following:

- Many automobile giants such as General Motors, Suzuki and insurance companies have been announcing job cuts from time to time.
- Banks and other Government undertakings have been announcing voluntary retirement schemes.
- Government of India has announced Voluntary Retirement Scheme to its employees and plans to cut at least 10 per cent of its staff over a period of next four years.

It is essential to examine all the relevant aspects, future as well as current, before any decision is made to implement a redundancy programme. If there is surplus manpower, identify exactly where the surplus lies, the period of time during which the excesses are expected to continue, and finally, quantify the surplus precisely—on a name-by-name basis. If not, there is every danger of losing key employees in the name of redundancy.

Can redundancy be avoided? Can the surplus staff be redeployed with little additional inputs of training in place of those likely to retire or resign shortly? Can the recruiting process be suspended to solve the redundancy problem? These alternatives have to be explored.

Where redundancy is inevitable, formulate a redundancy programme by establishing the exact terms of separation. Develop the criteria to implement the redundancy strategy. Arrange for the financial resources. Prepare the list of staff to be discharged. Finally, implement the programme.

Counselling Employees may get shocked the moment they hear that they are identified as ‘redundant’ by the organisation. They may get, at once, shocked or bewildered, and disoriented. Counselling, in such a case, comes very handy for the organisation to minimise the likely damage in the redundancy process. Counselling on matters relating to hunting for a new job or how to invest the funds in the compensation package for an optimum yield helps these employees to a large extent. Other strategies of counselling such as group counselling or private counselling to the ex-employee and to his/her spouse are worth considering. For those who are retiring, pre-retirement counselling will go a long way in boosting their morale.

The onus of building and maintaining a high confidence-level among the remaining employees rests with the organisation and its line managers. The company could consider certain positive assurances such as productivity-linked bonus, stock options, job security, and so on, to keep the morale of its employees high.

To sum up, the nature of the particular organisation and the kind of business undertaken will decide the details of manpower planning process and its specific details. However, the principles of manpower planning remain the same.

If the management integrates the strategies of succession, recruitment, and staff development into its manpower plans, it is likely that its manpower continues to be a major valuable resource for the company. This will be cost-effective, significantly motivating and highly capable of contributing to the attainment of corporate objectives.

SUMMARY

- ◆ A ‘job’ is the collection of tasks assigned to a position in the organisation structure.
- ◆ Job analysis is the process of examining the job by identifying its main features, the results it is expected to achieve, the major tasks undertaken, and its relationship with other jobs in the organisation.
- ◆ Job analysis leads to job description. In job description, the principal duties to be performed in the job are described.
- ◆ Job specification sets forth the requirements sought in the person who is to perform the work.
- ◆ Labour turnover refers to the number of employees leaving the organisation in relation to the number of employees on the payroll in the organisation per year. Higher labour turnover may be an indication of poor handling of personnel matters.
- ◆ Manpower planning is a rational approach to the effective handling of people within the organisation. The main object of manpower planning is to make available the exact number of right staff for the right jobs for different positions in the organisation.
- ◆ Manpower planning involves planning for succession, staff development, recruitment, and also, redundancy in the organisation, and evolves appropriate strategies.

- ◆ A succession strategy aims at identifying the career-plans of the key positions in the organisation. It outlines who will succeed whom in the event of promotion, transfer, retirement, or death of an employee in the organisation.
- ◆ Staff development strategy considers the issues relating to recruitment, promotion, training, development, and progress needs of the entire workforce in the organisation.
- ◆ Recruitment strategy takes care of the number and types of staff required, and why and when they are required. It considers the contingency arrangements in the event of non-availability of the right candidates.
- ◆ Redundancy means dismissal or separation of employees from the job due to organisational restructuring. In case of redundancy, there is a need for arranging counselling to the affected employees. Redundancy strategy attempts to contain the damage to the organisation, in case the employees are to be separated from the jobs.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. What refers to a collection of tasks assigned to a position in an organisation structure?
 - (a) Job
 - (b) Job analysis
 - (c) Job description
 - (d) Job specification
2. Which of the following is not an advantage of job analysis?
 - (a) Helps to develop job description
 - (b) Aids for assessing training needs
 - (c) Forms a pre requisite to job description
 - (d) Aids for assessing the performance of employees
3. What refers to the process of identifying the tasks comprising a particular job to assess whether they could be organised in a productive manner?
 - (a) Job description
 - (b) Job analysis
 - (c) Job specification
 - (d) Job
4. Which of the following is not a content of job description?
 - (a) Job title
 - (b) Personnel manager
 - (c) Main objectives
 - (d) What authority one has
5. Which of the following is not an advantage of job description?
 - (a) Forms the basis to identify job specification
 - (b) Explains the nature of duties of the job
 - (c) Evaluates or assesses the skills of the employee
 - (d) Motivates potential candidates to apply for the job at the time of advertisement

6. What refers to the identification of the requirements on the part of the person to perform the given job?
 - (a) Job specification
 - (b) Job analysis
 - (c) Job description
 - (d) Job design
7. What refers to the number of employees leaving the organisation as against the total number of employees on the payroll per year?
 - (a) Manpower planning
 - (b) Labor turn over
 - (c) Job description
 - (d) Job analysis
8. Which of the following is not a disadvantage of high labor turnover?
 - (a) Additional overtime costs
 - (b) Loss of output
 - (c) Decreased selection costs
 - (d) Under utilisation of equipment
9. Which one of the following is not a reason for labor turnover?
 - (a) Resignation
 - (b) Discharges
 - (c) Layoffs
 - (d) Promotions
10. Which of the following implies 'assessing the requirements of human resources at different levels in the organisation'?
 - (a) Manpower planning
 - (b) Personnel management
 - (c) Labor turnover
 - (d) Job specification
11. Which of the following is not an important for manpower planning?
 - (a) Help decision makers
 - (b) Helps line managers
 - (c) Directly contributes to the achievement of personal objectives
 - (d) Enables the organisation to secure the right kind of human resources
12. Which of the following is not a strategy involved in manpower planning?
 - (a) Succession strategy
 - (b) Performance strategy
 - (c) Recruitment strategy
 - (d) Staff development strategy
13. Which of the following is not a stage in the recruitment strategy?
 - (a) Advertising the vacancy position
 - (b) Screening the applications
 - (c) Conducting the interview
 - (d) Dismissing the employee

14. Which of the following is not a stage in manpower planning?
 - (a) Staff development
 - (b) Planning for succession
 - (c) Performance indication
 - (d) Redundancy in the organization
15. What sets forth the requirements sought in the person who is to perform the work?
 - (a) Job analysis
 - (b) Job specification
 - (c) Job description
 - (d) Job design
16. What takes care of the number and types of staff required and why and when they are required?
 - (a) Succession strategy
 - (b) Staff development strategy
 - (c) Recruitment strategy
 - (d) Redundancy strategy
17. What attempts to contain the damage to the organisation, in case the employees are to be separated from the jobs?
 - (a) Succession strategy
 - (b) Staff development strategy
 - (c) Recruitment strategy
 - (d) Redundancy strategy
18. Which is not a concern for staff development strategy?
 - (a) Training
 - (b) Development
 - (c) Staffing
 - (d) Progress
19. What considers the contingency arrangements in the event of non availability of the right candidates?
 - (a) Succession strategy
 - (b) Staff development strategy
 - (c) Recruitment strategy
 - (d) Redundancy strategy
20. What does the higher labor turn over indicate?
 - (a) the exact number of right staff for right jobs
 - (b) the description of principal duties to be performed
 - (c) poor handling of personnel matters
 - (d) the major tasks undertaken

Question II: Fill in the Blanks

1. Manpower planning can be defined as
2. The decision-makers, to search for the, use manpower plans.
3. Manpower plans have their deep roots in the objectives.
4. One of the goals of manpower plans is to
5. Manpower planning ends with

6. The succession strategy identifies the of the key positions in the organisation.
7. Staff development strategy addresses the needs of the entire workforce in the organisation.
8. Redundancy means

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. What is a job? What do you understand by job analysis?
2. Identify the contents of job description.
3. How do you determine labour turnover rate?
4. What are the goals of manpower planning?
5. How does succession plan contribute to manpower planning?
6. How can the harsh effects of dismissal be smoothed?

Question IV: Essay Type Questions

1. Explain how job analysis forms the basis for job description and job specification. How does it help the personnel manager?
2. What are the principles of manpower planning? How do you apply these to a software company?
3. Explain the important stages in the manpower planning function.
4. What are the reasons for high rate of labour turnover in some of the industries in India? Suggest how the employees can be retained.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. a | 2. c | 3. b | 4. b | 5. c |
| 6. a | 7. b | 8. c | 9. d | 10. a |
| 11. c | 12. b | 13. d | 14. c | 15. b |
| 16. c | 17. d | 18. c | 19. b | 20. c |

Answers to Question II

- | | |
|---|---|
| 1. <i>a management process that adds information about human resources to the corporate plan.</i> | 5. <i>feedback and control.</i> |
| 2. <i>optimum strategy</i> | 6. <i>the career plans</i> |
| 3. <i>corporate</i> | 7. <i>training, development and progress</i> |
| 4. <i>make best use of its manpower resources.</i> | 8. <i>separation or dismissal of the employee from the job.</i> |

14

FUNCTIONS OF HUMAN RESOURCE/PERSONNEL MANAGER — II

Learning Objectives

By the time you study this chapter, you should be able to

- explain in detail the functions of human resource/personnel manager
- explain the concept of job evaluation
- evaluate different methods of job evaluation
- analyse the concept of merit rating
- evaluate the different methods of merit rating

INTRODUCTION

The functions of personnel management are varied. The personnel manager has to look after all stages, from identifying the manpower requirements to the stage of ensuring that the employees contribute to the corporate goals: The list of functions of the personnel manager include: manpower planning, recruitment, selection, induction, training and development, placement, wage and salary administration, performance appraisal, motivation, grievance handling, and welfare.

MANPOWER PLANNING

The manpower position keeps on changing in the organisations because of several factors such as transfers, promotions, demotions, retirements, and death of the employees. Hence, it is the direct responsibility of the personnel manager to ensure that the right number of right people are made available at the right departments. The techniques such as manpower audit, manpower inventory, and others, help the personnel manager to identify the gaps in the manpower position in the organisation. The plans of succession, recruitment, staff development, and redundancy guide him to do his job in the right way.

RECRUITMENT

When the manpower plans reveal the need for additional people in the organisation, the personnel manager has to initiate the search for prospective employees and see that they apply for jobs in the organisation. Recruitment is often called a *positive* function. It is because the applications are invited at this stage for further scrutiny and shortlisting. Before advertising for the position, it is common to check up if the position could be filled in internally.

SITUATION ANALYSIS

What some of the leading companies look for

The thinking of the top management is undergoing a significant change. Let us see the opinions of a few top executives in the following organisations:

- *Pepsi Foods* “We are hiring people who are capable of growing the business rather than just growing with the business.”
- *Reebok* “We need youth, vitality, openness, a zest for life. And the willingness to get their hands dirty.”
- *Indian Hotel, Taj Group* “We want people who have patience to stay and rise with the company. We want our people to say ‘yes, sir’ to anybody. Besides these, we look for communication skills, the ability to work long and stressful hours, mobility, attention to personal appearance, and assertiveness without aggression. We do not look for academic high-flyers. Consistency is the priority for us rather than academic brilliance.”

What do these statements indicate?

The sources of recruitment include: internet, executive search agencies (popularly called head-hunters), advertisements in the media including TV and radio, employment exchanges, university and college campuses, technical and trade journals, and so on. These are the sources of recruitment for employees at different managerial levels.

The sources of recruitment for shop floor employees continue to be traditional. These include display of vacancy position on the factory gate, recommendation of the existing employees, employment exchanges, and others. Certain progressive industry associations maintain for different positions a waiting list based on applications received from the unemployed graduates and others living nearby.

SELECTION

The process of identifying the most suitable persons for the organisation is called *selection*. Selection is also called a *negative* function because at this stage the applications are screened and shortlisted on the basis of the selection criteria. The main purpose of selection is to choose the right person for the right job. The job analysis, job description, and job specifications are carried out before the position is advertised. These provide adequate insight about nature of the job, its description, and its specifications, and further focus on what type of person is to be selected for a given position. These simplify the process of selection.

The selection process, depending upon the cadre, involves different stages such as aptitude tests, group discussions, and personal interviews in professionally-run organisations. However, there is no standard practice in this regard. Many factors such as urgency, position advertised, costs involved, availability of candidates, and so on, govern the process of selection. If it is a senior executive position, selection may be based on one or two personal interviews. If it is for junior executive positions, it may be a written test, or group discussion followed by personal interview. The organisations are free to formulate their own selection procedures. Normally, the selection process involves the following stages:

- (a) *Initial screening/shortlisting* It is customary that the organisation gets enquiries seeking information about the availability of posts, salary range, place of work, working conditions, and others. At this stage itself, the organisation screens the enquiries and considers only such cases, which can result

in a potential candidature for a given vacant position. Based on the job specification, most of the enquiries can be eliminated. This process is called *shortlisting*. Also, in cases where the applicants are considered to possess the necessary qualifications and aptitude, they are encouraged to make a formal application. In the cases where the post is advertised, the applicants come to know the requirements of the job and apply for the same. The applications of those who do not have necessary qualifications are eliminated at this stage.

- (b) *Comprehensive application/biodata screening* Once the initial screening is completed, the applicants are asked to complete an application form provided by the organisation. The details of the comprehensive employment profile of the applicants are to be furnished in the given format.

In some cases, the organisations ask the applicants to send their biodata with all the particulars about their education, professional training and accomplishments, skills, experience, and so on. Some organisations would like to know the personal interests of the applicants for managerial positions, and hence, insist that a detailed note on ‘why the applicant wants to join this organisation’ has to accompany the applications. Here, the applicant furnishes all the relevant information. In cases where the information is incomplete, such applications are dropped at this stage.

Stages in campus recruitment

- Keep in touch with the placement officer in the college
- See the schedule of campus recruitment
- Choose the companies of your choice and submit the application
- If shortlisted, attend the written test, if any
- If shortlisted, attend the preliminary interview
- If shortlisted, attend the final interview
- If shortlisted, attend the medical examination
- If found fit, negotiate with the company for your terms of joining.
- If both of you reach a consensus, fix the date for reporting for duty.

- (c) *Aptitude or written tests* Organisations usually rely, to a considerable extent, on intelligence, aptitude, ability, and interest tests to provide a major input to the selection process. The aptitude tests enable the organisations to predict who would be successful on the job. The main purpose of the employment tests is to predict how the candidates are likely to perform the given job. For instance, for the position of an engineer trainee, basic concepts in science and engineering are tested. Also, the aptitude of the applicant on issues relating to creativity, judgement, situation analysis, and so on is tested. For positions of service engineer trainee, the aptitude for troubleshooting is particularly assessed.
- (d) *Group discussion* Those who pass in the aptitude test are called for group discussion. In group discussion, the following abilities of the candidate are assessed: communication skills, presence of mind, reacting to others' viewpoints, ability to convince, leadership skills, and others. At times, some controversial topics are given for group discussion. How best one organises one's thoughts and presents these to the group in a convincing manner is assessed here. The proceedings of the group discussion are closely watched and monitored by a facilitator (who is normally with a psychology background). In general, it is ensured that every candidate gets an opportunity to participate in the discussion. The candidates are shortlisted for the next selection stage based on their performance in the group discussion.
- (e) *Personal interview* Such of those who are shortlisted in group discussion are invited for attending a personal interview. The interview board consists of the personnel manager, one or two senior managers

within the organisation, and a psychologist to assess whether the candidate possesses the abilities as demanded by the job specification. Apart from this, the sociability, adaptability, ability to cope with stress, ability to achieve targets, degree of commitment of the candidate, and so on, are assessed at the time of personal interview. The original certificates relating to the qualifications and skills are verified to ascertain the reliability of the information submitted. The candidate may also be asked to show reference letters, if required. These will be cross-checked at a later date, in case the candidate is selected. Here, the members of the interview board will make a list of the successful candidates in the order of merit.

The personnel manager should ensure that the interview members assess the performance of the candidates in the interview in an objective, unbiased, and dispassionate manner.

- (f) *Medical examination* Those who are shortlisted in the interview are referred to for medical examination. This is intended to ensure that the candidate is in good health and has enough capacity to comply with the requirements of the job. It is also used to show that minimum standards of health are taken care of by enrolling those who fall short in company health-and-life insurance programmes. In such cases where the candidates fail to meet the minimum requirements at this stage, they may be sometimes given an opportunity to improve their health position within a specified time frame, and then report. Only those who comply with the medical requirements are considered for the next stage of the selection process.
- (g) *Employment offer* This is the last stage of the selection process. Those who are considered medically fit are offered employment in the organisation. The terms and conditions of employment are specified in the letter of the offer of employment. Most of the organisations insist that the candidate sign a contract for a minimum period, say, one or two years.

■ SITUATION ANALYSIS ■

Preparing for interviews

At the time of campus interviews, what do the companies look for?

The following are some of the very important clues:

- Conceptual clarity
- Ability to apply the basic concepts
- Consistent answers
- Confidence
- Ability to work in a team
- Extra curricular activities such as hobbies, sports, participation in competitions such as debates, and others
- Seriousness about the job
- Ability to cope up with stress
- Personal goals for future
- Aptitude and the job description

How much time is left for you to prepare for these?

Once the employment offer is accepted by the candidate, he/she will be placed on probation for a minimum period, say, one year. After this, if his/her services are found to be satisfactory, he/she will be regularised.

In such cases where the services of such probationer are considered unsatisfactory, either he would be given some time to improve or he would be terminated from employment, as per the terms of the contract.

These are the stages of the selection process, in general, in a medium or large organisation. However, it is to be noted that the selection process widely changes from organisation to organisation. The ultimate objective remains the same — selecting the right person for the right job. It is the personnel manager who has to ensure this at every stage.

INDUCTION

The main idea of this function is to share the information about the facts of the company with the new employee so that he feels proud of his association with the company. At the time of getting inducted into the organisation, the personnel manager provides orientation to the new employees about the profile of the organisation, its business, its departments, and their job. This process is also called orientation or indoctrination because the new recruits are taught a particular belief or attitude with the aim that they would only accept that belief or attitude exclusively.

The process of induction includes:

- Familiarising the new employees with the vision, mission, and goals of the organisation and with the functional environment of the organisation
- Providing certain insights into the organisational culture, values and personnel policies, code of conduct, terms and conditions of service, future growth opportunities, grievance handling, disciplinary procedures, and so on

TRAINING AND DEVELOPMENT

Training and development are essential for achieving organisational goals. Training and development always go hand in hand. Training leads to human development, that is, better skills, motivation, and personality development.

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

The role of training in the organisation is governed by the overall purpose of the organisation. In a fast-moving consumer goods company, training will be geared strongly to achieve larger sales than that of competitors. In a high-technology manufacturing company, training will be geared to product quality and innovation. In a hospital, training will be geared to provide a reliable standard of health care.

Need for training The need for training need not be over-emphasised, particularly in the world of fast changing technology, eroding values and work ethics, the increasing work pressures, the degree of complexity in the job, changing conditions of work, discontinuities in the skill levels as a result of foreign technologies, and so on, demand based training programmes and close monitoring of the progress of the trainees.

Assessing training needs Training needs can be assessed in such cases where a gap exists between the actual and standard performance of the job. This can be observed only through periodic appraisal of performance of the workforce at all levels. In addition, the following indicate training needs:

- High turnover among the new recruits

- Increase in wastage of materials
- Increase in the number of rejected units of production
- Increase in the number of customer complaints
- Increase in the accident rate
- Reduced productivity levels
- Increase in machine breakdowns

Training policy Although many organisations provide on-the-job training, it is necessary for the organisation to define its training policy. Most often, the training policy is reflected in a range of policies connected with human resources. The policy statement sets out what the organisation is prepared to do in terms of developing its employees.

Training policy statement

For some organisations, the policy is stated as briefly as follows:

‘The company will provide an opportunity for every employee to get adequately trained in the basic tasks of his or her employment. The company believes that this is one of the prominent ways of maintaining its competitive edge.’

The personnel manager has to formulate training programmes in consultation with the departmental managers as per the needs of the organisation. Organisations such as Titan, Wipro, and others, train their staff for creativity (see Exhibit 14.1). Senior managers are deputed to the training programmes of leading management institutions such as Indian Institutes of Management (IIMs) in Ahmedabad, Bangalore, Kolkata, and Lucknow, Administrative Staff College of India in Hyderabad, National Institute of Training in Industrial Engineering (NITIE) in Mumbai.

Exhibit 14.1 Moulding human resources for creative thought and action: Titan’s way

Titan, the premier watch-making company, has its own design section as the source of knowledge to teach elements of creativity to its executives. With inputs from National Institute of Design, Ahmedabad, Titan conducts training courses and workshops to teach its managers how to apply the creative principles of design to their own work.

Titan applies the strategy of transferring knowledge from a different field to its own business. It trains the designers for innovative work by exposing them to processes and products that share many features with watches—such as cars, jewellery, garments, and sport goods. Titan believes that the methods used in creative pursuits like art, literature, or even scientific research can be applied to solve corporate problems innovatively. The phenomenal success made by Titan so far has been due to its training of human resources for creative thought and action.

Training Methods Training methods are of two types: On-the-job training and off-the-job training.

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

(a) *Job instruction training* This is a method used for such jobs which can be performed with relatively low skill. Here, the trainees systematically acquire skills by following routine instructions in key processes from a qualified instructor. This helps to improve their morale, and thus, reduces the employee turnover also.

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

This technique transplants the corporate managers from real situations to a non-threatening climate where they can participate, commit mistakes, learn in the process, and emerge wiser. The mistakes made in this process do not cost anything to the organisation. To bridge the gap between the reality of the workplace and the classroom environment, trainers symbolically recreate actual working conditions. And the experience that managers derive from operating under these conditions is then linked to the actual work environment. Experiential learning provides the managers a free environment to learn.

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

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

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

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

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

(c) *Seminars* Seminars are held periodically by the professional organisations for the benefit of all the practising managers by taking into consideration the recent advances in a specialised area. Participation in such seminars enables the executives to get exposed to the recent developments in the area of their interest.

- (d) *Team discussions* This technique develops team spirit among the executives from different departments. It also enables them to understand and appreciate each other's problems. It reinforces a feeling of unity among those who work towards common goals.
- (e) *Case study* This is a predominant technique followed even in premier management institutes. This technique helps to provide an understanding of what has gone wrong in a particular case, such as Delhi Cloth Mills (DCM)*. Similarly, what are the factors responsible for the success of organisations such as Reliance or Hindustan Lever. Case study technique is a very good method of learning the principles and concepts. However, this method has one weakness. The circumstances you are likely to face in your life may be totally different from the cases you have analysed earlier! Case studies help to enhance the analytical & decision making skills.
- (f) *Role-playing* The participants are assigned roles and are asked to react to one another as they would do in their managerial jobs. These roles are eventually exchanged. In other words, each participant will get a turn to play all the roles. For instance, the role playing in a grievance handling situation involves two players: In the first step, the worker presents his grievance to the personnel manager. In the second step, the worker plays the role of the personnel manager while the personnel manager plays the role of the worker. Role playing allows participants to understand problems of each other. It enhances the interpersonal-handling skills.
- (g) *Programmed instruction* It is a system of instruction within which pre-established subject matter is broken into small, discrete steps and carefully organised into logical sequence in which it can be learned by the trainee. Each step is built upon the previous one. The programmed instruction techniques can be in the form of programmed tests and manuals, or video displays. For instance, withdrawal of money through automatic teller machines (ATMs) involves responding to programmed instructions; working on a personal computer or internet involves responding to a series of programmed instructions.
- (h) *Simulation exercises* These include interactive exercises in which trainees practice their skills on working models or in mock situations based on real-life situations.
- (i) *Group decision-making* Group decision-making refers to the process of making decisions based on the opinions expressed by all the concerned — may be subordinates, peers, or outside consultants. The manager thus ensures that more people are involved in taking decisions. Each member of the group will accept the responsibility for the decisions made as he is a party to it. This method facilitates to generate more alternative solutions to a given problem because more people are involved in the thinking exercise. This facilitates coordination among the groups also.

The personnel manager is concerned with choosing the right method of training for the right segment of the workforce. The right segment of the workforce may include workers, supervisory staff, junior managers, senior managers, and so on. It is necessary to optimise the benefits of training. However, the personnel manager has the option of consulting the qualified corporate trainers who may offer consultancy services also.

Evaluation of training programmes The real effectiveness of a training programme comes to light only when it is evaluated. Periodical monitoring of the feedback of the participants may focus on whether the objectives of the training are achieved or not. Where the results are not satisfactory, necessary changes in terms of learning methods can be initiated for better results.

*DCM was a leading brand in clothing in earlier times. It was almost a century-old manufacturing organisation which gradually sank due to lack of modernisation and financial bottlenecks.

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

Training and development always go hand in hand. Training leads to human development in terms of better skills, motivation, and strong character and personality. Successful employees prepared for positions of higher responsibility have analytical, interpersonal, conceptual, and specialised skills. Training, by itself, cannot enable an individual to understand cause-and-effect relationships, to synthesise from experience, to visualise relationships, or to think logically. As a result, employee development is considered as an educational process that supplements the training function.

Advantages of training and development programmes By focusing on its training and development needs, an organisation can produce a high standard of goods and services in a cost-effective manner through its well-trained workforce. In other words, the following are the specific benefits that result from training and development:

- Maintaining sufficient and suitable range of skills among the employees
- Developing knowledge and skills in the workforce
- Achieving higher job performance and productivity
- Improving service to customers
- Enhancing job satisfaction to the employees
- Improving prospects for internal promotions, and so on

Most of the corporate houses such as Satyam Computers, Larsen and Toubro, Mahindra and Mahindra, the Taj Group of Hotels, the Eicher group, and others, have been successful in training their workforce to meet the global standards. Such organisations, which envisage the need to integrate training into its operations on a regular basis, recruit a director for training who will report to the personnel manager.

PLACEMENT

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

Promotion/Demotion, Transfer, Separation, and Absenteeism

The personnel manager is to administer promotions/demotions or transfer among the workforce as per the needs of the organisation. He has to handle the cases of separation and absenteeism with care and diligence.

These concepts are explained below:

- (a) *Promotion* Promotion refers to the advancement of an employee to a job with a higher authority and responsibility. It may also carry a better compensation package. Promotion can also be viewed as a means of filling up vacancies in the organisation occurring from time to time. The basis of promotion could be merit or seniority depending upon the nature and level of job. The promotion policy defines the criteria the candidates have to fulfill to become eligible for promotion. Promotion is viewed as a reward for the better services one has rendered in a particular position. As and when the vacancies arise, the qualified staff may get promotion.

- (b) *Demotion* Where an employee is not in a position to perform a given job, he may be demoted or transferred to a position with a lower authority and salary. In other words, demotion is a punishment.
- (c) *Transfer* It is a lateral shift that moves an individual employee from one position to another. It may be in the same department, or to a different department or location. This does not involve any changes in the duties, responsibilities, or skills needed. The salary benefits also may remain the same. To optimise the human resources at different locations or departments, employees are transferred from one location to another. Transfer is also viewed as a tool for punishing the employee in case of misconduct or misbehaviour. The transfer policy sets the guidelines for the personnel manager to use this tool effectively. At times, the requests for transfer from an employee may be accommodated provided this does not affect the interests of the organisation adversely.
- (d) *Separation* Separation refers to termination of employment. In other words, the employee is separated from his job. In cases of misconduct or misbehaviour, or where the employee is not in a position to improve his performance despite notice, his/her employment is terminated. This is also called dismissal. At times, for want of raw material or power supply, the workers may not be provided work. In such a case, the workers are said to be laid-off and they are entitled for wages provided they do not take up work outside. In other words, separation includes dismissal and lay-off.
- (e) *Absenteeism* Absenteeism refers to the practice of an employee who does not report to work for any particular reason. Absenteeism affects the productivity adversely. It becomes difficult for the departments to cope up with the work pressures, if any particular employee is absent. As a measure of control, the employees are not allowed to be absent without prior permission from the management. The terms and conditions of employment specify ‘no work-no pay’, which implies that the employee would not be eligible for the salary for the days he/she does not report for duty. It is the personnel manager’s responsibility to ensure that people do not abstain from duty.

WAGE AND SALARY ADMINISTRATION

Wage and salary administration is the process of fixing wage/salary for different jobs in the organisation through job evaluation (this technique is discussed, in detail, later in this chapter), negotiations with the unions, and so on.

The best HR practices

Why do companies such as General Electric and Microsoft consistently figure among the top organisations? It is because these are among those organisations which are well-known for their best human resources (HR) practices with the most positive effect on shareholder value.

There is a considerable degree of research going on to establish a positive relationship between good HR practices and superior shareholder returns. The following five key links describe most of these best practices.

- (a) *Recruit and manage excellent people* It is not only necessary to recruit excellent people but also necessary to be aware how to manage such an excellent talent. It is because the value to the shareholder gets maximised from the way a company manages its people. One of the best recruitment practices continues to be the campus recruitment on the premier management and technological institutions.

(Contd.)

This gives new recruits an opportunity to know the company, and for the company to know the new recruits. The transition will be smooth and recruits can get into their job from day one.

- (b) *Make rewards and accountability clear* Designing attractive rewards and clear accountability systems is an equally tough but creative task. The assessment process should be continuous with regular feedback system and what is important is that it should be completely transparent. This way a company can ensure that its employees grow from time to time, and it can further mentor and train its employees, as it envisions, supplementing the missing inputs, if any. Employees should be taught well to review the performance of peers and seniors. It works extremely well in small groups, and hence, it is advisable to integrate this practice into the system.
- (c) *Provide congenial and flexible workplace* Providing a congenial and flexible working place where rewards are instantaneous is a challenge in itself. Research reveals that there is a significant relationship between this and increase in market value of the share of the company. The real crux is decentralisation of power and building the employee-commitment to the firm.
- (d) *Take advantage of technology for communications* Gain access to technology for communications. This is one of the easiest ways of enabling every employee at all levels with more information-flow, and reflecting trust and respect among managers and employees at all levels.
- (e) *Use resources prudently* There is a lot of discussion about prudent use of resources than practised. Train people to use resources prudently. Make them look at the links between rewards for success, even in bad times for the company. Be prudent to implement HR practices and execute them well for the desired results. Good financial performance empowers the organisation with large resources and time to invest in programmes related to human resources. It is interesting to note that good HR practices pay back richly to the organisations in terms of employee loyalty and commitment.

The list of companies practising these is on the rise. The list includes Infosys, Oracle, General Engineering, Microsoft, Asian Paints, Electrolux, La Farge, Goldman Sachs, Citibank, Bacardi, and others.

Where wage is paid on the basis of the time spent in the organisation it is called *time wage system*. This method is followed in all such cases where the services of the employees cannot be valued or quantified exactly. In the production or sales department, the production or sales staff can be paid based on the units produced or sold. This method is called *piece wage system*.

The salary constitutes the basic salary, dearness allowance*, house rent allowance, and other allowances. Depending upon the nature of organisation, there are different types of employee benefits. Some of the benefits include profit sharing, bonus, leave travel concessions, medical reimbursement (subject to a limit), provident fund, gratuity, group insurance schemes, pension, accident compensation, leave with pay, educational allowance, and so on. The wage/salary and the related benefits constitute compensation package.

*Dearness allowance is paid to meet the rise in prices.

The objectives of the compensation policy should be clearly defined. The compensation levels should be fixed in a rational and objective manner. It should be adequate enough for the employee to meet his basic needs and security needs. The security needs here mean protection during old age or after retirement, and so forth. There should be incentives for rewarding better work. The wages/salaries have to be disbursed on time and should be acceptable to the employees also. To ensure this, most of the organisations enter into wage agreements with their employee unions. The employee unions also negotiate for increments, additional service benefits, perquisites, and so on, at the time when the wage revision is due. It is through the personnel manager that the top management and the employees interact with each other.

Fair compensation package The personnel manager is responsible for evolving a flexible and rational compensation package, which satisfies the interests of both the management and the employees. The compensation package is said to be fair when it can

- attract new applicants for different positions in the organisation
- retain the existing staff
- reward good performance
- satisfy the employees

Wage differentials It is common to find different wages in different industries or different states for the same job or position. The magnitude of difference in wages is called ‘wage differential’. Wage differentials could result because of variations in employee characteristics such as productivity level, inter-occupational differences or inter-industry differences. The personnel manager has to be aware of these factors affecting such wage differentials.

A balanced compensation package The personnel manager has to ensure that the compensation package is a balanced one. It is said to be a balanced one when it is unbiased, employee-welfare oriented and fully rewarding the efforts of the employee.

If the compensation package is not a balanced one, it may very frequently lead to conflicts in the organisation. Employees, if paid arbitrarily, feel disappointed that they are not treated equal. This will be the starting point to disturb the harmonious employee relations and lose cohesiveness in the groups and departments, which will, ultimately, lead to the collapse of the organisation.

How the knowledge-based companies pay their staff

Some of the knowledge-based companies pay not on the basis of the worth of the services of the employee but on the basis of the employee potential. In most of the organisations it is viewed that offering shares (of course, by imposing a lock-in-period) in the company to the employees kindles ownership values and helps to retain people. Some of the progressive companies link incentives to team appraisal. The idea is to create a homogeneous work group and yet foster a competitive environment in which every one is performance-driven, both as an individual and as a team member.

Wage negotiations and agreements The personnel department administers the wage agreements between the management and the unions. As a part of administration, the scales of pay for different levels of jobs, associated perquisites, financial and non-financial incentives have to be worked out in detail.

The compensation policy has to be formulated considering the fair wages. Wages are said to be fair if they are equal to the rate prevailing in the industry for similar work. ‘Equal pay for equal work’ is one of the guidelines the personnel manager should keep in mind to rationalise the wage structure of different positions across different departments. There are minimum wages fixed by the Government of India for certain positions and it is the statutory liability for the personnel manager to administer these minimum wages where Minimum Wages Act is applicable.

Factors affecting compensation policy The following are the significant factors that affect the compensation policy:

- The firms’ ability to pay
- Cost of living
- Remuneration in the comparative industries
- Degree of productivity
- Union pressures
- Government Legislation such as Minimum Wages Act,
Payment of Wages Act, and so on.

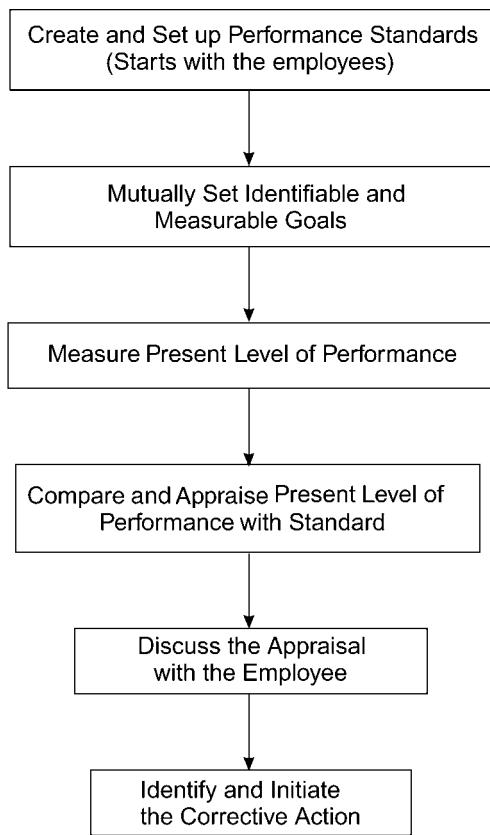
Transparency in the compensation policy is to be established to win the confidence of the employee and employer. The management should make its policies and procedures underlying wage and salary administration clear or transparent. The wage or salary structure should be well defined and communicated to all the concerned employees to avoid confusion. Also, it is necessary that the personnel manager collects data about the various factors affecting the compensation to support his/her arguments at the time of wage revisions or negotiations with the unions.

PERFORMANCE APPRAISAL

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

Why appraise the performance There are several reasons for carrying out performance appraisal. They are:

- (a) To assess the employee’s present level of performance
- (b) To identify the strengths or weaknesses of individual employee
- (c) To provide feedback to the employee so that he can improve his/her performance
- (d) To provide an objective basis for rewarding the employees for their performance
- (e) To motivate those employees who perform
- (f) To check and punish those employees who fail to perform
- (g) To identify the gaps in performance, and thus, assess training and development needs
- (h) To identify the employee’s potential to perform
- (i) To provide a database for evolving succession strategies
- (j) To provide a basis for many other decisions such as fixation of incentives or increment, regularisation or confirmation of the services of the employee, promotion, transfer or demotion.

**FIGURE 14.1** Steps in performance appraisal

How is the performance appraised Figure 14.1 outlines the following stages in the process of performance appraisal:

- Creating and setting up performance standards* This should be done for every employee at each level in every department, in accordance with the organisational goals. These standards should be clear and objective, capable of being understood and measured.
- Setting mutually the identifiable and measurable goals* Communicate with the employees to discuss with them how best the goals can be set in an identifiable and measurable manner. Seek information about their expectations regarding the performance standards.
- Measuring present level of performance* The present level of performance is assessed by collecting information relating to it from managers and personal observation by oral or written reports.
- Comparing and appraising the present level of performance* The focus here is to note the deviations in the actual performance from the set standards.
- Discussing the appraisal with the employee* To ensure that the appraisal is transparent and free from bias or subjectivity, discuss with the concerned employee. The employee may raise his/her objections in case the appraisal is far from reality. Free exchange of such information reduces not only the scope for subjectivity errors in the process of appraisal but also may strengthen the morale and self-esteem

of the employees. When the appraisal is discussed with the employees, it is likely that the employee may take it positively or negatively. Particularly, where the appraisal is negative, the employee is to be handled with a lot of care so that he does not get disillusioned.

- (f) *Identify and initiate the corrective action where necessary* Suitable corrective action may be identified and initiated immediately. At times, this may yield only temporary results. Immediate corrective action is often described as ‘putting out fire’. Most often, this may not be the solution. It is necessary to identify the source of deviation and try to adjust the difference permanently. This calls for corrective action for permanent results. Though it may be difficult or time-consuming to go to the source of deviation, it saves time and resources tomorrow when the problem may get bigger.

Basis of performance appraisal The principal basis of performance appraisal is to check how far the performance of the employee has contributed to the attainment of the organisational goals. The parameters to evaluate the performance widely differ from job to job. However, the common measures of performance appraisal include

- volume of sales
- total revenue generated
- return on investment
- volume of production
- quality standards achieved
- operating costs
- time saved
- number of customer complaints processed or pending
- timely completion of the projects
- number of projects or orders completed or secured
- debt recoveries
- loan advances
- deposits mobilised
- number and quality of training programmes conducted
- customer satisfaction level

Instruments of performance appraisal The performance of the employees is evaluated by using checklists or questionnaires. A typical questionnaire is outlined in Figure 14.2.

Who will appraise The performance of the employees is appraised or evaluated by any of the following:

Supervisors The immediate supervisor is the right person to evaluate the performance of the employee. It is because the supervisor monitors the progress of the employee on a day-to-day basis.

Peers Peers are those who are more knowledgeable about the job or work. They will tell whether the performance of the employee is satisfactory or not by observing his year-long accomplishments or activities.

Subordinates The subordinates assess the performance of the manager and this is not very common in our country, at least.

Managers by themselves This is called self-appraisal. The manager is encouraged to assess his own performance and forward his report to the management for necessary action.

Performance Factor	Performance Rating			
	Excellent	Good	Satisfactory	Poor
(a) Quality of work in terms of <ul style="list-style-type: none"> ■ accuracy ■ skill ■ completeness of work 				
(b) Volume of work done per day				
(c) Job knowledge				
(d) Dependability (ability to follow directions and company policies without supervision)				

FIGURE 14.2 A questionnaire for rating the performance of an employee

Users of services Most of the times, the customers of the services are the real judges of the performance of the department. The personnel in the service department can be assessed based on the customer satisfaction surveys.

Consultants More often, an outside consultant is engaged for appraising the performance of the employees at different levels. This method is preferred to overcome the problem of bias or subjectivity in the process of appraisal.

The success of performance appraisal richly depends on how best it is carried out in an unbiased manner. Performance appraisal is a tool to diagnose the deficiencies of the employees' skills and knowledge, and also, to determine their training and development needs.

Normally, the results of performance appraisal are treated as confidential. For good results, it is advisable to share the results of the performance appraisal with the concerned employee. Progressive organisations give an opportunity to the employee to justify his/her actions before any decision is taken unilaterally. Also in this process, the difficulties faced by the employee in the course of achieving the targets can be identified and discussed.

The personnel manager is responsible for the periodical appraisals of the performance of the employees. He should be familiar with the problems associated with performance appraisal. The real purpose of performance appraisal is not to punish but to develop the employee.

Motivational Climate

The performance of an individual employee is the function of his/her ability to do the job and his/her willingness to do it. It is the motivational climate in the organisation that creates this willingness among the employees. The personnel manager is directly responsible for creating a proper motivational climate, in which the management guides the development and growth of people at all levels by training, counselling, delegation, and communication.

Motivational climate, in most of the organisations, is a way of life. It is characterised by the way

- (a) the affairs are managed
- (b) people are recognised and treated
- (c) people are empowered with the appropriate authority
- (d) ideas, initiative, and enterprise are encouraged

- (e) opportunity is provided to experiment and test the new concepts, tools, and techniques for projection of a company's goals, policies, and philosophy.

Organisational climate and organisational culture The organisational climate is said to be favourable when plans are drawn in consultation with the people concerned and communicated to them for necessary administration and functioning. Organisation culture refers to the norms and standards that pervade in the organisation. Organisational culture influences the behaviour of individual employees at work. In other words, organisational culture affects both the individual and the organisational performance. Not passive, not reactive, but proactive organisational culture has to be evolved for sustained growth and development. Proactive organisational culture is the outcome of the sustained efforts of far-sighted, progressive, and professional chief executives. This creates a competitive climate through recognition of work. People tend to be more productive in such type of organisational climate.

The personnel manager should consider creating a climate for interdependent work, which develops team spirit and team building among the employees. Where required, the employees need to be motivated individually through personal guidance and counselling. It is necessary to create a climate of direct approach and problem solving rather than avoidance. The results can be better if a competitive climate is created through recognition of good work. It should be ensured that the employee's energies are not spent off totally in meeting only their basic needs.

Financial and non-financial incentives The personnel manager has to formulate rewards or incentives, which adequately satisfy the employees. These rewards can be of two types: Financial incentives and non-financial incentives.

Financial incentives include the following:

- (a) *Compensation based on performance* Where the performance exceeds the given standards, the employee is paid better in terms of piece rate, sharing profits, or bonus. This is different from the traditional compensation plan, which does not reflect the additional incentive for better performance.
In case of compensation programmes based on performance, the incentives the individual employee receives from time to time reflect some performance measures such as individual productivity, team or group productivity, or overall organisation profit for a given period. As there is a strong relationship between the effort and the rewards, employees tend to perform better if incentives are better designed.
- (b) *Compensation based on competency* Under this method, the pay and rewards are designed based on the competency of the employees. Competency is judged based on one's leadership skills, troubleshooting strategies. Pay levels may vary in tune with the degree of competency. In other words, an employee's rewards are determined by one's capability to contribute to the organisational goals and objectives.
- (c) *Stock options* Employees are given shares in the company in which they work. The potential growth in the market price of the share is the incentive to keep working in the company. There could be a restriction that the employees cannot sell the shares for a given period. This practice is perceived to develop, among the employees, a sense of loyalty to their organisations.
- (d) *Rewards* Rewards are individual incentives intended to reward individual performance. These include merit pay, time saving bonus, and commission.
- (e) *Group bonus* Where the employee's tasks are interdependent and thus require cooperation, group incentives such as group bonus make a lot of difference.

Non-financial incentives refer to the incentives related to the job. These include:

- (a) *Consultation* Today, most of the successful companies are those which invite participation from their employees on strategic issues such as working environment, introduction of changes, and so on. When the management consults the employees for their opinions, the employees feel motivated. This enhances their morale also. The consultation may take any of the following forms: inviting the employees for workshops, joint committee consisting of representatives of employers and employees, suggestion schemes, and others. The employees are encouraged to suggest on issues relating to productivity or cost-saving. Those who offer practical suggestions are recognised and the best suggestions are even rewarded.
- (b) *Teamwork* Here, the workforce is organised into small groups or teams who work together. A line manager may have one or more such groups and brief them regularly. There is a spirit of competition among the groups. Each group tries to outperform the other. In the process, the employees feel highly motivated and thereby develop a sense of belonging and loyalty to the organisation. Such an environment in the organisation is likely to enhance the overall performance level.
- (c) *Quality circles* Quality circle is a body of employees who meet from time to time under the guidance of a supervisor to discuss ways and means to improve the quality of the products and services of the organisation.
- (d) *Job security* When the employee is assured of the security of his job, he feels safer and this provides him adequate incentive to perform better.
- (e) *Job enrichment* Here, the employees are given greater scope in deciding how the tasks should be performed. In other words, they are allowed to assume increased responsibility for planning and self-evaluation.
- (f) *Job rotation* Doing the same job for years together may create boredom for the employee. To overcome this problem, the employee is given a different job, may be in the same department or a different one, after a particular period of time. This enables the employees to diversify their activities and develop multiple skills.
- (g) *Flexitime* Flexitime is a method of organising the working hours for the employees in such a way so as to provide greater flexibility in choosing their own working hours. It enables the employees to choose working hours of their choice within agreed parameters and provided they are present during a 'core' time (usually between 1000 hrs – 2100 hrs). With the growing Internet and PC culture, the place of work is getting shifted from offices to personal computers. Most of the knowledge-based organisations insist on results, not on the physical presence of the employees during office hours.

GRIEVANCE HANDLING

A complaint from an employee, when ignored, takes the form of a grievance. Grievance is a complaint, genuine or otherwise, about any issue relating to the job such as about supervisor, wages, working conditions, and so on. It is necessary to create an in-built mechanism to redress the grievances, at the earliest, at the departmental level. If the individual grievances are ignored, they may take the form of industrial disputes. The procedures of handling industrial disputes are clearly laid down in the Industrial Disputes Act, 1947.

Since employees with grievances cannot contribute their best to the organisation, grievances must be handled, at the earliest, firmly and with care. The grievance handling is the first step to initiate better industrial relations. Hence, the personnel manager has to own responsibility to handle the grievances effectively.

The following are the steps in setting up a grievance redressal machinery:

- *Conference among the aggrieved employee, supervisor, and union representative, if any* This is intended to identify the source of the problem and settle the problem once and for all, if possible. If the grievance is about the issue within the control of the supervisor, it is normally settled at this level itself. In case the grievance is not settled, it is referred to the conference with the middle management and middle union leadership.
- *Conference with middle management and middle union leadership* This is the second stage of grievance redressal. The middle management gets pressure from the unions to redress the grievance. If the grievance is related to any of the issues within the control of the middle management and the grievance can be redressed without any damage to the organisational interests, necessary changes are initiated in the policies or procedures. Where the grievance is not settled at this level also, it is referred to the conference between the top management and the top union leadership.
- *Conference among the top management and the top union leadership* Here, the top management and the top union leadership explore the possibility for redressal of the grievance. Considering the interests of the organisation, the top management takes an appropriate decision to redress the grievance. Where the grievance still continues, the last alternative is to refer the grievance to arbitration.
- *Arbitration* is usually handled either by a single person or by a panel of three persons: the first one representing the union, the second one representing the management, and the third one is an impartial person. Whatever decision the arbitrator or arbitration committee takes, it is binding on both the parties: the employer and the employee.

Steps in Handling a Grievance The following are the steps involved in handling a grievance:

- (a) *Receiving the complaint, in writing, from the aggrieved employee* This constitutes the documentary evidence for the dissatisfaction of the employee. The complaint should be complete in all aspects. This forms the basis for further investigation.
- (b) *Defining the nature of dissatisfaction* Identify the source of dissatisfaction and its nature. The dissatisfaction may arise due to disproportionate wages, poor working conditions, strained interpersonal relations among employees in the shop floor, and so on.
- (c) *Getting the facts* Collect all the related information about the complaint by enquiring from all the concerned parties.
- (d) *Analysing and deciding* Considering the policies and procedures, analyse the problem and decide what is the best course of action to be taken to redress the grievance. The nature of disciplinary measures, if any, should be clearly spelt out.
- (e) *Reply answer to the complainant* Inform the decision taken to the complainant within a given time frame.
- (f) *Following up* Verify whether the disciplinary measures pointed out were implemented or not. What is very important is to verify whether the grievance is redressed or not.

Disciplinary action In case it is decided that the guilty has to be punished, in the process of grievance redressal, the punishment may take any of the following forms:

- Oral or written warning to the concerned
- Loss of privileges
- Deferring annual increment
- Lay-off, demotion or discharge from the service

Establishing an environment of trust and confidence, in the course of grievance redressal, is the primary responsibility of the personnel manager.

WELFARE ASPECTS

The personnel manager is responsible for implementing the legal provisions under the Factories Act, which deals with the safety, welfare, and health of the industrial workers. There are legal enactments to govern payment of bonus, minimum wages, compensation, administration of various benefits such as sickness benefit, and so on. In relation to these issues, it is the primary job of the personnel manager to ensure the legal compliance of the provisions of the following enactments:

- The Payment of Wages Act, 1936
- The Minimum Wages Act, 1948
- The Workmen's Compensation Act, 1923
- The Employee State Insurance Act, 1948
- The Employee Provident Fund Act, 1952

To sum up, the personnel manager is the direct link between the labour and the management in an organisation. The position of the personnel manager is very sensitive and critical in view of the fact that, if things go wrong, both the labour and the management point their fingers at the personnel manager. So, in the interest of the organisation, the personnel manager has to operate in a professional way. One must be alert, particularly, to the wrong signals, if any, from the management or the employees, and act in an unbiased and mature manner considering the long-term interests of both the parties. It is always advantageous to have defined personnel policies to prepare the organisation to move in the progressive direction.

JOB EVALUATION

Job evaluation is the technique of assessing systematically the relative worth (in monetary terms) of each job. It provides valuable insights into certain questions such as why the chief executive is paid the highest, why the production supervisor in the shop floor is paid lesser, and so on.

A fundamental prerequisite to the establishment of a compensation policy is the determination of the comparative values of jobs throughout the hierarchy. These values form the basis to build the pay and the benefits package. Once the range of job values is available, they can be compared with those of other companies in the same or different industries in order to establish the prevailing market rates. The procedures used must be easy to understand and administer, and the employees must perceive the system as fair.

Aims of Job Evaluation

The aims of job evaluation are:

1. To provide a basis for ranking jobs to grade and group them under a salary scale
2. To ensure that job values are assessed on an objective basis, from an analytical study of the job content, to the extent possible
3. To provide a database to facilitate the review and update of job values

This is a very important technique for it provides the information that can be used by the personnel manager for wage and salary administration purpose. Job evaluation produces a rank order of jobs, based on a rational

and reasonably objective assessment of a number of key factors taken from a representative cross section of all the jobs in a particular job hierarchy.

Advantages of Job Evaluation

1. It provides a rational basis for discussions with the trade unions at the time of wage negotiations.
2. It provides a justification for allocating pay differentials between groups. This adequately compensates in financial terms, and thus, keeps the people who take up creative and innovative roles adequately motivated.
3. It eliminates, to a large extent, grievances about remuneration.
4. It provides data based on which an incentive scheme can be formulated.
5. It provides benchmarks for comparing the complexities.
6. It facilitates career planning.
7. It streamlines responsibility levels.
8. It helps flatten organisational levels.
9. It ensures the hiring of the right people.

Methods of Job Evaluation

The methods of job evaluation can broadly be classified as (a) Non-analytical methods and (b) Analytical methods.

Non-analytical methods These methods are traditional and simple. They consider all the jobs available, compare them, and then rank them. In complex organisations, they cannot be used. They can be used in such cases where the jobs are distinctly different and not similar. Non-analytical methods of job evaluation are: (a) Ranking method and (b) Job classification method.

Ranking method Under this method, the jobs in the organisation are arranged either in the ascending or descending order and numbered serially. The basis of such arrangement could be the job description in terms of duties, responsibilities, qualifications needed, relative difficulty involved in doing the job, or value to the company. The job, which carries the highest value to the company, is paid the most, and vice versa. Similarly, the job that carries critical duties and responsibilities carries a relatively higher worth.

Evaluation Conceptually, this is easy to understand and implement, particularly for a smaller organisation. However, it fails to indicate the degree of difference between each grade. Subjectivity cannot be ruled out in the process of ranking. In other words, value is placed on the people doing those jobs rather than on the job itself. However, this method cannot be used in larger organisations.

Job classification method This is also called job-grading method. Here, the number of grades and the salary particulars for each grade are worked out first. The grades are clearly described in terms of knowledge, skill, and so on. Then the jobs in the organisation are allocated to these grades as per the job description and grades identified.

Evaluation This is relatively simple to understand and easy to carry out. It is totally based on the number of grades and salary particulars for each grade worked out first. It may not be possible to make clear distinctions between jobs. In a complex organisation with a wide variety of specialist roles, it is very difficult to implement this method.

Analytical methods Under these methods, the jobs are broken down into different tasks. Different factors such as skill, responsibility, education level, and so on, are assessed for each job. The comparison of factor by factor, sometimes, allocating points or monetary sums for each factor is made for meaningful interpretation.

There are two types of analytical methods: (a) Factor comparison method and (b) Points rating method.

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

- Mental requirements (education, alertness, judgment, initiative, creativity, ingenuity, versatility)
- Skill requirements (use of equipment and materials, dexterity, precision)
- Physical requirements (strength, endurance)
- Responsibility (for the safety of others; for equipment, materials, processes; cost of error; extent of supervision exercised)
- Working conditions (work pressure, accident hazard, environment)

The factor comparison method consists of six well-defined steps:

- (i) Identify the key jobs
- (ii) Rank the key job, factor by factor
- (iii) Apportion the salary among each factor and rank the key jobs
- (iv) Compare factor ranking of each job with its monetary ranking
- (v) Develop a monetary comparison scale
- (vi) Evaluate non-key jobs based on the monetary comparison scale

The principal of a college is paid a higher salary than the lecturer in view of several factors, one of which is higher responsibility. Considering other factors also, weightage (in terms of money) is given to each factor and the total weight and the monetary value is taken. This provides a basis for arranging the jobs in relation to their relative worth.

Evaluation It provides a better basis for assessing the relative worth of each job when compared to the non-analytical methods. The list of factors is not a standard one. It can be changed as per the specific needs of the organisation. Non-key jobs are evaluated on the basis of monetary comparison scale.

It is difficult to comprehend, and hence, may be difficult to explain to the employees. Periodic adjustment of salary rates may lead to the development of inequities in the organisation's salary structure. Inequities in salary rates of key jobs will further affect the non-key jobs in terms of their evaluated worth. The list of requirements is very critical. Any lapse in identifying any of the factors or its weightage appropriately may affect very badly the validity of the entire exercise.

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

Skill:

- (i) Education and job knowledge
- (ii) Experience and training

- (iii) Initiative and ingenuity
- (iv) Physical dexterity (skills)

Effort:

- (v) Physical effort
- (vi) Mental and/or visual effort

Responsibility (for):

- (vii) Tools and equipment
- (viii) Materials or products
- (ix) Safety of staff
- (x) Others' work

Job Conditions:

- (xi) Working conditions
- (xii) Unavoidable hazards
- (xiii) Immediate surroundings

In the above list, skill is a factor and it has four sub-factors. Like this, each of these factors is further subdivided into sub-factors. Depending upon the complexity involved, each sub-factor is assigned a degree and points. The following table explains how the sub-factor ‘responsibility for equipment or tools’ is divided into degrees and each degree is assigned points.

Responsibility for Equipment or Tools

<i>Degree</i>	<i>Amount of Responsibility</i>	<i>Points</i>
1	The equipment is less likely to get damaged due to use. Hence, the equipment does not require special care.	6
2	The equipment requires some care in recognising trouble and shutting down to prevent or minimise danger. Equipment is likely to get damaged if care is not taken.	10
3	Equipment running on power needs moderate care to prevent damage.	20
4	Equipment is very expensive, and hence, is to be operated very carefully considering the rapidly changing conditions.	30

Once a factor is evaluated in accordance with its degree and points, the points attained for each factor are added up to obtain a score for the job. Based on this score, the jobs are ranked from the lowest to the highest or the other way. If two jobs obtain equal score, that indicates that both jobs are equal in every respect, and hence, should be given equal wages also. The number of jobs may cluster around certain groups of scores. This can simplify the process of allocating wage grades.

Evaluation It is difficult to develop factors, sub-factors, degrees, and points. Working out a point scale and selecting degrees are not simple jobs. They are complex in nature, and hence, involve a lot of time and skill. Allocation of points among sub-factors may appear to be arbitrary than realistic and scientific.

Point rating method: industry applications

Point rating is widely applied in the industry. A variation of the usual points method is the widely used Hay method—developed by Edward Hay, the founder of the Philadelphia (US)-based Hay Group which is one of the world's largest management consultancy firms. This method is more judgemental than scientific. However, it is more consensus-based. A group of evaluators measure the relative complexity of every job in the organisation.

The points are awarded on the basis of three criteria: the job knowledge, the problem solving skills, and the accountability levels that relate to a job. Each job has a certain degree of complexity or size, which can be measured by a standardised and transparent evaluation technique, expressed in terms of a score. The final score is then a linear measure of the job's complexity. So a job with a score of 1,200 Hay points is half as complex as one with a score of 2,400 Hay points.

In advanced countries like the United States, it is not unusual for an employer to ask a prospective employee for his last job's Hay points in order to place the candidate better.

The number of companies (such as Ballarpur Industries) using this system in India is also increasing year by year. The benefits realised were both general such as 'bringing order from chaos' as well as specific such as:

- to identify the positions not contributing value to the bottom line
- to flatten the organisations by streamlining the organisational hierarchies, and so on.

However, this is more rational because factors, sub-factors, degrees, and points are identified in an objective manner. In other words, it is less subjective. It provides consistent results. It is standardised to such an extent that it offers no scope for manipulations. Salary increases do not affect the basic system of grouping. The system is flexible to cater to the varying requirements of the organisations.

MERIT RATING

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

It is distinctly different from job evaluation. In job evaluation, the jobs are evaluated, not the doers of the job. In merit rating, the person doing the job is evaluated based on his or her performance.

Objectives of Merit Rating

Merit rating provides the management certain valuable inputs which can be used for the following:

- (a) To determine salary increments
- (b) To decide who has to be transferred, promoted, or demoted
- (c) To enhance employee morale, and thus, stimulate positive thinking among employees about the work and the organisation
- (d) To discover the workers' needs for retraining and advanced training

- (e) To unfold the exceptional skills among the employees, based on their innate potentials
- (f) To guide and monitor the performance of those who are lagging behind

Merit rating is a systematic evaluation of the personality and performance of each employee by his/her supervisor or some other qualified persons. A positive evaluation indicates that the employee has reached the standards of performance. On the other hand, a negative evaluation shows that the employee could not reach the minimum standards of performance. In such cases, it is necessary to probe into the minute details of employee performance to identify the real bottlenecks. This data provides valuable insight into the areas where the employee requires further training or orientation to do the job better. While evaluating the merit of an employee, the following traits of the employee are closely observed and analysed:

- Ability to carry out the instructions to do the job assigned
- Knowledge of every detail of the job
- Ability to solve problems on the job
- Special qualities such as creativity, quality of interaction, and so on
- Supervisory capabilities
- Ability to adapt or manage crisis
- Ability to work in a team
- Capability to work against hard targets

The list is, however, not a standard one. The list of such traits can be flexible considering the requirements of the organisations. The purpose for which the employee is evaluated is, more often, the better guide to suggest the parameters of evaluation.

Methods of Merit Rating

There are different methods of assessing the performance of the person on the job. While most of them are based on supervisor's remarks, some of them are based on self-evaluation. In other words, particularly at higher executive positions, the employee is given an opportunity to evaluate his own performance against his own preset objectives. Such reports are evaluated based on the merits of each case. The following are the different methods of merit rating:

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

Paired comparison method Here, every employee is compared with all others in a particular cadre in the department. By comparing each pair of employees, the rater can decide which of the employees is more valuable to the organisation. This method is more useful for an overall comparison of employees and if the number of employees is reasonable.

Rating scale Here, the factors dealing with the quantity and quality of work are listed and rated. A numeric value may be assigned to each factor and the factors could be weighed in the order of their relative importance. All the variables are measured against a three or five point scale. For instance, if a variable such as skill on the job is evaluated, a three point scale could be:

Traits	Good	Fair	Poor
Skill on the job	3	2	1
Punctuality	3	2	1
Cooperation	3	2	1
Care towards the equipment and tools	3	2	1

Similarly, a five-point scale could be excellent, good, satisfactory, average, and poor in which case the weightage could be 5, 4, 3, 2, and 1, respectively. Several traits or attributes such as punctuality, efficiency, cooperation, initiative, accuracy, and others are evaluated on such a scale. The indication is recorded by marking the concerned number representing the degree to which the individual satisfies the standard. The numbers also serve as weights, which can be added to judge the relative merit of each employee.

The rating scale is a widely used method of evaluating performance because it is economical to develop and easily understood by the worker and the evaluator. A major weakness is that each evaluator is apt to interpret the factors such as skill on the job and the degrees describing that factor are marked off along the scale (such as good, fair, poor). This method is simple to administer but cannot sharply differentiate the employees.

Forced distribution method Here, employees are given a set of alternatives and they have to choose one, which reflects their understanding of the true nature of the job. Their thinking is conditioned by the given set of answers. In other words, employees are forced to select one, from the given set of answers, which they think correct. Based on their answers, their judgement skills, analytical, and reasoning skills are assessed. The answers given may be very close to each other and to select the right answer, the candidate has to understand the job in its true perspective and in its entirety. The main parameters tested here are the employee's performance on the job and scope for promotion.

Narrative or essay method Here, the candidate is required to narrate in an essay format his/her strengths, weaknesses, and potential to perform. Here, the candidate is not restricted by any given set of alternatives. The candidate is free to decide what to furnish or what not to furnish. The advantage with this method is that the evaluator is also not bound by any constraints such as scaling, and others. This method is often used in evaluating employees, mostly in the service organisations. All the eligible candidates may be asked to enclose in their application for promotion, a page write-up on 'why they should be promoted'. The one who presents his arguments in a logical and justifiable manner is likely to emerge victorious. One difficulty with this method is the comparison. Since the candidates are likely to cover different aspects of performance and personal traits, it is difficult to compare the relative merit of each employee.

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

To sum up, merit rating is a crucial function which has to be carried out dispassionately and objectively. If it is not done in a professional way, this could be the source of complaints and tensions. Further, it should not be viewed as an annual ritual. Merit rating is a continuous phenomenon. Progressive organisations create an in-built system to enable their employees to constantly monitor their own performance periodically.

SUMMARY

- ◆ Recruitment is the process of attracting application for a particular position in the organisation.
- ◆ Selection is the process of selecting the right person for the right job. There could be several stages in the selection process such as initial screening, written test, group discussion followed by an interview. The stages in the selection process may differ from organisation to organisation.
- ◆ Induction refers to familiarising the new employee with the functional environment of the organisation.
- ◆ Training leads to human development. It is necessary that an organisation identifies its needs and evolves a suitable training policy.
- ◆ Training may be given on the job or off the job.
- ◆ On-the-job training methods include: job instruction training, experiential learning, demonstration, and apprentice training.
- ◆ Off-the-job training methods include: lecture method, conferences, seminars, team discussions, case studies, role playing, programmed instructions, simulation exercises, group decision-making and so on.
- ◆ An employee is said to be promoted to a higher post, if the post carries additional authority, responsibility, and a higher compensation package.
- ◆ An employee is said to be transferred if he is shifted from one position to another, may be in the same department or location. There may not be any change in the compensation package or in duties.
- ◆ Separation refers to termination of employment.
- ◆ Wage differential refers to the difference between wages in different industries or different states for the same job or position.
- ◆ Performance appraisal is the process of measuring and evaluating the accomplishments and individual behaviour of an employee on the job front for a given period. It should be carried out in an unbiased manner. It is a powerful tool to make or mar an organisation.
- ◆ Motivational climate brings forth the best performance from the employees.
- ◆ Financial incentives include pay for performance, competency-based compensation, employee's share ownership, individual incentives, group incentives, and other fringe benefits such as free furnished housing, car, and other perquisites.
- ◆ Non financial incentives include: consulting the employees, team working, quality circles, job security, job enrichment, job rotation, flexitime.
- ◆ Grievance handling procedures have to be established in the organisations.
- ◆ Job evaluation is the technique of assessing the relative worth of a given job.
- ◆ The methods of job evaluation include ranking method, job classification method, factor comparison method and point-rating method.
- ◆ Merit rating is the process of evaluating the relative merit of the person on a given job. The methods of merit rating include: ranking the employees on merit, paired comparison method, rating scale and forced distribution method, narrative or essay method, or management by objectives.

REVIEW QUESTIONS**Question I: Multiple Choice Questions**

1. Which of the following is a positive function of HR?
 - (a) Selection
 - (b) Recruitment
 - (c) Training and Development
 - (d) Performance Appraisal
2. The function of introducing the company to the employee before he reports for the duty is called
 - (a) Training
 - (b) Induction
 - (c) Recruitment
 - (d) MBO
3. Which of the following relates to 'on-the-job training'?
 - (a) Demonstration
 - (b) Conferences
 - (c) Seminars
 - (d) Case study
4. The stage at which the new recruit is allowed to exercise full authority and is held responsible for the results is called
 - (a) Induction
 - (b) Selection
 - (c) Placement
 - (d) Recruitment
5. Which of the following is a financial incentive?
 - (a) Stock Options
 - (b) Job Security
 - (c) Flexi-time
 - (d) Job Rotation
6. Which of the following is a non-financial incentive?
 - (a) Stock Options
 - (b) Performance Linked Pay
 - (c) Flexi-time
 - (d) Group Bonus
7. Which of the following is an example for the analytical methods of job evaluation?
 - (a) Ranking Method
 - (b) MBO
 - (c) Factor Comparison Method
 - (d) Point Rating Method
8. Which of the following is an example for off-the-job training?
 - (a) Lecture Method
 - (b) Experiential Learning
 - (c) Demonstration
 - (d) Apprentice Training

9. In which of the following methods is the employee asked to choose an alternative?
 - (a) ranking method
 - (b) forced distribution method
 - (c) narrative essay method
 - (d) MBO
10. In which of the countries given below has the Hay method been introduced?
 - (a) India
 - (b) USA
 - (c) UK
 - (d) Australia

Question II: Fill in the Blanks

1. The type of person required to be selected for a given job is outlined by
2. The process of familiarising the new employee with the vision, mission, and goals of the organisation is called
3. The process of evaluating the worth of a person based on his/her past performance is called
4. The results of could be used as a basis for salary fixation or promotion.
5. is the outcome of the sustained efforts of far-sighted, progressive, and professional chief executives.
6. The technique of assessing systematically the relative worth of each job is called
7. Point-rating method of job evaluation breaks the job down into factors, sub-factors,, and points.
8. The process of evaluating the relative merit of the persons on a given job is called
9. The technique, wherein short-term objectives as agreed upon by the management and the employees are used as the basis for evaluation of the employee performance, is called

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Explain the need for training in organisations.
2. Identify the techniques of training under off-the-job training methods.
3. What is the link between job evaluation, and wage and salary administration?
4. What do you understand by grievance handling?
5. Explain any four advantages of job evaluation.
6. What are the traits observed in the process of merit rating?
7. What do you understand by ‘management by objectives’?
8. What are the deficiencies in student merit rating practices, if any, prevalent in engineering colleges? Name at least four.
9. Explain the concepts of
 - (a) Promotion
 - (b) Transfer
 - (c) Absenteeism

Question IV: Essay Type Questions

1. Discuss the functions of Human resource/personnel manager in an industrial setting.
2. What is the difference between job evaluation and merit rating?
Explain and evaluate the analytical methods of job evaluation.
3. Define merit rating. Explain and evaluate any four methods (including the method of management by objectives) of merit rating.

Answers to Question I

- | | | | | |
|------|------|------|------|-------|
| 1. b | 2. b | 3. a | 4. c | 5. a |
| 6. c | 7. a | 8. a | 9. b | 10. b |

Answers to Question II

- | | |
|---|-------------------------------------|
| 1. <i>job specification.</i> | 6. <i>job evaluation.</i> |
| 2. <i>induction/orientation/indoctrination.</i> | 7. <i>degrees</i> |
| 3. <i>performance appraisal.</i> | 8. <i>merit rating.</i> |
| 4. <i>performance appraisal</i> | 9. <i>management by objectives.</i> |
| 5. <i>Proactive organisational culture</i> | |

UNIT VI

Chapter 15: Project Management—I: Programme Evaluation and Review Technique (PERT) and Critical Path Method (CPM)

Chapter 16: Project Management—II: Cost Analysis and Project Crashing

15

PROJECT MANAGEMENT—I: PROGRAMME EVALUATION AND REVIEW TECHNIQUE (PERT) CRITICAL PATH METHOD (CPM)

Learning Objectives

By the time you complete this chapter, you should be able to

- understand the concepts of network, PERT, and CPM
- explain the basic differences between PERT, and CPM
- explain the rules of drawing networks
- produce network, based on logical sequence
- identify the critical path in a network
- determine the probability of completing the project within a given time

INTRODUCTION

This chapter is extremely interesting and important for two reasons. One, it is very practical. Two, it is so simple that it can be applied in our day-to-day life to plan our schedule, review our plans, monitor the progress, and control the performance. Project managers of construction works or software assignments, for instance, find these techniques immensely useful.

NETWORK ANALYSIS

Network analysis refers to a number of techniques for the planning and control of complex projects. The basis of network planning is the representation of sequential relationships between activities by means of a network of lines and circles. The idea is to link the various activities in such a way that the overall time spent on the project is kept to a minimum. The optimum linking of the various stages is called the *critical path*.

The chief advantages of using networks are:

- They provide a logical picture of the layout and sequence of a complex project
- They help to identify the activities and events, which are critical to the entire project
- They provide a basis for working out times, costs, and resources involved in the project
- They act as a focus-point for action and coordination
- They make an enormous contribution to the planning and, especially, the control of complex projects

The two most frequently used forms of network planning are: programme evaluation and review technique (PERT) and critical path method (CPM).

EARLY TECHNIQUES OF PROJECT MANAGEMENT

Gantt's bar chart Before PERT and CPM were developed, Gantt charts and Milestone charts were used as tools to monitor the project progress in complex projects. Gantt chart is a bar chart, which was developed by Henry Gantt around 1900. The Gantt charts were used as early as World War I. It consists of two coordinate axes, one represents the time elapsed and the other, jobs or activities performed. The jobs are represented in the form of bars as shown in Figure 15.1.

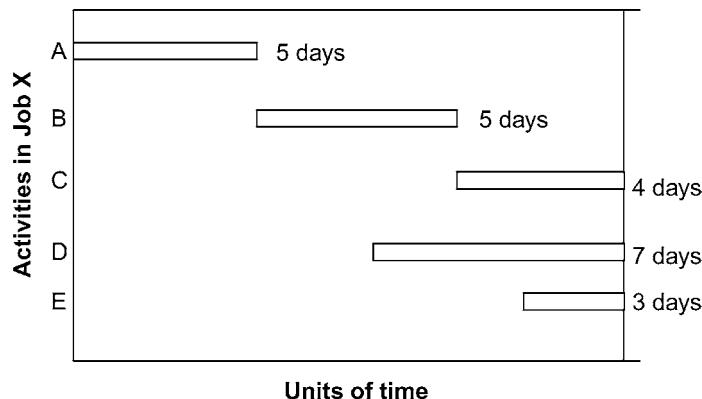


FIGURE 15.1 Gantt's bar chart

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

Inadequacies of bar charts The Gantt's bar chart is a simple method of presenting the number of activities in a given job and their respective time duration. Yet, particularly, where the number of activities in the given project is large and some of them are parallel activities, bar charts cannot be adequate in terms of presenting the interdependencies, project progress, or uncertainties involved in the activities of the project. These inadequacies are explained below:

Interdependencies among activities For example, if we are planning to manufacture a new product that requires special tooling we would have to show that manufacturing activity (Task 2) was dependent upon the procurement of the tooling (Task 1). We can do this by using tie-bars as shown in Figure 15.2.

However, this makes the chart confusing to understand when we have many dependent activities. The tasks can be grouped together vertically so that they form blocks of similar tasks with a common output, thus, reducing the complexity of the chart. Milestone chart takes care of this to some extent.

Project progress Bar charts cannot reflect the project progress. It is so, because they represent the time duration of the activity. However, this problem can be overcome by modifying the Gantt's bar chart. Shade a part of the bar representing each activity to indicate the extent of the progress made, as shown in Figure 15.3. Here for activity 'A' it is assumed that work for two days is completed and another three days of work is still to be completed. Unless 'A' is complete in all respects, 'B' cannot start and activity 'C' cannot start unless 'B' is complete.

Reflecting the project uncertainties It is difficult to present bar charts reflecting the project uncertainties in an accurate manner, particularly, in the modern context of space research programmes or other complex

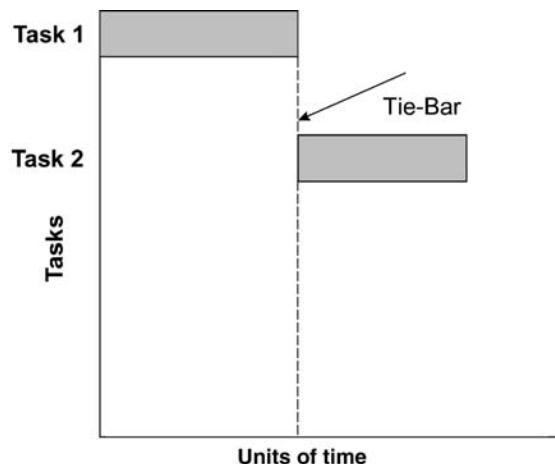


FIGURE 15.2 Tie-bars on Gantt charts

projects, which normally involve extensive research, development, and technological progress. Scheduling in these complex projects needs a high degree of precision and exactness. In such a context, we cannot forecast the completion of the various stages precisely. Sudden technological developments may change the nature of the project and it may call for rescheduling the entire project. Such type of emergencies cannot be handled through a bar chart.

Milestone chart Milestone chart is an improvement over Gantt chart. It has become a good link between Gantt chart and the PERT/CPM network. Every task represented by a bar in Gantt's Bar chart, is subdivided in terms of milestones. Each milestone is a key event or point in time.

In the Gantt chart, a bar (which represents a long-term job) is broken down into several pieces, each of which stands for an identifiable major event. Each event is numbered and an explanatory table is given, identifying the number with the event. These are specific events or points of time, which the management identifies as important reference points during the completion of the project. The work breakdown increases the awareness of the interdependencies between the tasks.

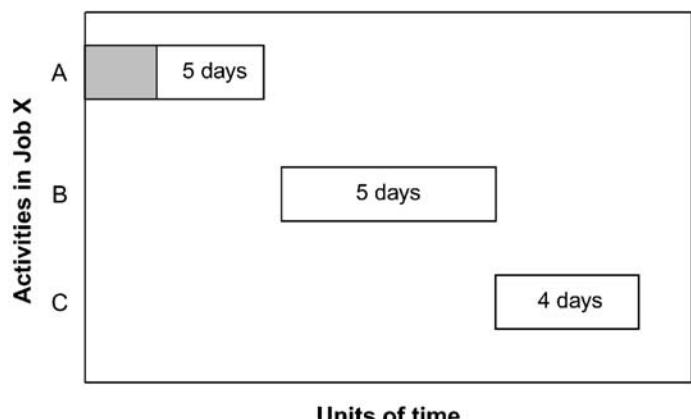


FIGURE 15.3 Modified Gantt's bar chart

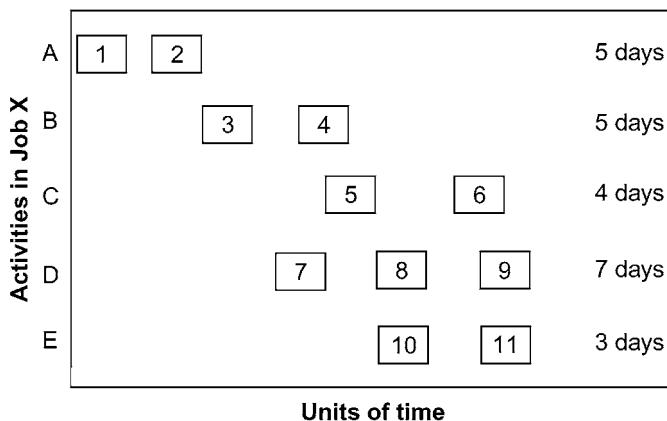
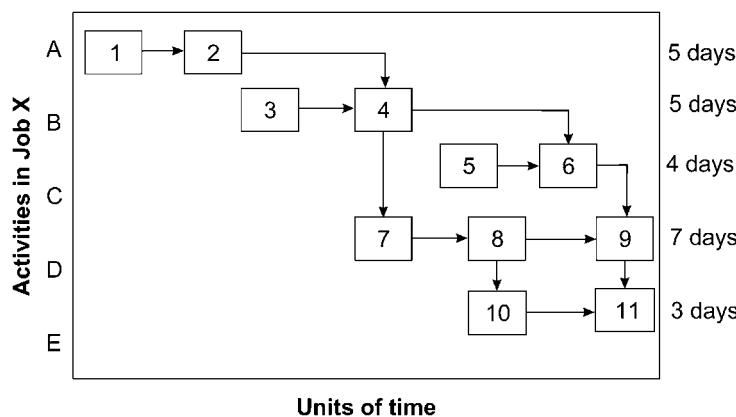
FIGURE 15.4a *Milestone chart*

Figure 15.4a represents a corresponding milestone chart for Figure 15.1. Figure 15.4b reveals that each bar representing an activity is divided into certain milestones. They are identified with a major event, and consecutively, numbered. Such a breakdown enhances the awareness about the interdependencies among the milestones. While the milestone chart is definitely an improvement over bar charts, it still fails to focus effectively on the interdependencies among the events. Hence, network constitutes a natural extension of milestone charts. This is shown in Figure 15.4b.

The emergence of PERT in network analysis A basic form of network analysis was being used in the UK and USA during the 1950s to reduce project duration. In 1958, the US Naval Special Projects Office set up a team to devise a technique to control the planning of complex projects. Thus, emerged the PERT network technique. PERT was used to plan and control the development of the Polaris missile and in the process it helped the team to save two years in missile development. The planning of the Polaris involved 23 networks with 3000 activities. The contract awarding agencies asked the contractors to furnish PERT charts for better coordination of the projects. Today, the World Bank and other international financial agencies insist that PERT networks be enclosed to the proposals submitted to them for funding.

FIGURE 15.4b *Milestone chart*

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

PERT AND CPM: THE CONCEPTS

Programme evaluation and review technique is a tool to evaluate a given programme and review the progress made in it from time to time. A programme is also called a project. A project is defined as a set of activities with a specific goal occupying a specific period of time. It may be a small or big project, such as construction of a college building, laying of a road, assembly of a PC, writing software for a given problem, or inauguration of a factory building. PERT is concerned with estimating the time for different stages in such a programme or a project and find out what the critical path is, that is, which consumes the maximum resources.

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

A partial list of applications of PERT and CPM techniques in project management is given below:

- Construction of projects such as buildings, highways, houses, or bridges
- Preparation of bids and proposals for large projects such as multipurpose projects
- Maintenance and planning of oil refineries, ship repairs, and other such large operations
- Development of new weapon systems and new products and services
- Manufacture and assembly of large items such as aeroplanes or ships
- Simple projects such as home re-modelling, house keeping or painting, and so on

PERT versus CPM The differences between PERT and CPM are summarised below:

PERT	CPM
<p>(a) It is event-oriented.</p> <p>(b) It is based on three time estimates: (i) optimistic (ii) most likely (iii) pessimistic.</p> <p>When there are considerable uncertainties about the project's activity times, a probability analysis gives valuable information. PERT is a technique for evaluating the probability of completing the project. Hence, it is probabilistic.</p> <p>(c) Time, in PERT, is not related to costs. Hence, it is more applied where pressure on the end results is meaningless, as in the case of R&D, or defence projects. (In other words, pressure on the end results in such a project would spoil the very purpose of the projects.)</p>	<p>It is activity-oriented.</p> <p>It is deterministic. Here, time estimates are based on past data.</p> <p>Here, time is related to costs. It can be advantageously applied where there is a need to complete the projects within a given deadline.</p>

(Contd.)

*For interruptible activities, precedence diagramming method (PDM) is used.

Graphic evaluation Review Technique (GERT) is used for advanced problems such as queueing, logistics, and others.

P-GERT is used for project planning using precedence networks.

Like this, there are many versions.

(Contd...)

PERT	CPM
(d) PERT terminology includes network diagram, event, slack, and so on.	CPM terminology involves arrow diagram, nodes, and float.
(e) It assumes that all the resources (men, money, materials, and machines) are available as and when required.	It is more realistic. It considers the constraints on the resources. It provides information about the implications of crashing the duration of the network and the consequent additional costs.

PERT: BASIC NETWORK TERMINOLOGY

Activity This is a task or job of work, which takes time and resources. For example, digging for excavation, verifying the creditors in the purchase ledger, providing electrical connections, and others. An activity is represented by an arrow like this:



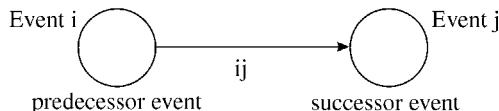
The head of the arrow indicates where the task ends and the tail where the task begins. The arrow points from left to right but is not drawn to scale. It is essentially used to establish:

- the activities involved in the project
- their logical relationship, for example, the activity of providing electrical connection must take place after the activity of building the wall
- an estimate of the time, which the activity is expected to take

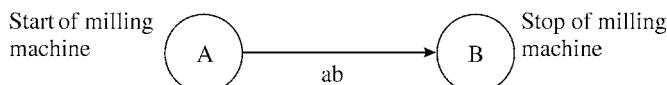
Event This is a point in time and indicates the start or finish/end of an activity or activities, for example, building wall completed, excavation/digging completed, electrical connections started. An event is represented in a network by a circle or node as follows:



The event from which an arrow comes out is called the predecessor event and it is denoted by event i. The event into which the arrow gets in is called the successor event. It is denoted by event j. The arrow connecting these two events is called activity ij. This is shown in the following figure:



The examples for an event include start of a milling machine, stop of a milling machine, start of an examination, end of an examination, and so on. These are illustrated as below:



The working of the milling machine is an activity ab.

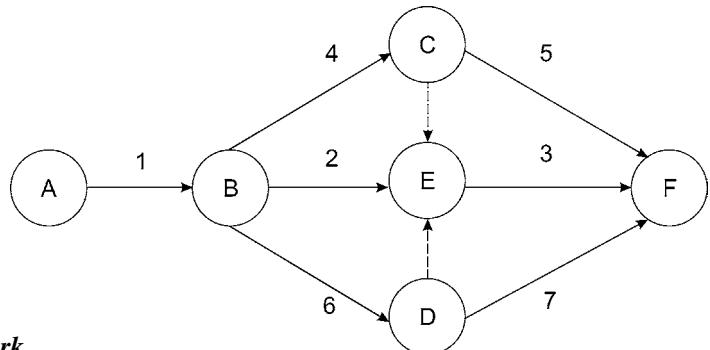


FIGURE 15.5 An example of a network

Dummy activity This is an activity drawn to show clear and logical dependencies between activities so as not to violate the rules for drawing networks. It does not consume resources. It is represented by a dotted arrow as follows:



Network This is the combination of activities, dummy activities, and events in a logical sequence, according to the rules for drawing networks. Thus, a small network might appear as in Figure 15.5 above.

In the above network, the events are represented by A, B, C, D, E, and F. The activities are represented by the numerals 1, 2, 3, 4, 5, 6, and 7.

A is the start event and F is the end event. The following are the different paths to reach the end event:

A-B-C-F; A-B-D-F; A-B-E-F; A-B-D-E-F; A-B-C-E-F

The events C and E, and D and E are connected by dummy activities. The dummy activities indicate the logical sequence. Unless D is complete, E cannot start. And unless C is complete, E cannot start. In other words, E can start only when C and D are completed.

RULES FOR DRAWING NETWORK

The following are logic-based rules and should be carefully observed while drawing a network:

- A complete network should have only one point of entry (a start) event and only one point of exit (an end event).
- Every activity must have one preceding or tail event and one succeeding or head event. Note that many activities may use the same tail event and many may use the head event. Figure 15.5a illustrates this rule.
- No activity can start until its tail event is reached.
- An event is not complete until all activities leading into it are complete.
- All the activities must be tied into the network, that is, they must contribute to the progression. In other words, none of the events should be left untied into the network. Events left untied to the overall network are called *danglers*. Event D is a dangler as shown in Figure 15.5b.

To avoid a danglor, connect it to the end event as shown in Figure 15.5c.

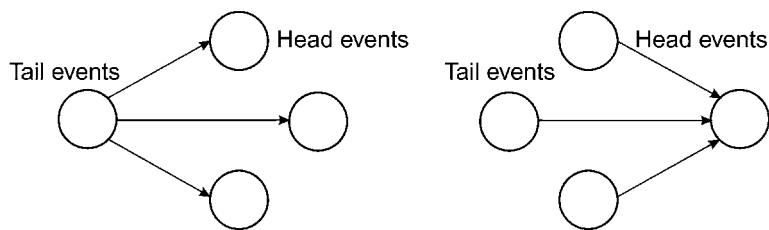


FIGURE 15.5a Head and tail events

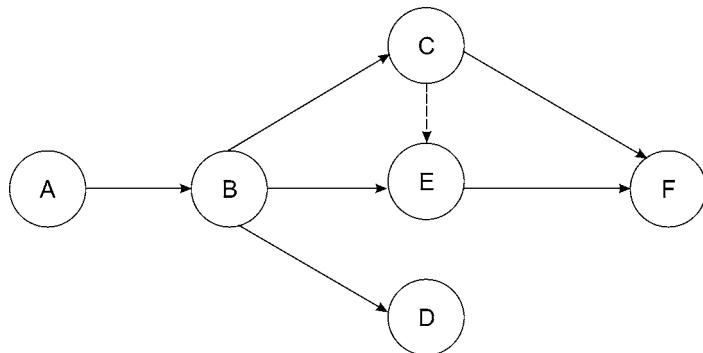


FIGURE 15.5b Dangler

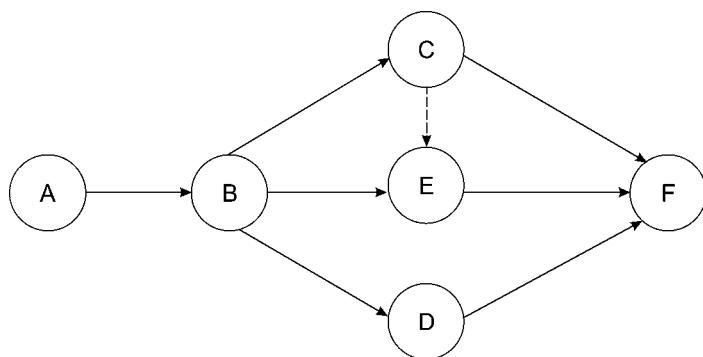


FIGURE 15.5c Dangler to be avoided

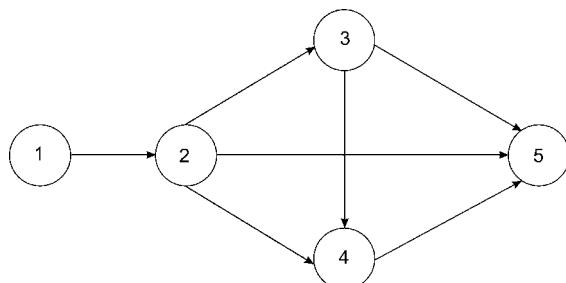


FIGURE 15.6a Wrong (Undesirable network: A case of arrows crossing each other)

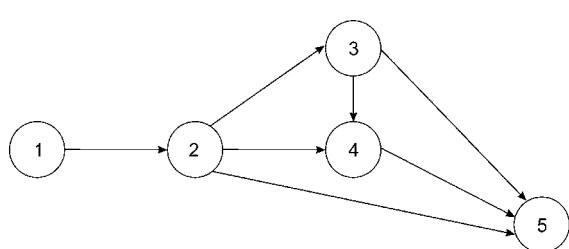
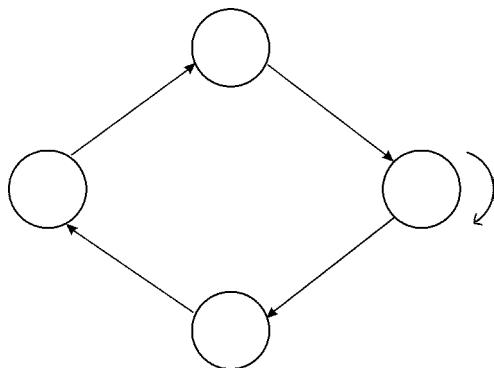


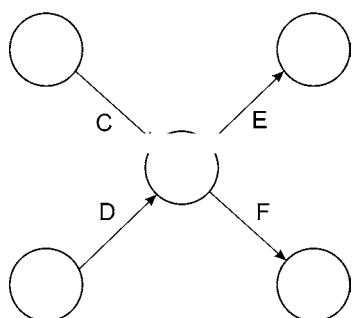
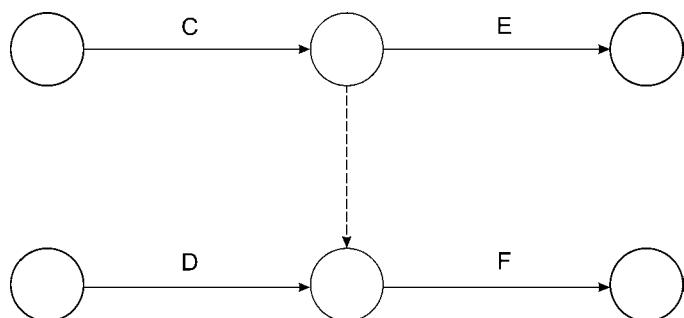
FIGURE 15.6b Corrected network

**FIGURE 15.7 Arrow cannot go backward**

- (f) It is better if arrows do not cross each other. Wherever it is possible, crossing of arrows should be avoided. The network given in Figure 15.6a is not desirable. It is because arrows are intersecting each other. This can be avoided as shown in Figure 15.6b.
- (g) An arrow should always be straight, not curved, and head from left to right.
- (h) The length of the arrow should be uniform. However, the length of the arrow has nothing to do with the time duration of the activity.
- (i) Loop network should be avoided.
- (j) Arrow cannot go backward as shown in Fig. 15.7.
- (k) Use dummies only when it is required. The use of dummy activities is to be minimised in the network. However, logical sequence can be explained better by the use of dummy activity as illustrated below: Figure 15.8a shows that event E follows event C and event F follows event D. This logic can better be explained by Figure 15.8b.

Another example for dummy activity

This is a case of two independent activities taking place simultaneously. For instance, forecasting unit sales (p) and surveying competitive pricing (q) are two independent activities. How will these be represented in a network? Figure 15.9a is obviously wrong, because not more than one activity can connect two events.

**FIGURE 15.8a Wrong****FIGURE 15.8b Right (Use dummy activity)**

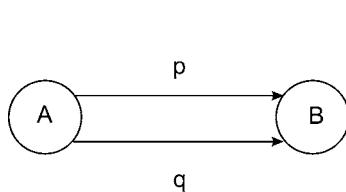


FIGURE 15.9a Wrong

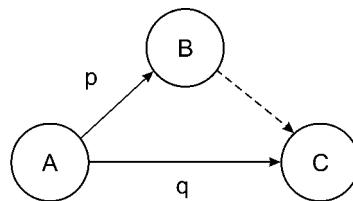


FIGURE 15.9b Right

A dummy can solve the problem here as shown in Figure 15.9b. Here, activity p and activity q can take place simultaneously. Unless event B is completed (in other words, activity p is completed) event C cannot be said to be complete. B-C is a dummy activity.

Logical sequence Logical sequence is the heart of network analysis. From a logical sequence, we can draw a network. Also, if a network is given, the logical sequence can be identified. See Figure 15.10.

Event B follows A.

Events C, E, and D are parallel, and start from event B.

Unless events C and D are complete, E cannot start. In other words, events C and D restrict the occurrence of E.

Event F follows events C, D, and E.

Before drawing the network, check whether the data relates to activities or events. Then proceed to draw the network.

Numbering the network Events have to be progressively numbered from left to right. Simple networks may have events numbered in simple numerical progression, that is, 1, 2, 3, and so on, but larger networks may be numbered in multiples of tens, that is, 10, 20, 30, and so on. This enables additional activities to be inserted subsequently without affecting the numbering sequence of the whole project. Consider the network in Figure 15.11b.

Now, let us number the network given in Figure 15.11a.

The direction of the arrow is the guide to number the events. Events 2 and 3 can be marked as 3 and 2 also, respectively. The dummy activity (4-6) does not bear any name.

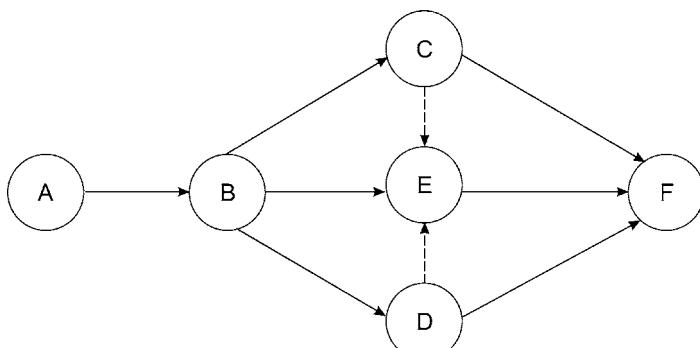


FIGURE 15.10 Logical sequence for network

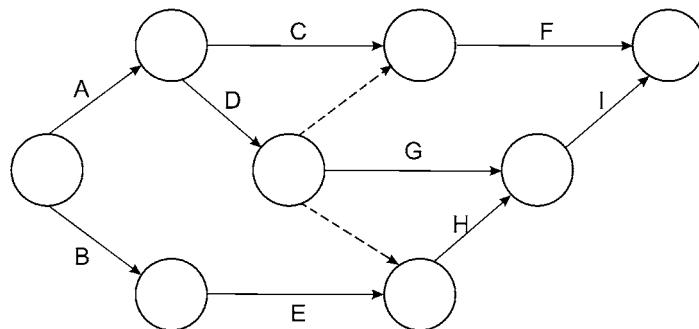


FIGURE 15.11a Network based on logical relationships

APPLICATION OF NETWORK TECHNIQUES TO ENGINEERING PROBLEMS

What is an engineering problem?

An engineering problem may pertain to design, development, production, maintenance, or service of a particular product. To illustrate, it means any of the following:

- Designing a prototype
- Planning a production facility
- Assembly of spare parts
- Maintenance of a production or service establishment
- Trouble-shooting
- Development of software
- Construction management
- Research and development
- Optimisation of resources, including men, materials, money, and machines

This list is only illustrative and inclusive. For all these problems, the underlying factor is logical sequence. Network techniques can be advantageously applied to all these areas. Let us see some of the specific examples:

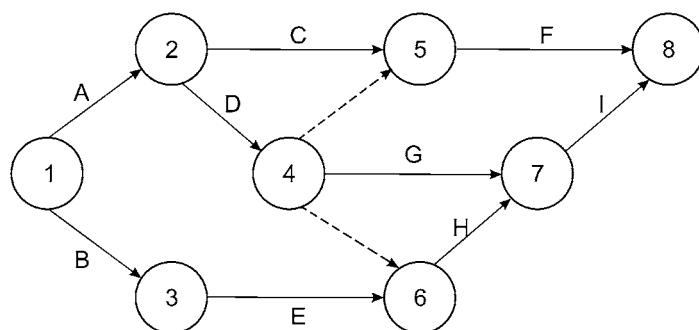


FIGURE 15.11b Numbering the events

EXAMPLE 15.1 You want to join a multinational organisation immediately after your graduation. This project of securing a decent and lucrative appointment in the campus interview involves the following activities and the logical sequence is given below. Draw a network.

Activity and its description	Preceding activity
A (apply for the advertisement)	—
B (prepare for interview)	—
C (receive interview call letter)	A
D (collect information about the company)	A
E (attend mock interview with your placement officer)	B
F (attend interview on the given date)	C, D
G (you decide to join the company, in case you get selected)	D
H (your placement officer tells you that your answers to the questions in the mock interview are very good)	D, E
I (great! you are selected in the campus interview!)	F, G, H

SOLUTION You can notice from Figure 15.12 that activity H follows activities D and E through a dummy activity and regular activity respectively. Similar is the case with F, preceded by C and D.

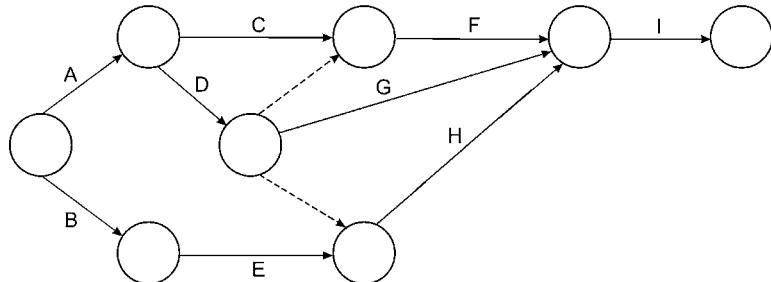


FIGURE 15.12 Network for campus selection

EXAMPLE 15.2 (A case of heat exchanger)

The following are the activities and the time duration pertaining to assembly and testing of a heat exchanger:

Activity (ij)	Activity description	Time duration (weeks)
1-2	Remove internals	2
1-4	Install external wiring	3
2-4	Install internal wiring	2
3-4	Install thermocouples	4
2-3	Construct supports	3
2-5	Install heaters	2
3-5	Install new tubes	4
5-6	Leak test	2
4-6	Check and calibrate	2
6-7	Insulate	1
7-8	Test at temperature	1

SOLUTION Figure 15.13 shows the network with the arrows representing the time duration (in weeks):

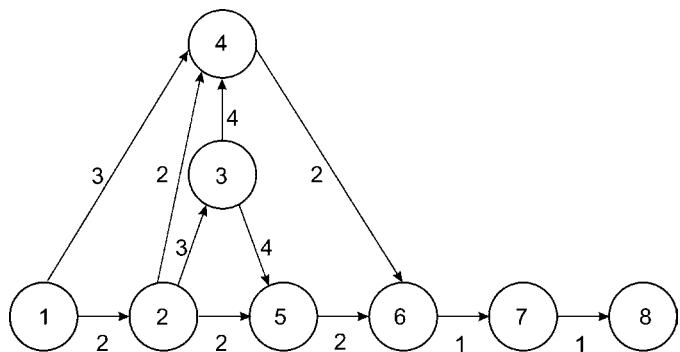


FIGURE 15.13 Network for heat exchanger

EXAMPLE 15.3 The following are the major activities identified in the process of development of a prototype and its installation:

Activity (ij)	Activity description	Labour hours
<i>Analysis:</i>		
1-2	Initial consultation	6
2-3	Full analysis	14
<i>Design and development</i>		
3-4	Initial design sketch	7
4-5	Create prototype	25
5-6	Final product development	20
<i>Implementation</i>		
4-8	Develop system documentation	10
5-7	Develop training material	6
7-8	Installation	4

SOLUTION Figure 15.14 presents the network for the new product development and installation. It can be noted that the given list of activities does not refer to the activity 6–7. It is a dummy activity shown to indicate the logical sequence.

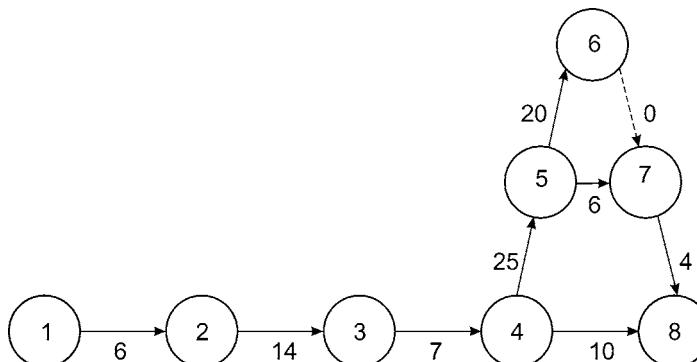


FIGURE 15.14 Network for new product development and installation

EXAMPLE 15.4 Andhra Pradesh Infotech and Engineering Consultancy (APITEC) Ltd., received a request to survey a specified area of a city to determine if the area would support a proposed shopping centre. APITEC has accordingly decided to initiate a data-gathering pilot study. Identify the activities (and their logical relationships) to be carried out in this project. Draw an appropriate network.

SOLUTION The following is the list of activities to be carried out to survey the given area in the city. The logical sequence is also identified as given below:

Activity	Code	Predecessor activity
Define study	A	—
Establish procedures	B	A
Design/prepare questionnaires	C	B
Hire/organise staff	D	A
Train the staff	E	C, D
Select sample sites	F	C, D
Assign sample sites to staff	G	F
Conduct pilot study	H	E, G

Based on this, the following network can be drawn and numbered as shown in Figure 15.15.

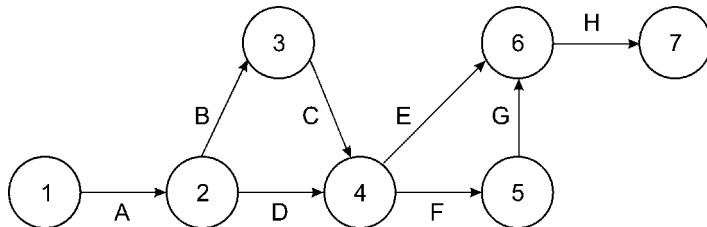


FIGURE 15.15 Network for carrying out pilot study

Time estimates in PERT PERT network is based on three time estimates, that is, optimistic time estimate, most-likely time estimate, and pessimistic time estimate.

Optimistic time estimate This is denoted by t_o . It refers to the minimum time the activity takes, assuming that there will not be any hindrances, such as delay, setbacks, and so on, in its completion.

Pessimistic time estimate This is denoted by t_p . This is the maximum possible time it could take to complete the job. If everything goes wrong, and abnormal conditions prevail, how much time would it take to complete the job? Obviously it would be the maximum time. Barring the major disturbances such as labour strike, and others, all other setbacks or delays are considered here.

Most-likely time estimate This is denoted by t_m or t_l . This is the time estimate, which lies in between the optimistic and pessimistic time estimates. Assuming that there could be some disturbances in the completion of the activity, how much time would it take to complete the activity? The time, thus, taken is called the most-likely time estimate.

Now, the next question is, which time estimate is to be considered in PERT? An average of these will be considered. In PERT, it is the beta distribution that provides meaningful results for most of the activities. It is

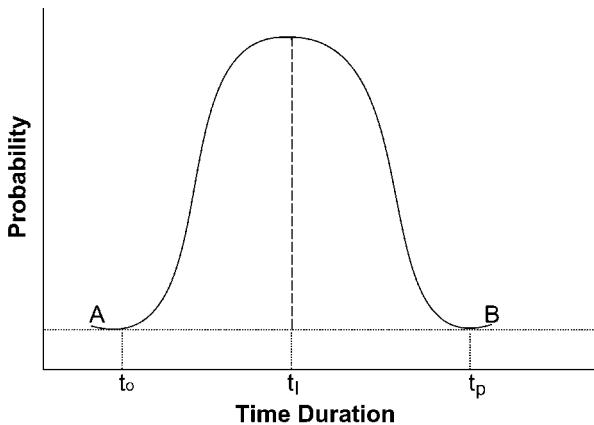


FIGURE 15.16 Three time estimates and beta distribution

different from the normal distribution curve and has a shape as shown in Figure 15.16. In order to make use of its general characteristics, in the theoretical curve, as outlined in Figure 15.16, point A is to coincide with the optimistic time estimate (t_o) and point B is to coincide with the pessimistic time estimate (t_p).

Average time estimate (t_e) According to beta distribution, the average of the three time estimates is equal to the aggregate of one-sixth of the optimistic, two-thirds of the most likely, and one-sixth of the pessimistic time estimates. In other words, the average time estimate (t_e) is calculated as below:

$$t_e = \frac{1}{6}t_o + \frac{2}{3}t_m + \frac{1}{6}t_p \quad \text{or}$$

$$t_e = \frac{t_o + 4t_m + t_p}{6}$$

This equation is very significant in PERT analysis.

EXAMPLE 15.5 If an activity is likely to take 20 minutes of optimistic time, 30 minutes of most-likely time, and 40 minutes of the pessimistic time estimate, what is the average time estimate?

SOLUTION Let us use the above formula and find out the average time estimate for this activity.

$$\begin{aligned} t_e &= \frac{20 + 4(30) + 40}{6} \\ &= \frac{20 + 120 + 40}{6} \\ &= \frac{180}{6} \\ &= 30 \end{aligned}$$

The average time estimate for the given activity is 30 minutes. In other words, if the most-likely time estimate is equidistant (in terms of time) from the optimistic and pessimistic time estimates, the most-likely time estimate itself will become the average time estimate.

Range, standard deviation, and variance In beta distribution, the range is equal to the difference between the pessimistic time estimate (t_p) and the optimistic time estimate (t_o). In other words, Range = $(t_p - t_o)$

The standard deviation (σ) is equal to approximately one-sixth of the range, that is,

$$\sigma = \frac{(t_p - t_o)}{6}$$

The variance is equal to σ^2 , which means

$$\sigma^2 = \left(\frac{(t_p - t_o)}{6} \right)^2$$

The variance is a measure of dispersion. It depends upon the range. Hence, the larger the variance, the greater will be the uncertainty. This can be further explained by an example.

EXAMPLE 15.6 Let us consider three time estimates from two athletes A and B. They give us the time estimates to finish a distance of, say, 400 metres. Can we say which athlete is more reliable? The following are the time estimates (in minutes) given by A and B.

	t_o	t_m	t_p
Estimate by A	8	12	18
Estimate by B	10	11	14

Now calculate variances for A and B.

$$\sigma_A^2 = \left(\frac{18 - 8}{6} \right)^2 = 2.77$$

$$\sigma_B^2 = \left(\frac{14 - 10}{6} \right)^2 = 0.44$$

A has a variance of 2.77 and B has a variance of 0.44. The lesser the variance, the more is the reliability. Hence, the time estimate given by B is more reliable and certain. In other words, we cannot rely upon A's time estimate.

Utility of average time estimate The average time estimate concept is very important in PERT. It is the basis for determining the duration of a given project. Further, it forms the basis to determine the critical path of a given project.

Critical path: Basic terminology and concept Critical path is that path which consumes the maximum amount of time or resources. It is that path which has zero slack. Slack means the time taken to delay a particular event without affecting the project completion time. If a path has zero slack that means it is the critical path. Slack is the difference between the latest allowable occurrence time (T_L) and the earliest expected time (T_E). Now, let us study the concepts of T_E and T_L .

Earliest expected time (T_E) It refers to the time when an event can be expected to be completed at the earliest. It is computed by adding t_e 's of the activity paths leading to that event. It is started with the start event and worked out for all other events. That is why, it is called *forward pass*.

Where there is more than one path leading to a particular event, consider the maximum value of the T_E 's. In other words, the rule can be stated as below:

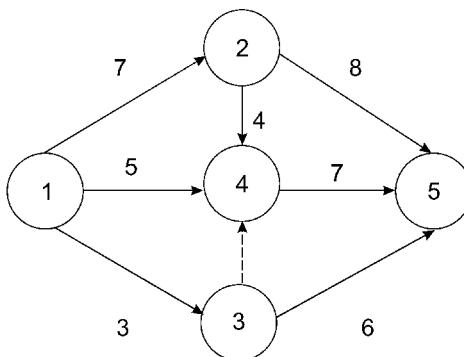
$$T_E \text{ (successor event)} = \text{maximum value of } \{T_E \text{ (predecessor event)} + t_e \text{ (activity)}\}$$

Or

$$T_{Ej} = \text{maximum } (T_{Ei} + t_{eij})$$

where subscript j refers to successor event, i refers to the predecessor event, ij refers to the activity.

EXAMPLE 15.7 Given the following network and activity duration, calculate the earliest expected time for all the events in the network.



Solution

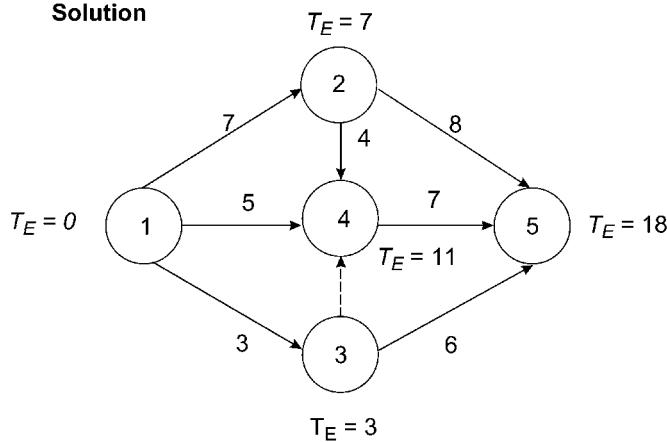


FIGURE 15.17 Computation of the earliest expected time

In Figure 15.17, the numbers shown on the arrows are the average expected times (t_e) for each activity. For the starting event, T_E is zero. At event 2, $T_E = 0 + 7 = 7$; for event 3, $T_E = 0 + 3 = 3$. Like this, compute for the whole network. At event 4 and 5, there is more than one path. In such a case, take the maximum of the T_E values, as shown below:

At event 4,

Paths	T_E Value
1 - 2 - 4	11
1-4	5
1-3-4	3

The maximum of the T_E values should be considered. The maximum value is 11.

Similarly at event 5,

Paths	T_E Value
1-2-5	15
1 - 2 - 4 - 5	18
1-3-4-5	10
1-3-5	9

The maximum of these values is 18. Hence T_E for event 5 is 18.

Latest allowable occurrence time It is the latest time by which an event must occur to keep the project on schedule. If not, the project gets delayed. It is denoted by T_L . This can be explained by considering a deadline to complete a given project. Consider that a period of 20 days is the scheduled completion time (T_S) for a given project. This time refers to the maximum time by which the last event should occur.

Where T_S value is not available, T_E for the end event becomes the T_L for the end event. We start from the end event and work out latest allowable occurrence time to all other events. That is why it is called the *backward pass*.

In other words, where, T_S is given, it becomes the T_L for the end event. T_L for the predecessor event (T_{Li}) is calculated by deducting the average time estimate for the activity (t_{eij}) from the T_L value of the successor event (T_{Lj}). Where there is more than one path, consider the minimum value of T_L . The same rule can be stated as:

$$T_L \text{ (predecessor event)} = \text{minimum of } \{T_L \text{ (successor event)} - t_e\} \text{ or}$$

$$T_{Li} = \text{minimum of } (T_{Lj} - t_{eij}) \text{ where subscript } j \text{ refers to the successor event, } i \text{ refers to the predecessor event, and } ij \text{ refers to the activity.}$$

Let us take the above example to work out T_L . Computation of T_L is the next logical step after determining T_E .

EXAMPLE 15.8 Calculate T_L for example 15.7.

You can notice that the $T_L = T_S$ for the end event. T_L for event five is 20 and T_E is 18. In other words, the difference between these time estimates is 2 days. This is called *slack*. The formula used to determine slack is: slack = $(T_L - T_E)$

Slack refers to the time for which the event can be comfortably delayed without affecting the project completion time. It is the allowable delay for an event without causing delay of the project completion. It is a measure of flexibility.

Usually, different events show up different values of slack. We are concerned with only that path along which the events show up zero or minimum slack. That path, which contains all the events with zero or minimum slack is called *critical path*. Critical path consumes the largest amount of resources. Hence, greater care has to be taken to see that the work is completed along the critical path as per T_L .

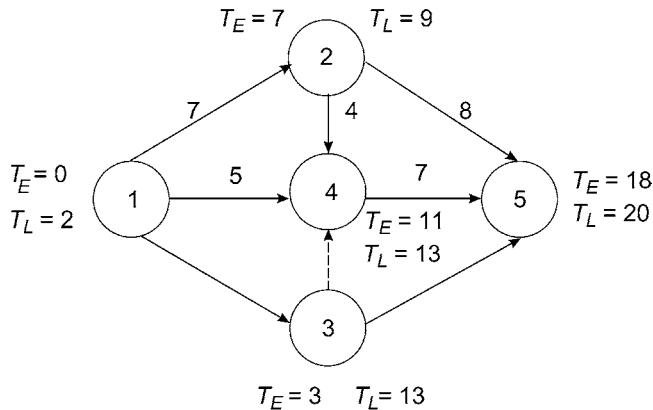


FIGURE 15.18 Computation of the latest allowable occurrence time

While calculating the T_L , the minimum number of days is to be taken. This point is explained below.

Paths	T_L Value At Event One
5-4-1	8
5-3-1	10
5-2-1	2

The minimum of these is 2. Hence, it is the T_L value for event 1.

Critical path The next step is to identify the critical path. Critical path is such a path, the completion of which is very critical for the timely completion of the project. The path, which has zero or minimum slack ($T_L - T_E$) is called the critical path.

Consider the network shown in Figure 15.18. The different paths leading to the end event along with their length or duration in days are shown below:

Path	Path length (in days)
1-2-5	15
1-2-4-5	18
1-4-5	12
1-3-5	9
1-3-4-5	9

Of all these paths, the longest path having a uniform slack of 2 days is 1-2-4-5. So, this is the critical path. The critical path is highlighted in Figure 15.18a.

A network may have any number of critical paths. The longest one is called the main critical path and the others are called sub-critical paths.

Based on the above network and T_E and T_L calculations, answer for yourself the following questions:

- Does it make any difference if activity 1–3 takes 5 days instead of 3 days? Does the critical path get affected?
- How many days 3–5 activity should take to get into the critical path?

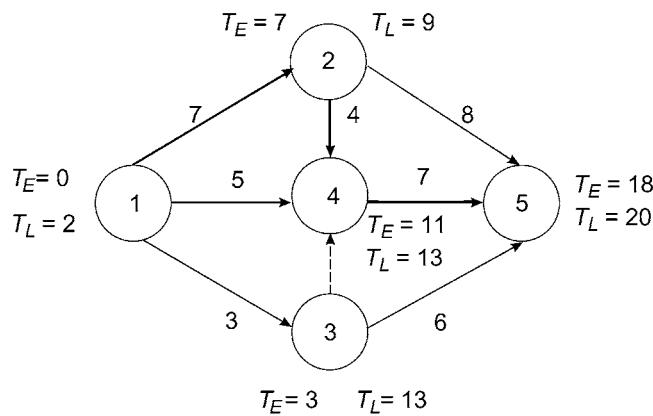


FIGURE 15.18a Network showing critical path

FLOAT

Need for Float in CPM Network

The whole network becomes critical if all resources are fully utilised. Though it is a desirable situation that there are no idle resources, it is always better to have some idle resources as a safety measure. This represents some degree of flexibility in a project. Otherwise, it may result in a state of crisis that can be avoided or taken care of if there had been some float.

Float is calculated for activities. Float represents underutilised resources. It also shows the degree of flexibility available for starting a given activity. A critical path in a network is that path which has least float. Float may be total float, independent float, free float or negative float.

Significance of Different Types of Float

Suppose there are critical and non-critical activities in a network. If the effort on a non-critical activity is to be reduced, it may result in increase in its duration time. At the same time, when these efforts are released/concentrated on some other critical activity, then, independent float can be used and this does not call for any replanning of any other activities. Free float can be used without affecting subsequent activities. Total float may affect both preceding and succeeding activities. Negative float indicates the reduction in the duration of time required to meet the given target date.

Total float Total float indicates the time by which an activity can expand. When total float is absorbed at the planning stage, the floats in both preceding and succeeding activities can be reduced. Subtract the earliest time for the preceding event from the latest time for the succeeding event, and from this difference subtract the duration time. Total float is the latest start date of activity *minus* earliest start date of activity and it may be *negative*. For instance, in Fig. 15.18b the total float for activity 4-5 is worked as given below:

Latest date, succeeding event	9 days
Less: earliest date, preceding event	5 days
	—
	4 days
less 4-5 activity duration	4 days
	—
	0

i.e., there is no time by which the 4-5 activity can expand.

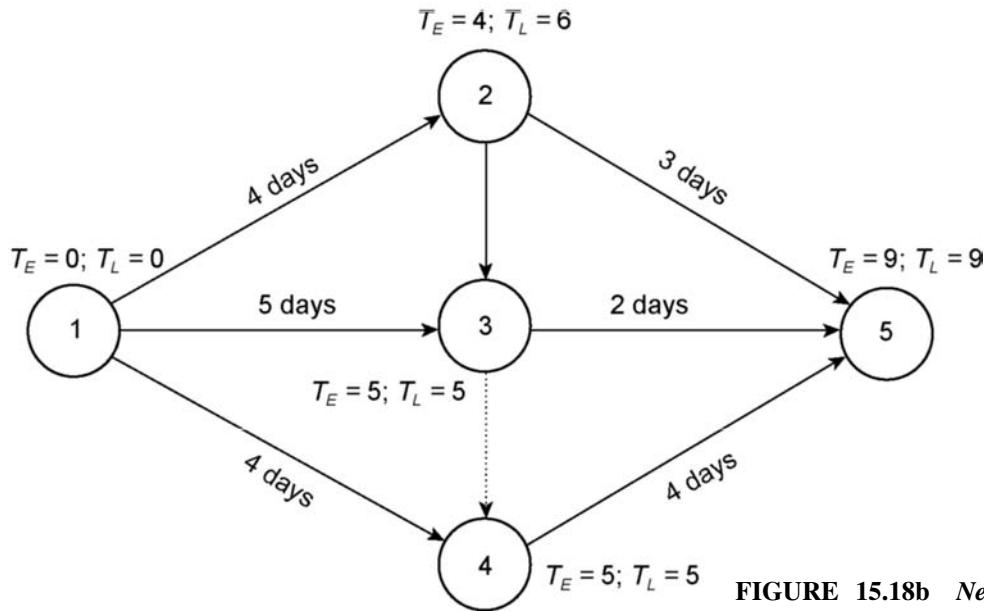


FIGURE 15.18b Network showing T_E and T_L times estimate

Independent float Independent float refers to the time by which an activity can expand without affecting any other preceding or succeeding activity. It is the earliest date of succeeding event minus latest date of preceding event minus activity duration. For instance, in Fig. 15.18b the independent float for activity 4-5 is worked as given below:

$$\begin{array}{rcl}
 \text{Earliest date, succeeding event} & 9 \text{ days} \\
 \text{Less: Latest date, preceding event} & 5 \text{ days} \\
 \hline
 & 4 \text{ days} \\
 \text{less 4-5 activity duration} & 4 \text{ days} \\
 \hline
 & 0
 \end{array}$$

i.e., there is no time by which the activity 4-5 can expand without affecting any other preceding or succeeding activities.

Free float Free float refers to the time by which an activity can expand without affecting succeeding activities. If some critical activity needs more resources, then the operation of such activities could be halted for the period of free float, and more attention should be paid towards the critical activity. For instance, in Fig. 15.18b, the free float for activity 4-5 is worked as given below:

$$\begin{array}{rcl}
 \text{Earliest date, succeeding event} & 9 \text{ days} \\
 \text{Less: earliest date, preceding event} & 5 \text{ days} \\
 \hline
 & 4 \text{ days} \\
 \hline
 \text{Free float} & 4 \text{ days}
 \end{array}$$

If the free float is 4 days, the activity could be delayed by 2 days, if necessary.

Negative float Compare the overall project time with a target or scheduled time if it is necessary to complete the project as per the scheduled time. The latest allowable occurrence time for the last event is made equal to the scheduled completion time (T_s). The float is worked out based on T_s .

If the T_s is greater than the total project time, then all activities will have positive float. Conversely, if T_s is less than the total project time, most of the activities including critical activities, will have negative float.

Probability of completing the project within the given time Given the scheduled completion time, what is the probability of completing the project within this time? This is the next logical question.

We use the concepts of range, standard deviation, and variance. The following are the steps involved in determining the probability.

- (a) Find out the range of the pessimistic and optimistic time estimates of those activities covered by the critical path ($t_p - t_o$). Other activities are not important because they cannot any more influence the critical path.
- (b) Determine standard deviation σ for each activity.
- (c) Determine variance $(\sigma)^2$.
- (d) Find out the sum of the variances of the project $\sum \sigma^2 = \sigma_1^2 \sigma_{21}^2 + \dots \sigma_n^n$.
- (e) Determine the square root of the sum of the variances. This gives standard deviation for the entire network. $\sigma = \sqrt{\sum \sigma_1^2 + \sigma_2^2 + \dots + \sigma_n^n}$
- (f) Divide the slack (the difference between the scheduled completion time and the latest allowable occurrence time) by the standard deviation for the entire network. By applying the principles of normal distribution, we get:

$$\text{Normal deviate } Z = \left(\frac{(T_s - T_E)}{\sigma} \right)$$

Thus, we get the value of the normal deviate. (This is not the probability of completion.) This should be within a range of $\pm 3\sigma$ limits.

- (g) To arrive at the percentage of probability of completing the project within the given time, the value of the normal deviate has to be converted into the value of probability by using the table of normal distribution function table. Thus, the probability of completing the project is determined. An extract of normal distribution function table is furnished in Table 15.1.

It may be noted that the probability of not completing the project within a given time is (100 – Percentage of probability for completing the project). In other words, if the normal deviate is $+1.0\sigma$, the corresponding percentage of probability is 84.1 per cent. Here, normal deviate is $+$ means, it is the case of completing the project. It means that the probability of not completing the project within the given time is 15.9 per cent (i.e., 100 – 84.1).

Now, let us work out another problem starting from drawing the network to determining the probability of completing the project within a given time.

TABLE 15.1 Normal Distribution Function Table

Normal deviate (Z)	Probability (%)	Normal deviate (Z)	Probability (%)
0	50.0	-0	50.0
0.2	57.9	-0.2	42.1
0.4	65.5	-0.4	34.5
0.6	72.6	-0.6	27.4
0.8	78.8	-0.8	21.2
1.0	84.1	-1.0	15.9
1.2	88.5	-1.2	11.5
1.4	91.9	-1.4	8.1
1.6	94.5	-1.6	5.5
1.8	96.4	-1.8	3.6
2.0	97.7	-2.0	2.3
2.2	98.6	-2.2	1.4
2.4	99.2	-2.4	0.8
2.6	99.5	-2.6	0.5
2.8	99.7	-2.8	0.3
3.0	99.9	-3.0	0.1

EXAMPLE 15.9 The following list of activities relates to a new factory construction. The logical sequence and duration of each activity are given below. Draw the PERT network and identify the critical path. Also, determine the probability of completing this project within a scheduled completion time of 60 days.

Activity code	Activity	Preceding activities	Time Estimates	
			$t_o - t_m - t_p$	(in days)
A	Demand forecast	—	6-8-14	
B	Product development	—	6-9-12	
C	Capital procurement	—	12-15-18	
D	Production planning	A	2-3-4	
E	Product design	B	5-6-7	
F	Deciding about plant	D, E	11-13-15	
G	Profit planning	D, E	1-2-3	
H	Materials acquisition	C, G	4-5-6	
I	Recruitment of operators	G	4-5-6	
J	Production design	G	2-3-4	
K	Acquiring manufacturing facilities	C, J	7-10-13	
L	Training the operators	I	4-5-6	
M	Plant layout	F, K	7-8-9	
N	Manufacture	H, L, M	8-14-20	

SOLUTION

Stage I: Drawing of network and numbering the events (Fig. 15.19a)

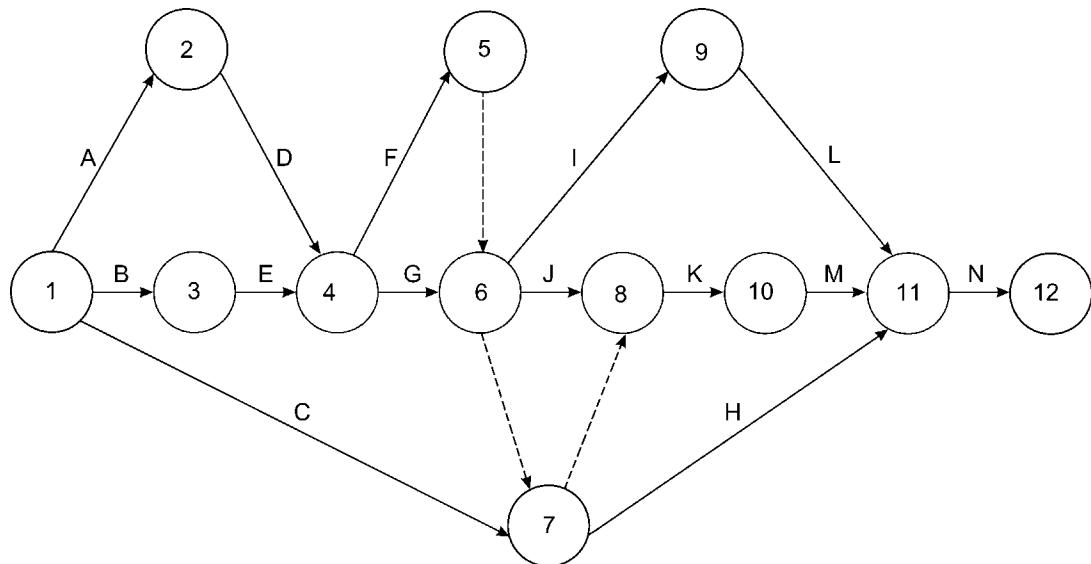


FIGURE 15.19a Network for new factory construction

Stage II: Determining the average time estimate (Fig. 15.19b)

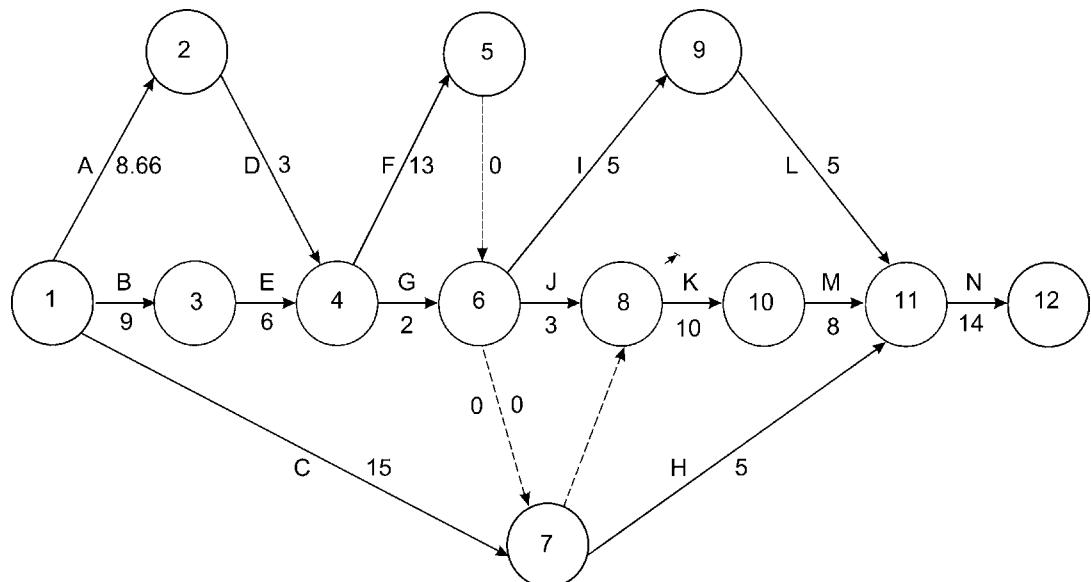
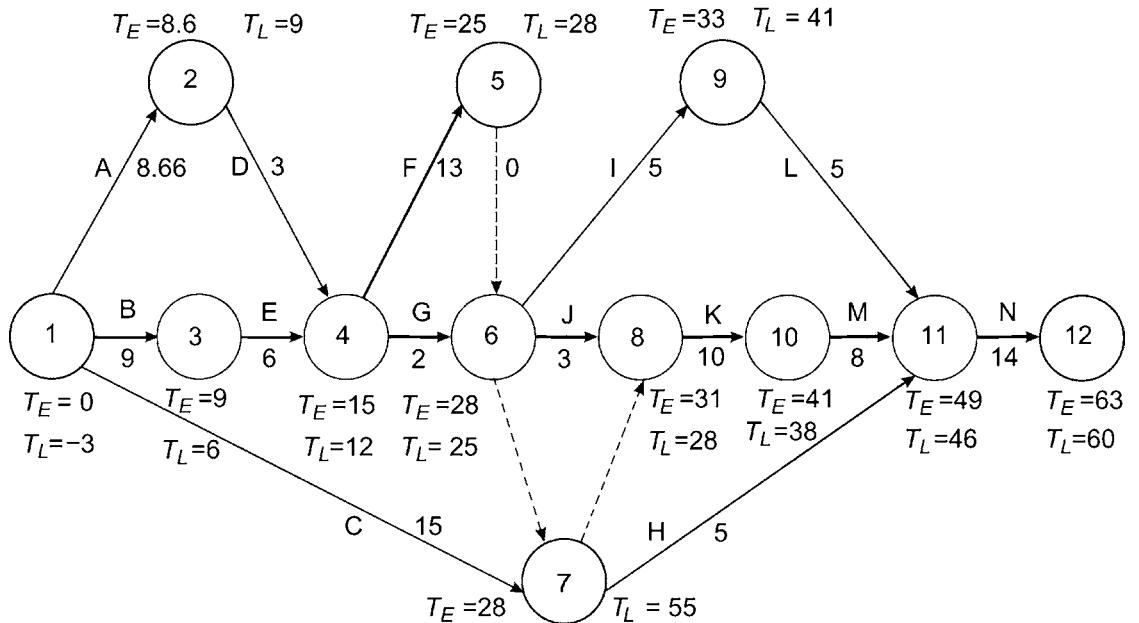


FIGURE 15.19b Network with average time estimates (Numbers by the side of arrow indicate T_E values for the activity)

Stage III: Calculation of T_E , T_L and identification of the critical path (Fig. 15.19c)

FIGURE 15.19c Network with critical path

The scheduled completion time is 60 days. This becomes the T_L for event 12. Thus, the above network reveals a slack of -3 at event 12. The path that maintains the same slack throughout is 1-3-4-5-6-8-10-11-12. Hence, this is the critical path.

Stage IV: Determining the probability of completing the project within the given time

Activity	Time Estimates	$\sigma^2 = \left(\frac{(t_p-t_o)}{6}\right)^2$
B	6-9-12	$(\frac{12-6}{6})^2 = 1.00$
E	5-6-7	$(\frac{7-5}{6})^2 = 0.11$
F	11-13-17	$(\frac{17-11}{6})^2 = 1.00$
J	2-3-4	$(\frac{4-2}{6})^2 = 0.11$
K	7-10-13	$(\frac{13-7}{6})^2 = 1.00$
M	7-8-9	$(\frac{9-7}{6})^2 = 0.11$
N	8-14-20	$(\frac{20-8}{6})^2 = 4.00$
		$\sum \sigma^2 = 7.33$

Standard deviation for the entire network

$$\begin{aligned}(\sigma) &= \sqrt{\sum \sigma^2} \\ (\sigma) &= \sqrt{7.33} = 2.8\end{aligned}$$

Normal deviate

$$\begin{aligned}(Z) &= \left\{ \frac{(T_L - T_E)}{\sigma} \right\} = \left\{ \frac{60 - 63}{2.8} \right\} = \frac{-3}{2.8} = -1.07 \\ &= -1.1 \text{ approximately}\end{aligned}$$

From the normal distribution function table, it can be noticed that the value of the normal deviate of -1.1 lies in between the probability of 15.9 per cent and 11.5 per cent as shown below:

Normal deviate (Z)	Probability
-1.0	15.9
-1.2	11.5

For a normal deviate of 1.1 the approximate probability value could be average of this, which amounts to 15.2 per cent.

In other words, the percentage of probability of completing the project within the given time is 15.2. {This means automatically that the percentage of *not* completing the project within the given time is 85.8%, i.e., $(100 - 15.2)$ }

SUMMARY

- ◆ The idea in drawing a network among the activities is to link them in such a way so as to minimise the overall time spent on the project.
- ◆ The early techniques of project management include Gantt's Bar charts and Milestone charts.
- ◆ In Gantt' bar chart, every bar represents a job or activity in the given task.
- ◆ Gantt's bar chart has certain inadequacies. It cannot show interdependencies among the activities, reflect project progress, and highlight the uncertainties involved in the activity completion.
- ◆ Milestones, in the milestone chart, refer to specific events or points of time during the completion of the project.
- ◆ There are similarities in PERT and CPM such as the basic concepts of activity, event, critical path, and so on.
- ◆ There are certain differences between PERT and CPM. PERT is probabilistic whereas CPM is deterministic in nature. In CPM, time is related to costs whereas in PERT, time is not related to costs. PERT is event-oriented whereas CPM is activity-oriented.
- ◆ The network consists of events and jobs. Events are represented by nodes and jobs are represented by arrows.

- ◆ The direction of the arrow in the network diagram guides the numbering of events.
- ◆ In PERT, every activity has three time estimates: optimistic time estimate, most-likely time estimate, and pessimistic time estimate.
- ◆ It is beta distribution that fits into the study of PERT.
- ◆ Average time estimate has to be ascertained for each job. It is the basis to compute the earliest expected time and latest allowable occurrence time, and thereby, the critical path also. Average time estimate (t_e) is calculated as follows:

$$t_e = \frac{t_o + 4t_m + t_p}{6}$$

- ◆ Earliest expected time refers to the time when an event is expected to be completed. It is calculated as follows:

T_{Ej} maximum ($T_{EI} + t_{eij}$) where subscript j refers to the successor event, I refers to the predecessor event, and ij refers to the activity.

- ◆ The latest allowable occurrence time by which an event must occur to keep the project on schedule is calculated as follows:

T_{Li} minimum of ($T_{Lj} - t_{eij}$) where subscript j refers to the successor event, i refers to the predecessor event, and ij refers to the activity.

- ◆ Slack refers to the time for which an event can be comfortably delayed without affecting the project completion time. It is calculated as:

$$\text{Slack} = (T_L - T_E)$$

- ◆ Critical path is that path, which takes a longer duration and which consumes the maximum resources. The slack is always uniform and minimum for all the events along the critical path.
- ◆ To ascertain the probability of completing the project within a given scheduled time, the following are the steps: (a) find out the average time estimate for each job, (b) determine the standard deviation for each activity, (c) determine the variance, (d) find out the sum of the variances of the project, (e) determine the standard deviation for the entire network, (f) find out the normal deviate and, (g) refer to the normal distribution function table for exact percentage of probability for a given normal deviate.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Which of the following denotes a number of techniques for planning and control of complex projects
 - (a) Network analysis
 - (b) Planning analysis
 - (c) Activity analysis
 - (d) Project analysis
2. In network analysis the overall objective is
 - (a) To minimise overall time spent

- (b) To maximise overall return on capital
 - (c) To neutralise overall time spent
 - (d) To cover all activities at any cost
3. The minimum slack will always be
 - (a) Positive
 - (b) Negative
 - (c) Linear
 - (d) Deterministic
 4. PERT refers to
 - (a) Programme Escalation Review Tool
 - (b) Programme Evaluation Review Technique
 - (c) Project Evaluation Revised Testing
 - (d) Project Evaluation Reasoning Tool
 5. PERT & CPM provide
 - (a) Logical Picture Layout & Complex Project Sequence
 - (b) Identifying the Critical Activities & Events
 - (c) An Optimal Rate of Return on Investment
 - (d) Basis for Working Time, Cost & Resources
 6. Which of the following is not a limitation of Gantt's bar chart?
 - (a) Interdependencies
 - (b) Project Progress
 - (c) Uncertainties
 - (d) Coordination
 7. Which is the Link between Gantt Chart & PERT/CPM network ?
 - (a) Milestone Chart
 - (b) Logical Chart
 - (c) Network Chart
 - (d) Activity Chart
 8. Which of the following denotes a set of activities with specific goal for a specific period of time?
 - (a) Schedule
 - (b) Project
 - (c) Activity
 - (d) Critical path
 9. What does CPM involve in a tradeoff between
 - (a) Cost & Quantity
 - (b) Time & Work
 - (c) Cost & Time
 - (d) Cost, Time and Quality
 10. Which of the following is event oriented?
 - (a) PERT
 - (b) CPM
 - (c) Schedule
 - (d) None
 11. CPM is
 - (a) Optimistic

- (b) Probabilistic
 - (c) Deterministic
 - (d) Optimistic and Probabilistic
12. In PERT activity is represented by
- (a) Arrow
 - (b) Circle
 - (c) Line
 - (d) Dotted circle
13. In PERT, the event is represented by
- (a) Arrow
 - (b) Circle
 - (c) Line
 - (d) Dotted Arrow
14. Which of the following does task or job in a program represent?
- (a) Event
 - (b) Activity
 - (c) Network
 - (d) Dotted Event
15. What is the start or end of activity is called
- (a) Event
 - (b) Activity
 - (c) Critical path
 - (d) Event and Activity
16. In PERT, dummy activity represents
- (a) Dependence
 - (b) Logical Dependence
 - (c) Logical Independence Among Jobs
 - (d) Independence Among Jobs
17. Which of the following does not consume resources?
- (a) Activity
 - (b) Event
 - (c) Dummy activity
 - (d) Dangler
18. Events left untied to overall network are called
- (a) Prototype
 - (b) Sequence
 - (c) Danglers
 - (d) Drops
19. In optimistic time estimate, the time taken by activity is
- (a) Maximum
 - (b) Minimum
 - (c) No consumption of time
 - (d) None

20. Average time estimate (t_e) is
(a) $t_e = 2/3t_o + 1/6t_m + 1/6t_p$
(b) $t_e = 2/3t_o + 2/3t_m + 1/6t_p$
(c) $t_e = 1/6t_o + 2/3t_m + 1/6t_p$
(d) $t_e = 1/6t_o + 1/6t_m + 2/3t_p$
21. Time taken to delay a particular event without affecting the project completion time
(a) Deviation
(b) Succession
(c) Slack
(d) Critical Path
22. Path which contains all event with zero or minimum slack is
(a) Critical path
(b) Succession or event
(c) Critical slack
(d) Event slack
23. Float represents
(a) Under utilised resources
(b) Over utilised resources
(c) Optimally utilised resources
(d) Sub-optimally utilised resources
24. Negative float occurs
(a) When T_s is less than total project time
(b) When T_s is greater than total project time
(c) When $T_s =$ Total project time
(d) When $T_s +$ total project time
25. Positive float occurs when
(a) T_s is less than project time
(b) When T_s is greater than total project time
(c) When $T_s =$ Total project time
(d) When $T_s +$ total project time
26. Which of the following Normal deviate?
(a) $\frac{T_s - T_E}{\sigma}$
(b) $\frac{T_s - T_E}{\sigma}$
(c) $\frac{T_s - T_E}{\infty}$
(d) $\frac{T_s - T_E}{A}$
27. Which of the following indicates time by which an activity can expand?
(a) total float
(b) free float
(c) independent float
(d) negative float
28. If the effort on a non-critical activity is to be reduced, it may result in
(a) Its duration and time
(b) Its number of activities

- (c) Its number of events
 - (d) Its number of critical activities
29. A programme is also called
- (a) Job
 - (b) Project
 - (c) Event
 - (d) Network
30. In Beta distribution, standard deviation is equal to
- (a) $\frac{t_o - t_p}{6}$
 - (b) $\frac{t_o - t_p}{2}$
 - (c) $\frac{t_o - t_p}{4}$
 - (d) $\frac{t_o - t_p}{3}$

Question II: Fill in the Blanks

1. In milestone chart, every bar shown in chart is divided into certain number of milestones.
2. A programme is also called a
3. An activity with a specific goal occupying a specific period of time is called
4. is event-oriented.
5. The task or activity which does not consume resources, yet, is shown to indicate a logical sequence in a network, is called
6. The event, which is not tied into the network is called
7. The time estimate, which assumes no hindrances in its completion is called
8. In beta distribution, standard deviation is equal to
9. The allowable delay for an event without causing delay of the project completion is called
10. All such events carrying a zero slack or minimum slack fall under

Question III: Short-answer Question

Write short notes on the following short-answer question (in not more than six lines each)

1. Gantt chart
2. Milestone chart
3. Average time estimate
4. Critical path
5. Probability of completing the project within the given time
6. PERT versus CPM
7. Rules for drawing networks
8. Network analysis

Question IV: Answer the Following:

1. Draw a Gantt chart for the following programme:

- (a) Conducting a campus interview:

Collect the final year BTech student profile	2 weeks
Print the profile	1 week
Contact the potential employers	4 weeks
Fix the dates for interviews	2 weeks
Prepare the students by mock interviews	3 weeks
Conduct the interviews	1 week

- (b) Make a milestone chart for the above Gantt chart.

2. Draw the network for the following project and number the events:

Event number	Preceded by	Event number	Preceded by
A	Start event-	G	E
B	A	H	G, E
C	B	J	D, F, H
D	B	K	C, J
E	D	L	K
F	B	M	J

3. Draw a PERT network for the following project:

A is the first event and J the end event
 J is a successor event to F
 C and D are successor events to B
 D is a predecessor event to G
 E and F occur after event C
 E precedes F
 C restrains the occurrence of G and G precedes H
 H follows F
 H precedes J

4. Which of the following two time estimates is reliable?

	t_o	t_m	t_p
Estimate by P	18	22	27
Estimate by Q	22	30	36

5. In a construction company, the construction engineer spends on inspection different periods of time at different sites. More often he inspects from ten minutes to one hour. Twenty minute-inspections are more frequent than inspections of any other duration. If each inspection were an activity in a PERT project,

- (a) what would be the expected duration of each inspection?
 (b) what estimate would you give for its variance?
 (c) in scheduling the project, how much time would you allocate for the inspection?
6. A small project consists of the following activities with the given time estimates.

<i>Predecessor Event- Successor Event (i-j)</i>	<i>Estimated duration (in months)</i>		
	<i>Optimistic</i>	<i>Most likely</i>	<i>Pessimistic</i>
1-2	2	2	14
1-3	2	8	14
1-4	4	4	16
2-5	2	2	2
3-5	4	10	28
4-6	4	10	16
5-6	6	12	30

- (a) Draw a network
 (b) Calculate the average expected time for each activity
 (c) Calculate the earliest expected time and the latest allowable occurrence time for each event
 (d) Determine the critical path considering project completion time of 36 months
 (e) Determine the probability of completing the project
 - (i) within the scheduled completion time
 - (ii) at least 6 months earlier than expected
 - (iii) no more than 6 months later than expected
 (f) What due date has about a 80 per cent chance of being met?
7. The following are the activities identified in scheduling the time required to install an improved local area network (LAN). Draw the PERT network and identify the critical path.

<i>Activity Identification</i>	<i>Activity Description</i>	<i>Average duration (t_e) in days</i>	<i>Logical sequence</i>
a	Establish project parameters	2	—
b	Assess present LAN	5	a
c	Present analysis	1	b
d	Refine objectives	3	a
e	Purchase upgradation equipment	6	c, d
f	Test hardware	1	e
g	Test software	2	f
h	Conduct training	4	e
i	Evaluate the upgradation	2	g, h

8. Global Teleshopping Ltd. is a high-technology retailer and mail order business. In order to improve its process the company decides to install a new PC system to manage its entire operation (i.e.

payroll, accounts, and inventory). Terminals at each of its many stores will be networked for fast, dependable service. The specific activities that will need to be accomplished before the system is up and running is listed below. Draw a network diagram for the project and determine the critical path.

<i>Activity</i>	<i>Preceding activities</i>	<i>Average time estimate</i>
(a) Build insulated enclosure	—	8
(b) Decide on computer system	—	2
(c) Electrical wiring of room	A	6
(d) Order and collect computer	B	4
(e) Install air-conditioning	A	8
(f) Install computer	D, E	4
(g) Staff testing	B	10
(h) Install software	C, F	4
(i) Staff training	G, H	6

9. The following is the list of events found in the process of organising a students' convention. Identify the logical sequence and fix the duration as per the estimate. Draw a PERT network.
- (a) set convention date
 - (b) set convention location
 - (c) select convention chairman
 - (d) select convention facilities
 - (e) develop convention programme
 - (f) select convention speakers
 - (g) set convention cost
 - (h) notify members of the convention programme
 - (i) print programme
 - (j) notify convention facility of desired set up of each meeting room
 - (k) select banquet menu
 - (l) determine recipient of outstanding member award
 - (m) prepare citation for outstanding member award
 - (n) determine honorarium for speakers
 - (o) arrange for registration
 - (p) make boarding and lodging arrangements
 - (q) arrange transportation from airport
 - (r) await convention
10. For the particulars of the project shown in the table below, (a) draw a PERT network, (b) determine the critical path, (c) determine the probability of completing the project within 72 days.

<i>Predecessor event- Successor event (i - j)</i>	t_o	t_m	t_p
10-20	6	10	14
10-30	2	4	6
20-50	12	16	24
30-40	16	24	34
40-50	0	0	0
50-80	10	14	18
40-60	12	18	24
40-70	6	12	16
60-90	2	4	6
80-90	6	12	16
70-100	16	30	50
90-100	4	8	12

11. A manufacturing company is planning to introduce a new project for sale in the market. The table below provides a list of the activities required to plan and control this marketing project effectively:

<i>Activity code</i>	<i>Activity particulars</i>	<i>Immediate predecessors</i>	<i>Expected duration</i>
A	Initial discussions	—	3
B	Product design	A	11
C	Market survey	A	9

(Contd.)

<i>Activity code</i>	<i>Activity particulars</i>	<i>Immediate predecessors</i>	<i>Expected duration</i>
D	Market evaluation	C	2
E	Product costing	B	5
F	Sales plan	C	6
G	Product pricing	D, E	2
H	Prototype construction	F, G	11
I	Market information preparation	B	8
J	Prototype testing	H, I	9

- (a) Draw a network to represent the various activities of the marketing project.
 (b) Determine the critical path and minimum project time considering a scheduled completion time of 42 days.
12. Consider a project consisting of nine jobs with the following precedence relations and average time estimates.

Job	Predecessor	Time (days)
A	—	30
B	—	20
C	A, B	20
D	A, B	20
E	B	10
F	D, E	10
G	C, F	40
H	D, E	20
I	G, H	30

- (a) Draw the project network.
 (b) Identify the critical path.
 (c) Answer the following (each is an independent issue by itself):
 (i) What is the effect on critical path if job E is delayed and it takes 30 days for its completion?
 (ii) Does the project duration get affected if job H is delayed by 20 more days?
 (iii) What difference does it make if jobs F and G are completed 2 days ahead of schedule?
13. Consider a project consisting of 7 jobs with the following precedence relations and three time estimates.

Job	Predecessor	Optimistic time estimate	Most-likely time estimate	Pessimistic time estimate
A	—	2	5	8
B	A	6	9	12
C	A	5	14	17
D	B	5	8	11
E	C, D	3	6	9
F	—	3	12	21
G	E, F	1	4	7

- (a) Draw a network for the above jobs.
 (b) Determine the average expected duration and variance of each job.
 (c) What is the expected length of the project and its variance?
 (d) Compute the probabilities of completing the project
 (i) 2 days earlier than expected
 (ii) no more than 4 days later than expected.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. a | 2. a | 3. b | 4. b | 5. b |
| 6. d | 7. a | 8. b | 9. c | 10. a |
| 11. c | 12. a | 13. b | 14. b | 15. a |
| 16. b | 17. d | 18. c | 19. b | 20. c |
| 21. c | 22. a | 23. a | 24. b | 25. a |
| 26. a | 27. b | 28. a | 29. d | 30. a |

Answers to Question II

- | | |
|--------------------------|---|
| 1. <i>Gantt</i> | 6. <i>dangler</i> |
| 2. <i>project</i> | 7. $\left(\frac{t_p - t_o}{6}\right)$ |
| 3. <i>project</i> | 8. <i>optimistic time estimate (t_o)</i> |
| 4. <i>PERT</i> | 9. <i>slack</i> |
| 5. <i>dummy activity</i> | 10. <i>critical path.</i> |

16

PROJECT MANAGEMENT — II: COST ANALYSIS AND PROJECT CRASHING

Learning Objectives

By the time you complete this chapter, you should be able to understand

- the concepts of direct and indirect costs
- time and cost relationship in projects
- the concept of cost slope
- how to ensure optimum cost and optimum duration for a given project

INTRODUCTION

In the last chapter, we studied PERT networks and their probabilistic nature. In other words, one of the purposes of PERT analysis is to ascertain the probability of completing the project within a given time period. More often, determining the probability of completing the project within a given time may not be adequate. It is necessary to find out a viable alternative, particularly, where the probability of completing the project within a given time is low or there is urgency to complete the project. The urgency could be to prepare for a national convention, participation in an international exhibition, launching a new product, and so on. In such a case, the only alternative, the management has, is to crash the duration of the project by pumping additional inputs of labour and machines. Here, the management would like to optimise the costs and the time.

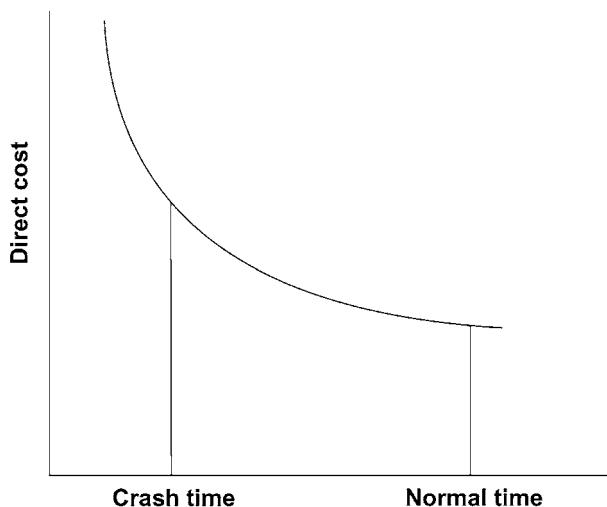
In this chapter, we will discuss the concepts of direct and indirect costs; the relationship between project time and project cost; the concept of cost slope and how the optimum cost and optimum duration are ensured for a given project while crashing.

PROJECT COSTS AND TIME

The costs associated with any project can be classified into two categories: (a) Direct costs and (b) Indirect costs.

Direct costs are those, which are directly proportional to the number of activities involved in the project. The more the number of activities, the more is the direct cost. Activity-wise costs are identified in terms of manpower and machine requirements.

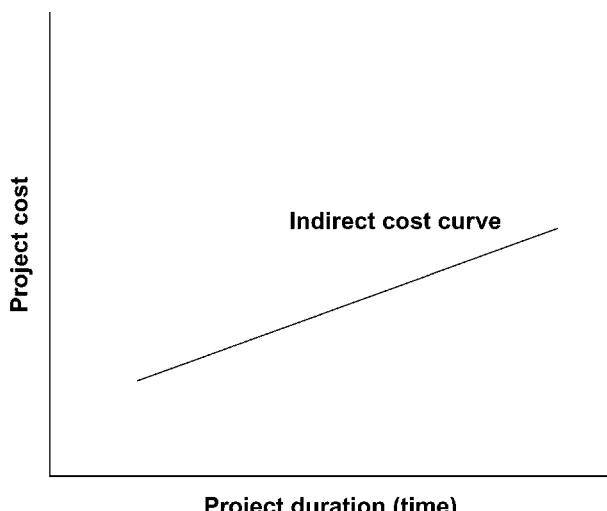
For example, if a software development project takes 10 days for four system analysts and 30 programmers, the direct cost, in this case, involves the salaries paid for this staff for 10 days. In case the project has to be completed within six days, more staff have to be recruited at different levels or the present staff have to work at two shifts, and more system analysts have to be employed, and thereby, the direct costs increase

**FIGURE 16.1** *Direct cost varies with time*

steeply. Time factor plays a vital role in determining the quantum of direct costs. This is illustrated in Figure 16.1. Direct costs in normal time are lower than those in crash time.

Indirect costs are those costs that are determined per day. Some of the examples for indirect costs are supervisory personnel salaries, supplies, rent, interest on borrowings, advertisement, depreciation, other fixed charges such as bonus to the staff, and so forth. The firm has to spend these irrespective of its level of business. These costs are directly proportional to the number of days of the duration of the project. If the project duration is reduced, the indirect costs also come down. Indirect costs per day are fixed. However, this assumption holds good only in the short run. In the long run, all costs are variable. Figure 16.2 explains the nature of fixed costs. The more the number of days in the project duration, the more is the total indirect cost.

In the above example of the software development project taking 10 days, the indirect costs work out to Rs 3,00,000 if the indirect costs per day amount to Rs 30,000. Where the project is to be completed within six days by pumping in additional inputs in terms of staff and systems, the indirect costs will come down to Rs 1,80,000 ($= 6 \times \text{Rs } 30,000 \text{ per day}$).

**FIGURE 16.2** *Indirect costs increase with the number of days in the project*

Normal cost is the cost that is incurred if the project is allowed to take its normal duration of time, considering the most efficient utilization of the resources.

Crash cost is the cost incurred to reduce activity duration to its minimum. The firm has to spend more if it intends to reduce the normal duration of an activity, and thereby, the project duration. In all, the crash costs would be more than the normal costs because of the extra wages, overtime, or extra costs spent to provide facilities to reduce the normal duration of the activity.

Normal time is the time required for a project to be completed at normal cost under normal circumstances.

Crash time is the possible time to which the duration of the project could be reduced by pumping additional resources. There may be economic benefits in completing the project ahead of schedule. For instance, a new product may capture a larger share of the market if it is introduced earlier than the competitor's product. Since the crash time involves spending of additional resources, every project manager will trade-off between the costs and time. It is carefully observed how far it is feasible to crash the duration of the project.

Cost Slope is the amount that has to be spent over and above the normal direct cost for reducing the duration by one unit of time (day, week etc.). Cost slope is defined as the additional cost for reducing one unit of time, assuming a given rate of increase in direct cost with a decrease in one unit of time. In other words, it represents the additional direct cost required for reducing the duration by one unit of time.

Here, it is assumed that the relationship between direct cost and time is a straight line. If it is not a straight line, there could be more than one cost slope. The relationship between the direct cost and time, as a falling straight line AB, is shown by a dashed line in Figure 16.3. The relationship between time and cost of an activity is formulated as:

$$\begin{aligned} \text{Cost slope} &= \frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}} \\ &= \frac{CC - NC}{NT - CT} = \frac{\Delta C}{\Delta T} \end{aligned}$$

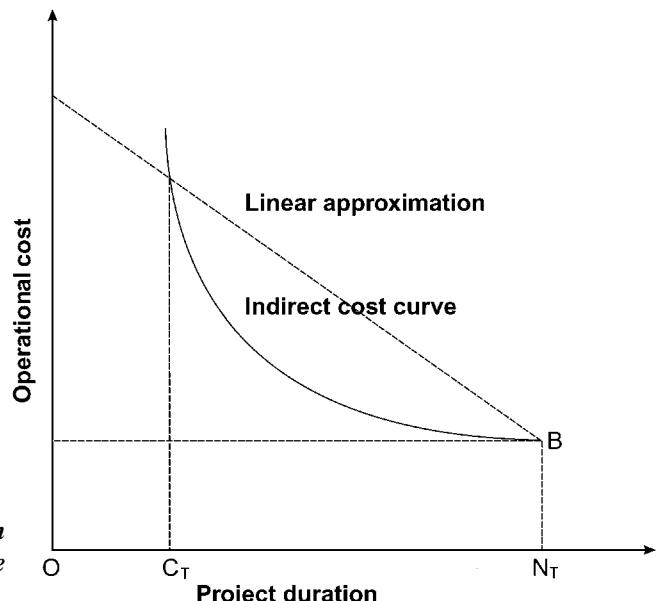


FIGURE 16.3 Linear relationship between time and cost of an activity—the dashed line indicates linear approximation

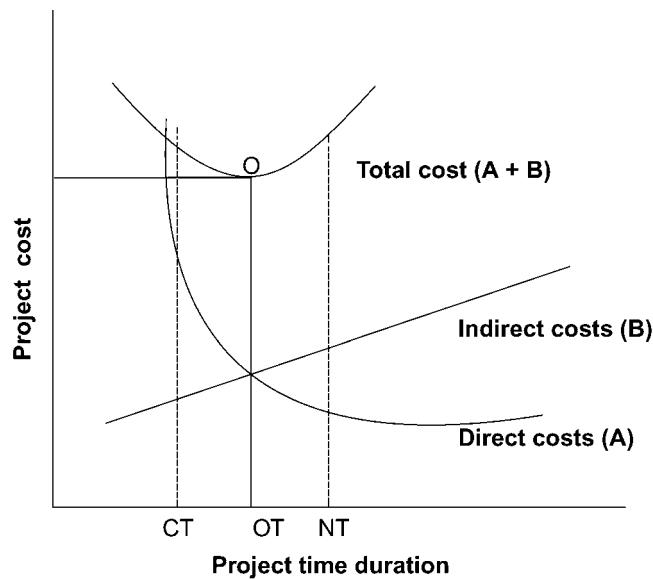
Cost slope is a very useful factor to determine, which of the activities has to be crashed in a sequence. Only such activities underlying the critical path, that is, the critical activities, need to be crashed. It is because the other non-critical activities have no influence on the critical path.

PROJECT CRASHING

In project crashing, the starting point is the critical path. Once the critical path in a network is identified, it is necessary to identify the priority to crash the activities by calculating the cost slope. The network diagram should be reconstructed at every stage of crashing incorporating the effect of crashing in the selected sequence.

For reducing the duration, extra expenditure is required to be incurred, but to save resources, organisations keep this extra expenditure at a minimum. As such, the decision to crash or expedite should be taken for only those activities, which would involve minimum extra cost. Further, these activities should be crashed to such an extent that the corresponding values of the cost slopes would fulfil the criteria of minimum extra cost.

From Figure 16.4 it can be observed that the direct costs (A) decrease with an increase in time. As the project duration increases, the indirect costs (B) increase. The total cost ($A + B$) curve is a flat U-shaped curve, which implies that only up to a particular point (O) the crashing is economical, not beyond.



(CT = Crash time, OT = Optimum time and
NT = Normal time)

FIGURE 16.4 Optimum cost and optimum duration

The time duration, which involves the least total cost is the optimum duration at optimum cost.

Crashing the duration of a project may not be possible beyond a particular point. In some cases, there could be scope to further crash the duration but it may not be economical. If time is not a constraint, it is not a prudent decision to crash beyond a particular optimal point. On the other hand, where time is a constraint, the project manager does not bother about the costs. The project has to be completed within that time at any cost!

EXAMPLE 16.1 Crashing the activities under critical path to reduce the project duration

Identify critical path for the following network. Show how far the project can be crashed.

Also, show the extent of increase in normal costs with every stage of crashing.

Activity	Preceding activity	Time (in weeks)		Cost (Rs)	
		Normal	Crash	Normal	Crash
A	—	6	4	5,000	6,200
B	—	4	2	3,000	3,900
C	A	7	6	6,500	6,800
D	A	3	2	4,000	4,500
E	B, C	5	3	8,500	10,000

Here, it is assumed that normal costs include overheads.

SOLUTION Let us draw a network as shown in Figure 16.5a for the above relationships:

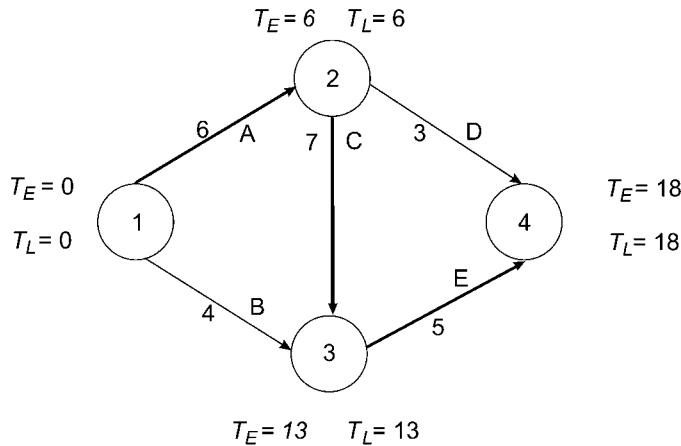


FIGURE 16.5a Network showing the critical path

This shows the critical path as 1-2-3-4. The total duration of the critical path is 18 days. The normal cost is Rs 27,000. Let us work out the cost slope for all the activities to ascertain the priority for crashing.

Activity	Preceding activity	Time (in weeks)		Cost (Rs)		Cost Slope and priority	Remarks
		Normal	Crash	Normal	Crash		
A(1-2)	—	6	4	5,000	6,200	600 (II)	
B(1-3)	—	4	2	3,000	3,900	450	not under CP
C(2-3)	A	7	6	6,500	6,800	300 (I)	
D(2-4)	A	3	2	4,000	4,500	500	not under CP
E(3-4)	B, C	5	3	8,500	10,000	750 (III)	

To start with, let us crash activity 2-3 as shown in Figure 16.5(b)

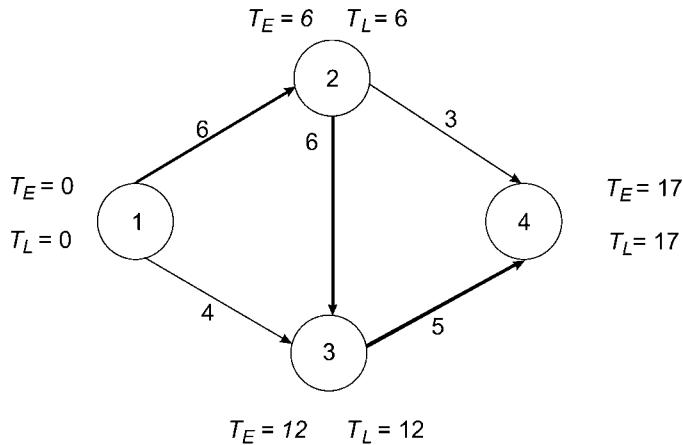


FIGURE 16.5b Network with activity 2-3 crashed by one day

Stage I: Crash activity 2-3 by one day

Now the duration is 17 days. There is no change in the critical path. The normal cost now is Rs 27,000 + Rs 300 = Rs 27,300. To reduce the duration further, we can crash activity 1-2, which costs Rs 600 per day as shown in Figure 16.5c.

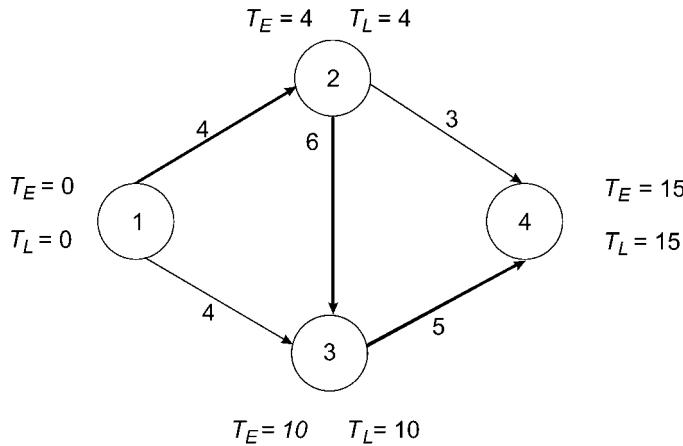


FIGURE 16.5c Network showing activity 1-2 crashed by two days

Stage II: Crashing activity 1-2 by two days

Now, the duration is 15 days. There is no change in the critical path. The normal cost is Rs 27,300 + Rs 1,200 = Rs 28,500. To reduce the duration further, we can crash activity 3-4, which costs Rs 750 per day, as shown in Figure 16.5d.

Stage III: Crashing of activity 3-4 by 2 days

Now, the duration is 13 days. There is no change in the critical path. The normal cost is Rs 28,500 + Rs 1,500 = Rs 30,000. Since all the activities under the critical path are crashed to their possible crash duration, there is no scope for further crashing.

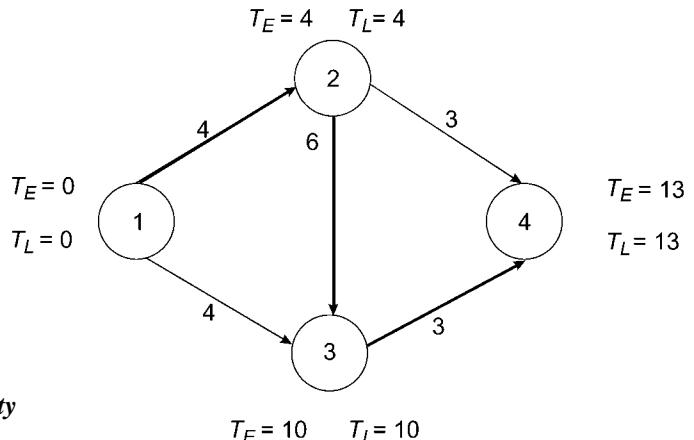


FIGURE 16.5d Network showing activity 3-4 crashed by two days

Thus, the project duration at every stage of crashing and the increase in normal costs can be summarised as below:

Project Duration	Normal Costs (Rs)
18 days	27,000
17 days	27,300
15 days	28,500
13 days	30,000

The project manager can decide whether to crash or not considering the incremental increase in the normal costs.

EXAMPLE 16.2 Changes in critical path with each stage of crashing

From the following particulars,

- draw the network
- calculate the earliest expected time; latest allowable occurrence time, and identify the critical path
- determine the cost slope
- prepare a statement showing the different stages of crashing and the corresponding cost estimates, assuming that the project has a fixed overhead cost of Rs 600 per day
- find out the optimum duration and cost for the project

Jobs	Normal time (in days)	Normal cost (Rs)	Crash time (in days)	Crash cost (Rs)
1-2	3	10,000	2	11,000
1-3	6	6,000	3	8,400
2-3	9	9,000	3	12,000
2-4	7	5,000	4	7,800
3-4	3	3,000	2	3,400

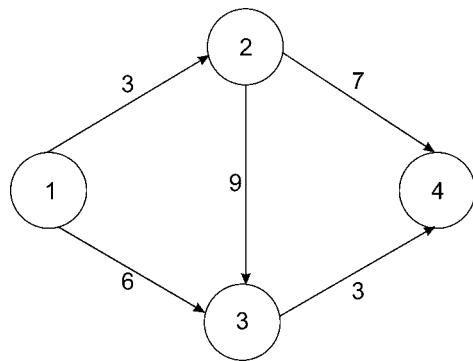


FIGURE 16.6a Network showing logical relationships

SOLUTION

- (a) Network for the given job: see Figure 16.6a.
- (b) Determining the earliest expected time (T_E) latest allowable occurrence time (T_L), and critical path.
 Here, the slack is zero ($T_L - T_E = 0$ for the end event). All events show zero slack, and hence, all the events fall under the critical path. The critical path is always the longest. So, the critical path is 1-2-3-4.
- (c) Determining the cost slope and the priority of crashing.

Jobs	Normal time (days)	Crash time (days)	Normal cost (Rs)	Crash cost (Rs)	Cost slope (per day)	Priority of crashing*
1-2	3	2	10,000	11,000	1000	V
1-3	6	3	6,000	8,400	800	IV
2-3	9	3	9,000	12,000	500	II
2-4	7	4	5,000	7,800	700	III
3-4	3	2	3,000	3,400	400	I
Total = Rs 33,000						

$$\begin{aligned}
 \text{Total cost of the project} &= \text{Direct cost} + \text{Indirect cost} \\
 &= \text{Rs } 33,000 + (15 \text{ days} \times \text{Rs } 600 \text{ per day}) \\
 &= \text{Rs } 33,000 + \text{Rs } 9,000 \\
 &= \text{Rs } 42,000
 \end{aligned}$$

Stage I: Crashing job 3-4 by one day

All the events have zero slack again. This shows that there is no change in the critical path. So the critical path continues to be 1-2-3-4. However, the total cost changes. The direct cost increases the additional crashing cost for job 3-4, that is, Rs 400.

*It is necessary to identify the priorities of crashing for the critical activities as the critical path tends to change at every stage of crashing.

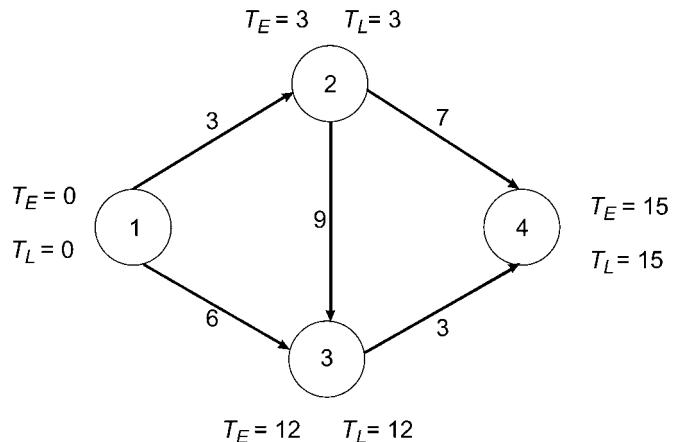


FIGURE 16.6b Network showing the critical path and normal duration

The cost slope indicates that it is the 3-4 job that can be crashed first. Job 3-4 can be crashed by only one day. Let us crash this job first, as shown in Figure 16.6c.

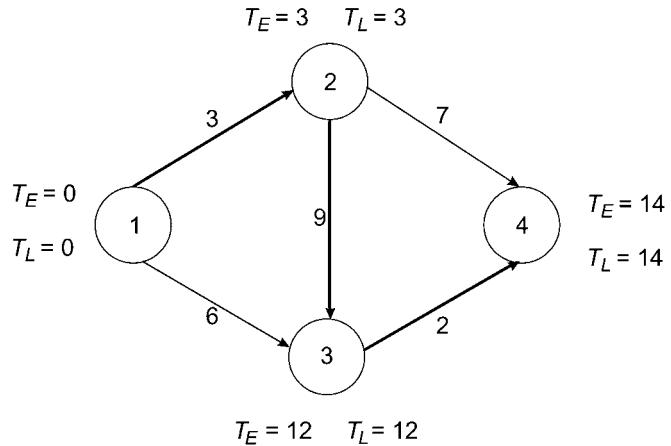


FIGURE 16.6c Network showing crashing of job 3-4

Total cost calculation at Stage I

$$\begin{aligned}
 \text{Total cost of the project} &= \text{Direct cost} + \text{Indirect cost} \\
 &= (\text{Rs } 33,000 + \text{Rs } 400) + (14 \text{ days} \times \text{Rs } 600 \text{ per day}) \\
 &= \text{Rs } 33,400 + \text{Rs } 8,400 \\
 &= \text{Rs } 41,800
 \end{aligned}$$

Stage II(a): Crashing job 2-3 by 6 days

Now the total duration of the project comes down to 10 days. It has come down by only four days. In other words, though job 2-3 can be crashed by six days, the benefit on the total duration is limited to only four days. Hence, crash job 2-3 by four days only. As such, the network in Figure 16.6d will change to Figure 16.6e.

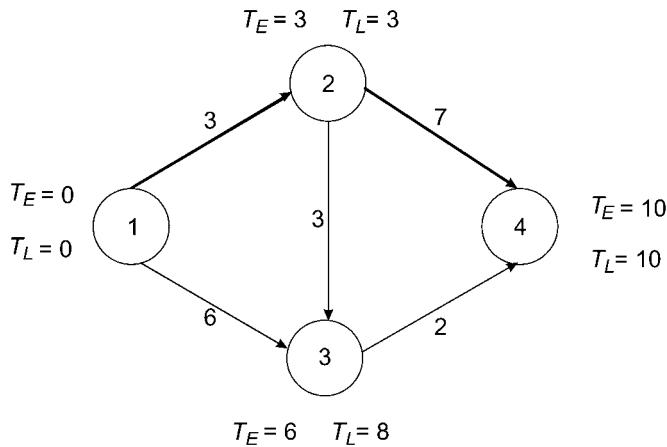


FIGURE 16.6d Network showing crashing of job 2-3

There is scope to further crash job 2-3. This can be crashed by six days. This is shown in Figure 16.6d in stage II(a).

Stage II(b): Crashing job 2-3 by 4 days

This shows that all jobs come under the critical path. Let us see the different paths and their respective duration to find out how many critical paths we have at this stage:

Path	Duration (in days)
1-2-4	10
1-2-3-4	10
1-3-4	8

Since the paths 1-2-4 and 1-2-3-4 have equal duration, both of these become critical paths.

Now, find the jobs underlying these paths and identify the jobs available for further crashing:

Path	Jobs	Comments
1-2-4	1-2	Available for crashing
	2-4	Available for crashing
1-2-3-4	1-2	Available for crashing
	2-3	Already crashed
	3-4	Already crashed

For further crashing, consider jobs 1-2 and 2-4. As per the cost slope considerations, it is cheaper to crash job 2-4. Hence, in the normal course, 2-4 should be considered for crashing at this stage. But since both paths 1-2-4 and 1-2-3-4 are equally critical, crashing of job 2-4 will reduce the duration of 1-2-4 only. It does not reduce the duration of the other critical path 1-2-3-4. Thus, crashing of 2-4 will not be of any use. However, we can consider crashing of the other job 1-2, which is common to both these paths. Crashing of job 1-2 is shown in Figure 16.6e in stage III.

Total cost calculation at stage II

$$\text{Total cost of the project} = \text{Direct cost} + \text{Indirect cost}$$

The direct cost increases by the additional crashing cost of job 2-3, that is, 2,000

$$\begin{aligned} &= (\text{Rs } 33,400 + \text{Rs } 2,000) + (10 \text{ days} \times \text{Rs } 600 \text{ per day}) \\ &= \text{Rs } 35,400 + \text{Rs } 6,000 \\ &= \text{Rs } 41,400 \end{aligned}$$

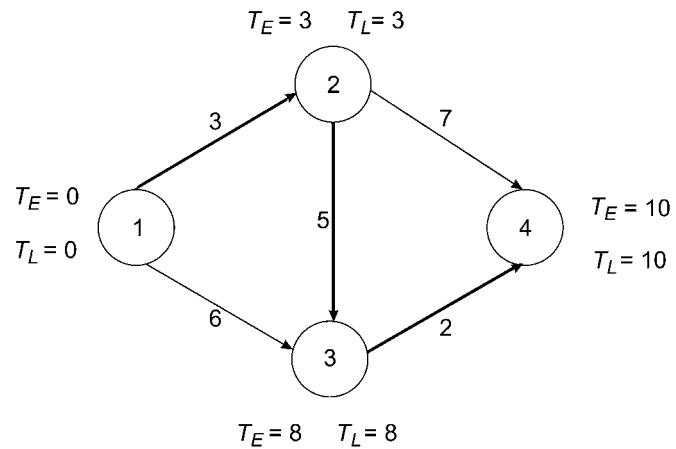


FIGURE 16.6e Network showing crashing of job 2-3 by four days only

Stage III: Crashing of job 1-2 by one day

Total cost calculation at stage III

$$\text{Total cost of the project} = \text{Direct cost} + \text{Indirect cost}$$

The direct cost increases by the additional crashing cost of job 1-2, that is, 1,000.

$$\begin{aligned} &= (\text{Rs } 35,400 + \text{Rs } 1,000) + (9 \text{ days} \times \text{Rs } 600 \text{ per day}) \\ &= \text{Rs } 36,400 + \text{Rs } 5,400 \\ &= \text{Rs } 41,800 \end{aligned}$$

At the end of stage III, the following are the paths and their respective duration:

Path	Duration (in days)
1-2-3-4	9
1-2-4	9
1-3-4	8

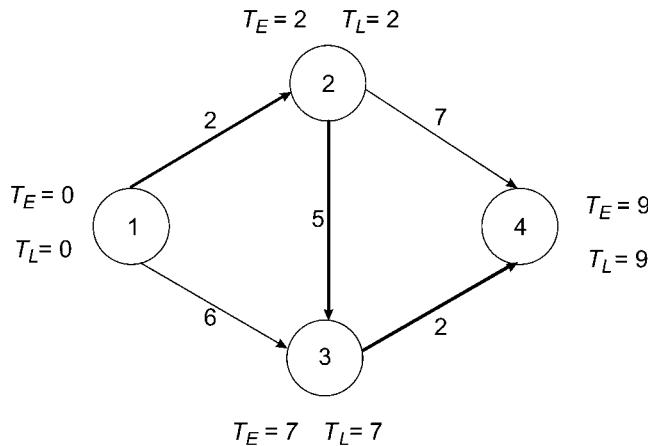


FIGURE 16.6f Network showing crashing of job 1-2 by one day

Thus, both the paths 1-2-3-4 and 1-2-4 continue to be critical (as these have equal duration). And all the jobs underlying these paths have already been crashed to their minimum duration. There is no scope for further crashing.

- (d) Let us make a statement of duration of the project at different stages of crashing and the corresponding costs. This is necessary to identify the optimum duration and optimum cost.

Jobs crashed	Days saved	Project duration	Direct cost (Rs)	Indirect cost (Rs 600 per day)	Total cost (Rs)
None	0	15	33,000	9,000	42,000
3-4	1	14	33,400	8,400	41,800
2-3	4	10	35,400	6,000	41,400
1-2	1	9	36,400	5,400	41,800

- (e) The above table reveals that the project duration of 10 days costs the least, that is, Rs 41,400. This is the optimum duration and the optimum cost. Unless there is strong reason such as availing of any incentive more than the cost of crashing; the visit of a dignitary such as the Chief Minister, Vice Chancellor, and others, further crashing is not advisable. This implies that there is scope to crash further by one day. However, the project cannot be crashed beyond nine days.

EXAMPLE 16.3 Crashing two activities simultaneously

Identify the critical path for the following network. Determine the incremental increase in the normal cost for each stage of crashing. Here, normal cost includes overheads.

Activity	Preceding Activity	Time (in days)		Normal cost (Rs)	Cost Slope (Rs)
		Normal	Crash		
A(1-2)	—	10	6	50,000	1500
B(2-3)	A	21	14	10,000	700
C(2-4)	A	8	6	15,000	2500
D(4-5)	C	15	12	20,000	1000

SOLUTION Let us first identify the critical path as outlined in Figure 16.7a.

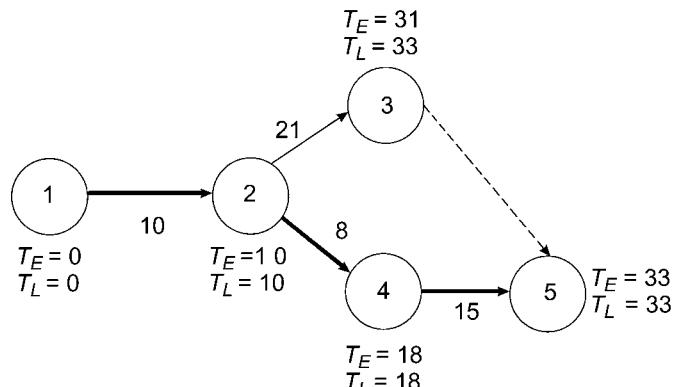


FIGURE 16.7a Network showing the critical path

The critical path in the above network is 1-2-4-5. The normal duration of the project is 33 days. The normal cost is Rs 95,000.

TABLE 16.1 Cost slope priorities

Activity	Preceding Activity	Time (in days)		Normal cost (Rs)	Cost Slope (Rs)	Priority of crashing
		Normal	Crash			
A(1-2)	—	10	6	50,000	1500	II
B(2-3)	A	21	14	10,000	700	
C(2-4)	A	8	6	15,000	2500	III
D(4-5)	C	15	12	20,000	1000	I

The crashing sequence can be determined on the basis of the cost slope. Table 16.1, showing cost slope priorities reveals that among activities 1-2, 2-4, and 4-5, activity 4-5 can be crashed first. It is so because it costs the least. This has been shown in Figure 16.7b in stage I.

Stage I: Crash activity 4-5 by three days

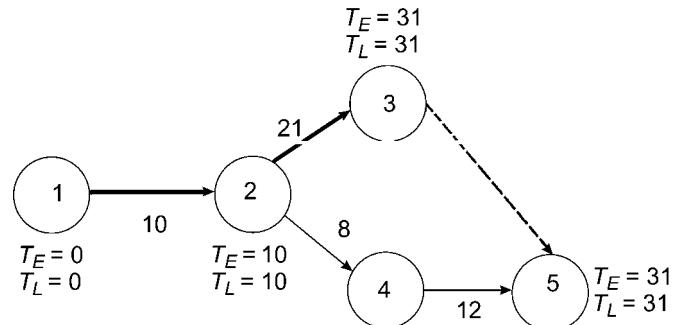


FIGURE 16.7b Network showing activity 4-5 crashed by three days

Here, the critical path changes to 1-2-3-5. However, the project duration comes down to 31 days. The normal cost increases to Rs 97,000. The increase is by Rs 2,000 at Rs 1000 per each day saved. Though activity 4-5 may be crashed by three days, the project duration gets reduced by two days only. With crashing activity 4-5 by two days, Figure 16.7b will change to Figure 16.7c.

Stage I (a): Crashing of activity 4-5 by two days only

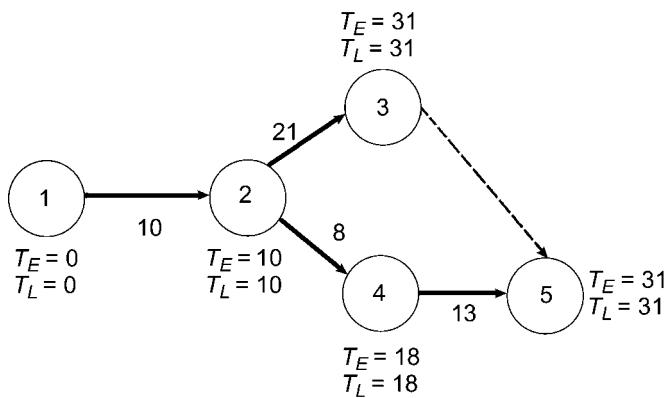


FIGURE 16.7c Network showing activity 4-5 crashed by two days only

Crashing of activity 4-5 by two days results in two critical paths: 1-2-3-5 and 1-2-4-5, both with 31 days. This means both paths are equally critical. Of the activities underlying these paths, activity 4-5 has already been crashed. Now crashing of either of the activities 2-3 or 2-4 does not help in reducing the duration of both the critical paths. So, activity 1-2 is the next alternative that will benefit both the critical paths.

Stage II: Crashing of activity 1-2 by four days

At stage II, activity 1-2 can be crashed by 4 days, as shown in Figure 16.7d.

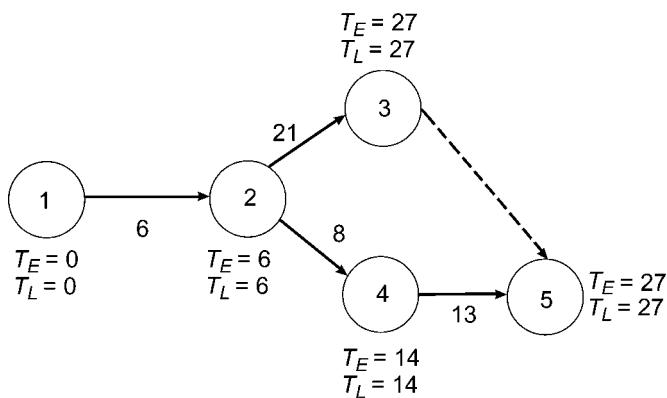


FIGURE 16.7d Network showing activity 1-2 crashed by four days

Crashing of activity 1-2 by four days reveals two critical paths, 1-2-3-5 and 1-2-4-5, with 27 days of project duration. At this stage, the activities available for crashing now are 2-3 and 2-4. These should be crashed together because crashing either of the activities individually will not help in reducing the project duration.

Stage III: Crashing of activities 2-3 and 2-4 together

At stage III, the activities of 2-3 and 2-4 are crashed together, as shown in Figure 16.7e.

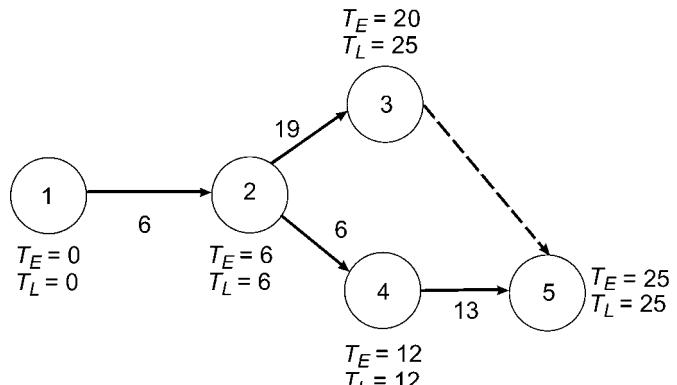


FIGURE 16.7e Network showing crashing of activities 2-3 and 2-4 together

Since the project duration is reduced only by two days, crashing 2-3 by seven days is not advisable. As it can be seen, at event 3, there is a slack of five days ($T_E = 20$; $T_L = 25$). Why should we have a slack of five days at event 3 by crashing 2-3 activity by seven days? This results in unnecessary increase in costs. So, the best alternative would be restricting crashing of activity 2-3 to two days only. Hence, activity 2-3 can be advantageously crashed by two days. Thus, the slack at event 3 will be zero.

Stage III (a): Crashing of activity 2-3 by two days only

By crashing the activity 2-3 by two days only, the network in Figure 16.7e will change to that shown in Figure 16.7f.

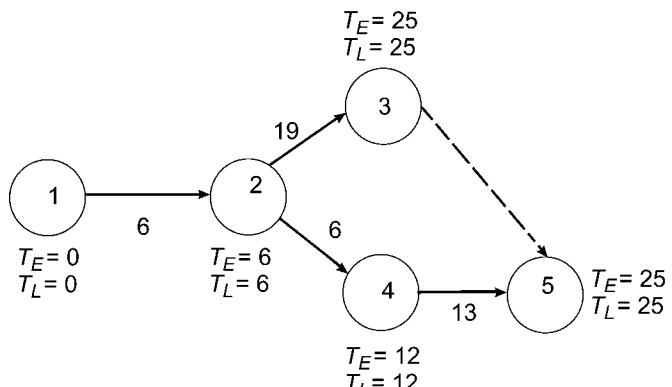


FIGURE 16.7f Network showing activity 2-3 crashed by two days only

The critical paths continue to be the same as 1-2-3-5 and 1-2-4-5 with path lengths of 25 days each. Since all the activities underlying both these paths are already crashed, there is no scope for further crashing. Table 16.2 outlines the calculation of the total normal cost at every stage of crashing.

TABLE 16.2 Calculation of total normal cost for the project

<i>Stage of crashing[⊗]</i>	<i>Project duration</i>	<i>Total normal cost (Rs)</i>
With no crashing	33 days	95,000
Stage I (activity 4-5)	31 days	(95,000 + 2000) = 97,000
Stage II (activity 1-2)	27 days	(97,000 + 6000*) = 103,000 *(4 × 1500 = 6000)
Stage III (activities 2-3 and 2-4)	25 days	(103,000 + 6,400*) = 109,400 Activity 2-3: (700 × 2 = 1400) Activity 2-4: (2500 × 2 = 5000) *(1400 + 5000 = 6400)

[⊗]Each stage of crashing includes the earlier stages of crashing, if any. For example, stage 3 crashing includes stage 2 crashing.

Gaps in Project Management

The Project manager has to guard himself against the following likely gaps in Project Management:

1. Quite often, the customer needs are not stated effectively.
2. Customer needs, most often, are not understood correctly.
3. At times, customer needs are not translated into projects effectively.
4. Project plans are not effectively executed.
5. Project management team is not empowered in an appropriate manner and not made a party to the decision making.

Why do projects get delayed?

Project management is more than effective coordination of various resources such as men, materials, and infrastructure for the execution of the project as per the plan. This is brought out by the following two examples.

- To project manager, in a production organisation, gathers information on the details of each and every task from the concerned departments. For instance, the standard time particulars of a particular task are available from the industrial engineer. Similarly, the data on the availability of materials is available from the materials manager. The project manager should coordinate the tasks considering the availability of the materials in time and the tasks are executed within the standard time. If there is a delay in any of these tasks, the project also gets delayed.
- In a particular road-bridge construction project, the following were some of the causes identified for the project delay:
 1. Delay in finalising the bridge structural designs
 2. Delay in acquiring the land or public litigation
 3. Delay in release of funds
 4. Differences with the contractors and so on.

Computers in Project Management There are various comprehensive and sophisticated software packages available to address the needs of the project manager in the following ways:

- Network for any complex projects can easily be drawn fast.
- Gantt bar charts can be displayed by merely entering the data.
- The possible schedule dates for completion can be worked out for the given network.
- The activities can be sorted out by listing of the activities with dates or by departments.
- The requirements of resources for each department or site can be assessed and allocated as per the needs.
- The calculations pertaining to normal cost and crash cost can be worked out easily for any given number of activities.
- PERT calculations, such as the average time estimate, earliest expected time, latest allowable occurrence time, variance, standard deviation, normal deviate, and others, can be worked out.

How can we minimize the gaps in the project management?

The following are some of the strategies to minimize and bridge the gaps in project management.

1. Establish a close interaction between the customer and the project team to clearly define the project requirements.
2. Identify the primary and secondary objectives of the project. Achieving the primary objectives is essential and achievement of secondary objectives is desirable.
3. Never lose the sight of project objectives.
4. Encourage and ensure adequate communication between project team and top management.
5. Discuss proactively and evaluate decisions concerning time and tradeoffs.
6. Ensure that the infrastructural inputs, support, and necessary funds are made available in time as per the project plan.
7. Adhere to the time, cost, and quality performance.
8. Establish an effective project review mechanism wherein the customer representatives and the project team, who are empowered with appropriate authority, can participate.
9. Periodically review the project progress, identify/diagnose the problems and develop remedial measures. Involve the project team and the customer in this process, wherever necessary.
10. The project objectives are to be reviewed periodically so that they can be met effectively.
11. Encourage the project team members to express their opinions freely during the review meetings.
12. Evaluate all deviations from the project plan, however small they are, before they get compounded.
13. Continue to get visible commitment of the top management.
14. Update the PERT chart as the project progresses, whenever required.
15. Be sensitive to environmental threats and respond to them in a proactive manner.

- The trade-off between cost and duration for ascertaining optimum utilisation of resources can efficiently be handled.
- The project manager has to evaluate a number of alternatives, such as, what happens if a particular activity takes two days more than its normal duration, does the critical path change, to what extent does it affect total costs, and so on. These ‘what if?’ calculations can be made by computer programs.

SUMMARY

- ◆ Project cost can be divided into direct costs and indirect costs.
- ◆ Direct costs change directly in proportion to the number of activities involved in the project. The more the number of activities, the more is the direct cost.
- ◆ Indirect costs are fixed per day, week, or month. The more the number of days or weeks, the more is the total indirect cost.
- ◆ Normal cost is the cost incurred if the project goes as per schedule.
- ◆ Crash cost is associated with the minimum possible time for an activity. Crash costs will be more than the normal costs.
- ◆ Normal time is the time required for the project to be completed at normal cost under normal conditions.
- ◆ Crash time is the possible time to which the duration of the project could be reduced by spending additional resources.
- ◆ Cost slope is the amount that has to be spent over and above the normal direct cost for reducing the duration by one unit of time (day, week etc.). Cost slope is determined by the following formula:

$$\begin{aligned}\text{Cost slope} &= \frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{crash time}} \\ &= \frac{CC - NC}{NT - CT} = \frac{\Delta C}{\Delta T}\end{aligned}$$

- ◆ Cost slope indicates the priorities for crashing. Only the activities under the critical path shall be crashed.
- ◆ The crashing of an activity may lead to a change in the critical path.
- ◆ At times, it may not be possible to reduce the project duration by the equal number of days of crashing of a particular activity. In such a case, it is necessary to redraw the network considering the minimum number of days of crashing for the activity under consideration.
- ◆ Where there are two critical paths, crash first the common activity falling under the critical paths. Cost slope priority, in this context, has no meaning.
- ◆ Sometimes, it may be necessary to crash more than one activity together to reduce the project duration.

REVIEW QUESTIONS**Question I: Multiple Choice Questions**

1. Which form the costs directly proportional to number of activities in project?
 - (a) Optimal costs
 - (b) Variable costs
 - (c) Direct costs
 - (d) Differential costs
2. What are the costs that are determined per day?
 - (a) Direct costs
 - (b) Differential costs
 - (c) Direct Costs
 - (d) Indirect Costs
3. Which of the following costs varies with time?
 - (a) Optimal costs
 - (b) Variable costs
 - (c) Direct costs
 - (d) Indirect costs
4. Interest on borrowings and advertisements form a part of
 - (a) Optimal costs
 - (b) Differential costs
 - (c) Direct costs
 - (d) Indirect costs
5. Which of the following costs increase with the number of days in the project
 - (a) Indirect costs
 - (b) Differential costs
 - (c) Direct costs
 - (d) Optimal costs
6. What does Crash cost mean?
 - (a) Cost incurred due to crash
 - (b) Cost incurred due to errors
 - (c) Cost incurred to reduce activity duration to minimum
 - (d) None
7. What is the possible time to which the duration of the project could be reduced by pumping additional resources?
 - (a) Normal cost
 - (b) Normal time
 - (c) Crash time
 - (d) None
8. What is cost incurred if project is allowed to take normal duration of time?
 - (a) Optimum cost
 - (b) Excessive cost
 - (c) Normal cost
 - (d) Deterministic cost

9. What amount that is spent over and above normal direct cost for reducing the duration by one unit of time
 - (a) Optimum cost
 - (b) Excessive cost
 - (c) Cost slope
 - (d) Deterministic cost
10. Which of the following the relationship between time and cost of an activity
 - (a) Cost slope = $\frac{\text{Crash cost} - \text{Normal Cost}}{\text{Normal Time} - \text{Crash Time}}$
 - (b) Cost slope = $\frac{\text{Normal cost} - \text{Crash cost}}{\text{Crash Time} - \text{Normal Time}}$
 - (c) Cost slope = $\frac{\text{Normal time} - \text{Crash cost}}{\text{Crash Time} - \text{Normal cost}}$
 - (d) None

Question II: Fill in the Blanks

1. Direct costs are those, which vary with the number of in the project.
2. Indirect costs are always per given unit of time, in the short run.
3. Total cost is the aggregate of and costs.
4. Rent or advertisement is an example for costs.
5. The time required to complete the project under normal conditions and under normal cost is called
6. refers to the duration of such project, which can be reduced to a lower period by pumping additional resources.
7. The additional cost per additional unit of time assuming a linear rate of approximation, is called

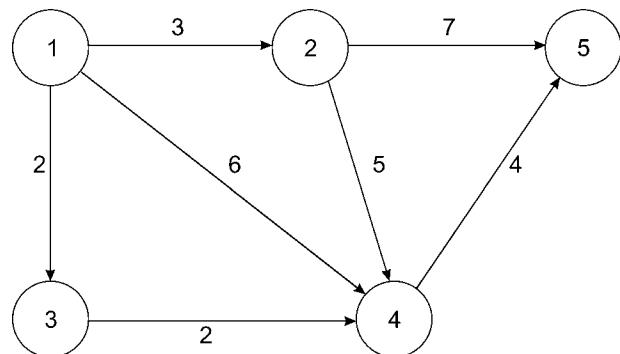
Question III: Short-answer Questions

Write short notes on the following (not more than six lines each):

1. Cost slope
2. Direct costs and indirect costs
3. Optimum duration and cost

Question IV: Answer the Following:

1. Explain the nature of costs in a project. Discuss how the project manager should go about analysing the costs while different activities are to be crashed in a project.
2. The following network shows the activities to be carried out to launch a product by a marketing manager. Show the critical path. The numbers on the activities represent the activity duration in days.

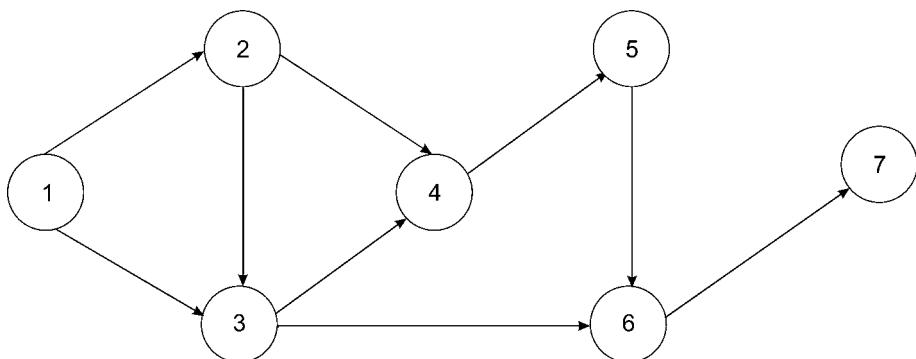
**FIGURE Q1**

3. The particulars of cost and duration are given in the following table:

Activity	Normal cost		Crash cost	
	Days	Cost (Rs)	Days	Cost (Rs)
1-2	3	500	2	1,000
1-3	2	750	1	1,500
1-4	6	1,400	4	2,600
2-4	5	1,000	3	1,800
2-5	7	1,150	6	1,450
3-4	2	800	2	800
4-5	4	1,000	2	2,400

Show the calculations of total cost at every stage of crashing.

4. The network given in Figure Q2 pertains to the construction of a culvert, which consists of nine activities.

**FIGURE Q2**

Other particulars are given in the following table:

Activity	Normal cost		Crash cost	
	Days	Cost(Rs)	Days	Cost (Rs)
1-2	4	350	3	400
1-3	5	1,450	3	1,620
2-3	7	2,200	5	2,400
2-4	11	1,120	7	1,600
3-4	9	400	5	960
3-6	12	1,600	9	1,810
4-5	6	450	4	610
5-6	6	1,200	4	1,440
6-7	4	500	3	860

Determine the critical path for the above network. Also, determine the optimum duration that involves the optimum cost.

5. Work out optimum duration and optimum cost for the following project:

Activity	Preceded by	Normal cost		Crash cost	
		Days	Cost (Rs)	Days	Cost (Rs)
A	—	10	5,00,000	6	5,60,000
B*	A	21	1,00,000	14	1,49,000
C	A	8	1,50,000	6	2,00,000
D	C	15	2,00,000	12	2,30,000

*B restricts the completion of D.

6. Calculate cost slopes and the critical path for the following network:

Activity	Preceded by	Normal cost		Crash cost	
		Days	Cost (Rs)	Days	Cost (Rs)
1	—	6	5,000	4	6,200
2	—	4	3,000	2	3,900
3	1	7	6,500	6	6,800
4	1	3	4,000	2	4,500
5	2, 3	5	8,500	3	10,000

Also construct a statement showing the optimum cost and duration.

7. You have heard recently about PERT and CPM. You are considering a project, which can be divided into activities A to H. Estimates have been made of the time and cost each will take under normal conditions and under crash conditions.

Activity	Preceded by	Normal cost		Crash cost	
		Days	Cost (Rs)	Days	Cost (Rs)
A	—	3	1,600	1	2,400
B	—	4	2,300	2	2,700
C	A, B	4	2,800	2	3,000
D	B	5	2,400	2	2,900
E	C, D	8	4,400	4	6,000
F	E	6	3,200	4	4,500
G	A	18	7,000	10	15,000
H	G, F	6	3,200	5	4,000

Indirect costs are estimated at Rs 3,000 per day.

You are required to

- (a) identify and state the different paths through the network
 - (b) calculate and state the normal time for completion and the normal costs
 - (c) calculate and state the minimum time for completion and minimum cost of completion in this time
 - (d) explain clearly the comparative features of both PERT and CPM
8. Kamal Constructions has been awarded a contract to construct an office building. The project has been broken down into a number of activities:

Activity	Preceding activity	Normal		Crash	
		Time (Weeks)	Cost (Rs)	Time (Weeks)	Cost (Rs)
A	—	8	1,00,000	6	1,25,000
B	—	2	75,000	1	90,000
C	A	13	1,35,000		
D	A	7	70,000	5	85,000
E	B	5	1,60,000	3	2,00,000
F	C, D	9	2,55,000	7	2,75,000
G	D	12	30,000		
H	D, E	4	90,000	2	95,000
I	G, H	3	55,000		
		Rs 9,70,000			

The overheads on this project are Rs 5,000 per week

You are required to:

- construct a network diagram for this project, and hence, determine the minimum project duration and its associated cost.
- consider this case: the builders are subsequently offered a bonus of Rs 25,000, if they can complete the project in 20 months or before. Their site manager is aware that certain activities only can be

speeded up, if necessary, at additional cost as mentioned in the above table. (Activities C, G, and I cannot be crashed). Find the minimum cost project schedule, and hence, determine whether or not the builders should accept the bonus offer.

9. A maintenance foreman has given the following estimate of time and costs for jobs in a motor-overhaul project:

<i>Job</i>	<i>Predecessors</i>	<i>Normal duration (hours)</i>	<i>Normal cost (Rs)</i>	<i>Crash duration (hours)</i>	<i>Crash cost (Rs)</i>
(a) Disassemble motor	—	8	160	6	200
(b) Clean and paint frame	A	7	80	4	190
(c) Rewind armature	A	12	200	5	380
(d) Replace bearings	A	9	140	5	220
(e) Assemble and inspect motor	B, C, D	6	100	6	100

The indirect costs work out to Rs 50 per hour. Determine the optimum duration and cost.

10. Consider the project given below:

<i>Job</i>	<i>Normal Cost (Rs in 000's)</i>	<i>Normal Time (weeks)</i>	<i>Crash Time (weeks)</i>	<i>Cost Slope Per Week (Rs in 000's)</i>
1-3	12	20	14	8
1-2	16	10	8	4
2-3	8	6	4	4
3-5	9	8	6	6
3-4	13	10	6	6
4-7	16	12	6	10
5-6	8	10	4	2
5-7	7	12	8	4
7-8	14	12	8	6
6-8	6	8	6	6

- (a) Determine the critical path taking scheduled completion time two days less than the earliest expected time.
 (b) Given the overhead costs as Rs 5,000 per week, determine the optimal duration of the project.

Answers to Question I

1. c 2. d 3. c 4. d 5. a
 6. c 7. c 8. c 9. c 10. a

Answers to Question II

- | | |
|----------------------------|-----------------------|
| 1. <i>activities</i> | 5. <i>normal time</i> |
| 2. <i>fixed</i> | 6. <i>Crash time</i> |
| 3. <i>direct, indirect</i> | 7. <i>cost slope</i> |
| 4. <i>indirect</i> | |

UNIT VII

Chapter 17: The Corporate Planning Process

Chapter 18: Environmental Scanning and SWOT Analysis

Chapter 19: Strategy Formulation and Implementation

17

THE CORPORATE PLANNING PROCESS

Learning Objectives

By the time you study this chapter, you should be able to

- understand the basic concepts of corporate planning
- analyse the steps involved in the corporate planning process

INTRODUCTION

Corporate planning refers to the process of planning undertaken by the top management to achieve their organisational goals. Two significant phases in corporate planning are: environmental scanning and strategy formulation. Mission is the guiding force for all the activities here. The first step in the process of achievement of the mission is to break the mission into objectives. Strategies and programmes have to be formulated and implemented to achieve the given objectives, which would eventually lead to the fulfillment of the mission. To be successful, it is essential to know what changes are necessary in the corporate plans and how to initiate them, and to adapt to a continuously changing business environment. This chapter deals with the concepts and elements of corporate planning.

BASIC CONCEPTS OF CORPORATE PLANNING

Mission

This is also called ‘overall objective’ or ‘overall goal’. For long-term survival, the corporates have to gain acceptability in the society and this is achieved through mission. William F. Glueck¹ calls this ‘legitimisation’. The companies legitimise their existence by showing that they are of value to the society.

The corporate planners always want to seek answers to questions such as ‘what does the business want to achieve in the years to come?’, ‘What business is it associated with?’ Answers to these questions require a careful definition of the mission or the scope of the business activities the company pursues. The mission statement defines the basic reason for the ‘existence of organisation’ and provides the basic philosophy of what the company is all about.

Mission statements can be very effective if they are guided by a vision or a challenging dream that directs the efforts of the company for the years to come. The dream of Akio Morita, Sony’s former President, to bring ‘personal portable sound’ within the reach of everyone, was the guiding spirit for his company to create the walkman and the portable compact disk player. Thus, the vision usually emanates from the entrepreneur who founded the firm or from major strategists engaged in the firm’s development over a period of time.

Definition

A mission statement defines why the organisation exists. It describes the customer needs, both present and future. It identifies the functions to be pursued. It focuses on the markets where the company can operate. It outlines the corporate philosophy about the overall design, orientation to quality, and work culture. It may specify the role the company has to play in the society.

The mission statement is an explicit written statement of what an organisation wishes to achieve in the years to come. Mission statements provide substance to the perceived purposes of the organisation. They provide inspiration and guidance to the employees at all levels to put forth their best in their individual and collective efforts in the organisation. A mission statement is said to be well defined if it can explain to all the concerned the basic purpose of organisation, the image and character the organisation wants to create for itself, and finally what it is committed to.

Characteristics of a Mission Statement

- (a) *It must be clear enough to trigger action* A clear statement of mission facilitates clear understanding among the employees. This, in turn, leads to action. NASA's mission in the 21st century is to know more about Mars. The mission of a university could be to provide teaching, research, public service through training and consultancy, cultural entertainment and promoting team spirit through sports.
- (b) *It focuses on customer needs and utilities, not products* A mission statement should define the broad scope of activities within which the company will operate competitively. It may specify the details of the range of industries, products, and their markets. However, all these must be built around customer needs and utilities. For example, Tata Cellular is in communications, not telephones. Bollywood does not just produce movies, it provides entertainment. If products are referred to, it may limit the validity of the mission statement. Customer needs are more permanent than the products, which always keep changing.
- (c) *It should be capable of being measured in terms of specific targets* Organisations must establish specific targets so that the performance can be exactly measured. If a university states in its mission that it would promote 'technological education' and fixes a target to provide admission for 40,000 engineering students per year across the country, it can evaluate its progress by comparing the actual number of admissions made in a particular year with the target.
- (d) *It should focus on limited number of goals* The mission statement has to prioritise its preferences and put forward what it wants to achieve in the years to come.
- (e) *It outlines the major policies and values the company wants to honour* A mission statement spells out the major policies and values the top management is committed to. This will set the direction for quality orientation and work culture throughout the organisation.
- (f) *It also identifies the core principles to guide decision-making* These principles serve as mechanism for self-control to guide managers at all levels of the organisation. For example, Voltas in its mission statement states 'we will be among the 10 most admired industrial corporations in the country capable of delivering, as a market leader, products and services which are globally competitive... and our values of justice, fair play, and integrity in our areas of core competence'.
- Where quick decisions are needed at the lower levels of an organisation, such core principles serve as a guide in the decision-making process. It also enables the managers to take such actions that are consistent with the values outlined in the mission.
- (g) *It should be flexible* No mission statement can ever be rigid and hard. It should be flexible. If the company finds that the mission is achieved or the present mission does not hold relevance any more,

or it is not economical to pursue the mission further, it is free to modify its mission statement. Kodak added digital processing to its list of activities and changed its profile to an image company. However, it should be ensured that the mission statements are not revised very frequently, whenever there is a new turn in the economy. An organisation should be given reasonable time to perform and succeed.

- (h) *It provides for shared vision* Mission statements have to be communicated down to the lowest levels in the organisation. A successful organisation is one that involves its executives in developing a mission statement for the company. When the executives are involved in the vision-building process, they develop a shared vision. It is essential to get the spirit of the corporate mission injected into the veins of the organisation so that each of its employees gets inspired and feels as an integral part of the organisation.

Exhibit 17.1: Shared vision

Roger Smith, Chairman, General Motors, immediately after taking over office, chose to promote a shared vision by distributing 'culture cards' to all the executives. The idea was that they should always carry the card to be mindful of their new mission.

This card outlined the fundamental purpose of General Motors—to provide quality products and services. In the process, the customers were to get superior value for their money, the employees were to get competitive salaries and the business partners were to receive the profits resulting from the sustained growth of the business.

When the employees down the levels in the organisation understand the mission, they too share the vision of the organisation. Shared vision makes all the difference. When the employees understand the spirit of the decisions taken by the management, they tend to become more cooperative than critical. It simplifies the job of the manager.

- (i) *It is a facilitator* The statement guides employees, particularly when they are dispersed over different geographical locations, to work independently and yet collectively towards realising the organisational goals. They work with the principle of 'unity in diversity'.

To sum up, the mission statement shows the direction for the company to accomplish its goals. The mission statements are to be drawn with foresight, care and diligence since these govern the efforts of the organisation for generations to come. An understanding of the micro and macro level business environment makes the mission statement more realistic. The starting point of any corporate planning exercise is to spell out the mission.

Goal

Goals are the overall objectives of a department or an organisation. For instance, the goal of the army is to emerge victorious against the enemy. The goal of the football team is to win. The goal of the manager is to create surplus for the company. Here the goal is for the entire team. Every player contributes his/her best to achieve the goal. The captain of the team coordinates the efforts of all these individual players for victory or achievement of common goal. Every individual is clear and conscious about what is required of him/her to achieve the goal. Even if a single player fails to deliver his best effort, it will affect the group performance.

Similarly, the manager is concerned with the achievement of the goals set by the top management. If the mission for an engineering organisation such as Bharat Heavy Electricals Limited (BHEL) is to be innovative

in engineering enterprise in providing total business solutions, the corporate office may fix responsibility of developing say at least three new applications as a goal for each of its R&D departments all over the country. At times, a manager may be handling multiple goals of satisfying customers, maximising profits and reducing costs.

Definition

Goal is defined as what an organisation wants to achieve during or by the end of a given period. Based on the time frame, goals may be classified as long-term or short-term goals. Getting into any of the Indian Institutes of Management (IIM)* may be a long-term goal for a student who is in the second or third year of engineering but for a final year student, it is a short-term goal. Short-term goals are those which are to be achieved in less than a year whereas the time frame for long-term goals is more than a year. The goals are always set within the scope of the mission statement.

Significance

- (a) *It helps to define the organisation in its environment* By stating the goals, the company can attract people who identify with these goals to work for them. A non-government organisation (NGO) announces its mission as ‘to empower women’ and goal as ‘to educate the tribal women about the self-employment opportunities during next five years’. All those individuals who volunteer to work in this direction join this organisation. Thus, goals define what the enterprise is all about.
- (b) *It helps in coordinating decisions* Goals help the managers to coordinate resources and the efforts of the employees under their command effectively. A general manager coordinates the efforts of production and sales manager to achieve the goal of increasing the market share by 10 per cent in a given year. Employees must be aware of the organisational goals so that they act in the way the top management wants them to, thereby functioning in a conflict-free environment.
- (c) *Goals are more tangible targets* Goals are capable of being measured. At times, the mission statement may look abstract. One should be innovative in the goal-setting process. Output goals can be in terms of quality, variety, and the types of potential and targeted customers or clients. The clearer and more verifiable the goal is, the better can be the managerial effectiveness.
- (d) *It facilitates performance appraisal* The performance of both the organisation and the individuals in it can be evaluated by considering whether the goals have been achieved or not. Where the goals are not measurable or quantifiable, the organisation cannot evaluate the individual or corporate performance effectively.

Objectives

Objectives explain why one should do the given job. For example, ‘why should I do this work now?’ ‘what shall I have to achieve?’

Once the mission is clear, goals are fixed for individual departments; the next stage is to break down the goal into objectives for every level in the organisation. The objectives get narrowed and specific as one moves from the top to the lower levels in the organisation. Defining objectives precisely is not a small job. It calls for discussions among the managers of different levels and at different stages. The group of managers at every hierachial level in the organisation is responsible to achieve the objectives set to their level. Objectives** may

*These are the premier institutes in management education

**Managerial objectives have been discussed in detail in chapter 5.

be general or specific. As the managerial process gets more and more complex, objectives continue to guide the managers in their day-to-day performance.

Policy

Policy is a broad guideline set by the top management for the purpose of making decisions at different levels in the organisation. Once the corporate objectives are established, policies can be formulated. Organisation policy reflects the owners' attitudes to different segments such as creditors, the employees, customers, and the society at large. The laws applicable to a particular area or a country may shape the organisational policies. If you see the organisation as an owner, it may not require many policies as such. But if you view the same from a stakeholder's* point of view, it may call for a wide range of policies. The features of policy can be stated as follows:

- (a) *It expresses organisational culture* Policy statement is an expression of organisational culture and commitment to the given mission. It is a statement of how one has to conduct oneself in a given situation. It outlines what one can or cannot do.
- (b) *It is a guide to managerial performance* It is intended to help the managers in their routine. Whenever there is any confusion in conducting organisational matters, the managers refer to what is stated in the policy.
- (c) *It brings out uniformity in action* Policies are designed to bring uniformity in the managerial performance, particularly in multi-location setting of an organisation. Policies cause managers to take action in a defined way.
- (d) *It provides discretion to managers* They also provide certain amount of discretion to the managers. The manager can use his/her discretion, in the best interest of the organisation, to decide when the given situation is different from what is outlined in policy. In this case, the manager will have to justify his/her decision.
- (e) *It creates and sustains good conduct and character* Policies are meant for creating and sustaining good conduct and character among the employees at different levels in the organisation. Payment of salaries on the first day of the month can be cited as policy and if this is strictly adhered to, it will create good conduct and character among the workforce. It is likely that the employees continue to be honest when they are paid their wages and salaries in time.
- (f) *Policies can be of different kinds based on their purpose* Some policies are based on ethical and philosophical considerations. Some focus on functional aspects of business, say, marketing, finance and so on. The basic idea remains the same: to be helpful to the managers in running the department smoothly.

The following are some examples for policies:

- The top management in a newspaper group will not interfere with the freedom of its editors
- A manufacturing company will take account of the safety needs of the customers while using its products

*Stakeholder is one who has an interest or stake in the operations and performance of a firm. The stakeholders include (a) shareholders who invest money in the company for a return on that investment in the form of dividends and share appreciation (b) creditors or suppliers who provide raw materials and other supplies on credit basis (c) financial institutions that provide long-term and short-term loans (d) employees who work in the firm and depend on it for their jobs and income (e) customers who buy products and services of the firm and look for a stable supply of safe, effective, and affordable products (f) entire community that expects the firm to avoid pollution and participate in the community development projects such as providing drinking water, literacy, development of arts and so on.

- Do not accept cash from any source without issuing a receipt for the same (to prevent generation of black money)
- A university permits its teaching faculty to undertake consultancy
- A company wants to finance its growth only through internally generated revenues
- The company works only for six days a week. If any of the staff is called for work on a holiday, he is entitled for double wages
- All receipts and payments will be done only through cheques
- Goods once sold cannot be exchanged or returned
- Check your cash before you leave the counter

Strategy

The term ‘strategy’ is drawn from the armed forces. It is a strategic plan that interlocks all aspects of the corporate mission designed to overpower the enemy or the competitor. Strategy is considered more important to face adversary situations such as cut-throat competition. For instance, what should the company do when the competitor is selling at the marginal cost?

Strategy may imply general or specific programmes of action outlining how the resources are deployed to attain goals in a given set of conditions. If these conditions change, the strategy also changes. Strategies give direction for the achievement of objectives necessary through the deployment of resources.

Purpose A strategy is an operational tool to achieve the goals, and thus, the corporate mission. Strategies do not attempt to outline exactly how the enterprise is to accomplish its objectives. A company may view downsizing* as a strategy, as illustrated in Exhibit 17.2, in a competitive market to render cost effective services. Thus, strategy provides a framework to guide thinking and action. Strategies are very much useful in the organisations for guiding, planning and control.

Mass market as the focus of corporate strategy

Today the corporate strategy is to identify and focus on the largest potential and concentrate business there. It is realised, of late, that the largest potential lies in the mass market, which is the largest source of volume though with marginal profits. The following examples substantiate this:

- Hindustan Lever Limited (HLL) launched the Wheel brand to cater to the requirements of large number of customers (hitherto uncovered by its popular products Surf, Surf Excel, etc.) at affordable prices.
- Britannia Industries was earlier addressing the needs of upper income segments of the market. Having realised that there was a huge number of people who want to eat biscuit at a lower price, the company launched the Tiger brand.

*Downsizing refers to the practice of reducing the number of employees at different levels in the organisation to minimise the operational expenditure.

Exhibit 17.2: Translating corporate vision into action

The vision of Cadbury, the market leader during the late 1990s, was translated into different operational and marketing strategies—such as downsizing or providing more value for money.

Strategy is a way of life both at the macro level and micro level for everyone, whether it is a nation or a company. To win over in a given complex situation, the organisations, including the transnationals* adopt strategies. They make changes, if necessary, even to their global strategies. An individual company may formulate its own strategy to bring out the desired results. See Exhibit 17.3. The eventual success of the organisation depends upon strategy formulation and implementation.

The recently initiated moves such as globalisation, privatisation, and liberalisation can be described as strategies to attain a globally competitive economy in the Indian context. In recent years, the state governments have also been developing a professional approach to formulate strategy for economic development. For example, the Government of Andhra Pradesh engaged the services of McKinsey, the world-famous management consultancy house, to prepare its policy document Vision 2020. This was a strategy to identify the right priorities to be pursued for the economic development of the state. Vision 2020 was known more for its action oriented directions for all-round-economic progress and development.

Exhibit 17.3: Corporate strategies

Reebok has the following strategies:

- Articulate the vision of the company
- Involve the staff in the vision
- Be a good motivator
- Focus on human resource by having the right people with the right thinking in the right jobs
- Empower the staff to take risks and be innovative

Programmes

Programmes refer to the logical sequence of operations to be performed in a given project or job. Programmes tell you ‘what to do’. A programme is based on a set of goals, policies, procedures, rules and task assignments. They are used to carry out a given course of action. For instance every undergraduate or postgraduate course offered by the university or a college has its own academic programme. The goals, policies, procedures and the like for each of these courses are clearly defined.

Normally, the size of each programme is assessed in terms of resources and duration. If a programme takes larger resources and time, it is said to be a major programme. Innumerable number of minor or supporting programmes may support a major programme. If the activities involved in a programme require logical sequence and there is a shortage of resources, they require special attention of the manager. For instance, in

*Transnationals refer to such business organisations which extend their operations beyond the national territories.

entertainment organisations, event managers are given full authority and responsibility to organise the cultural shows. Event managers fix the responsibilities on their supporting staff at different levels. The event manager plans the necessary supporting programmes involving financial and non-financial resources to carry them out. Where the manager finds that the supporting programmes are constrained by certain infrastructural or financial bottlenecks that would ultimately affect the scheduling of the major programme, there the attention of the top management is drawn for necessary clarification/instructions.

Coordination and timing of the supporting programmes need a detailed analysis. Failure of any part of this network of supporting programmes means not only delay for the major programme but also unnecessary additional costs besides loss of revenue. Network techniques such as programme evaluation and review technique (PERT) and critical path method (CPM) are used to represent the time duration of the supporting projects and the logical sequence among the given activities and also to control the consumption of resources and the time duration of the projects. These techniques are discussed in detail in Chapters 15 and 16.

Translating Corporate Vision Into Action

To illustrate, if BHEL has the following vision: ‘A world class, innovative, competitive and profitable engineering enterprise providing total business solutions.’ Can we develop from this vision statement, the mission, goals, objectives, policies, strategies, and programmes? Yes. How it is done is given below.

Mission A mission is what the company wants to achieve. BHEL wants to

- deal with engineering products or services with engineering applications
- become an international player
- be innovative
- be competitive
- be profitable
- provide total business solutions to ensure consumer satisfaction

Goals To achieve the above mission, some of the goals could be

- to understand the state of technology in engineering and management
- to actively participate in R&D and develop innovative products and services
- to emerge as the most competitive supplier of products in terms of price and quality

Objectives To achieve the above goals, some of the objectives could be

- to upgrade innovative R&D skills among the technical human resource
- to ensure that the employees are committed
- to make the key personnel more conscious in terms of time, quality, and cost
- to develop reliable and resourceful network of customers
- to optimise the utilisation of resources, both financial and non-financial

Strategies To achieve the above, some of the strategies could be

- to promote a joint venture with a strategic partner, preferably with a leading multinational
- to work for ISO 9000 certification, which streamlines the company’s operating systems in design, manufacturing, installation, testing, and service

- to provide a continuous learning atmosphere for the technical and non-technical staff at all levels by setting up a human resource development (HRD) centre
- to network with leading international software leaders and transport companies of global standards
- to ensure quick recovery of the receivables outstanding, offer incentives for early payments and initiate a system of ‘debt factoring’*, if necessary
- to make it compulsory for every technical manager to undergo two refresher courses to qualify for annual increment
- to announce ‘golden handshake’ scheme to reduce the staff other than those who are strategically important.
- to recruit engineers with the right aptitude
- to make the organisation flat and lean to enhance the degree of competitiveness

Policies Some of the policies could be

- to recruit engineer trainees based on written test only
- to consider an employee for promotion only if he has undergone a minimum of three refresher programmes in the last two years
- to sell to a buyer only when he clears old dues
- to sponsor every R&D scientist in the organisation to an international conference only if he/she is presenting a research paper
- to make it compulsory for all maintenance staff to live on the factory campus

Programmes Some of the programmes could be

- to work for ISO 9000 certification. Conducting orientation programmes for all the staff at all levels to communicate the goals of such a certification system and the help it will render to every one in the organisation to do better as a team
- to conduct job analysis, identify job description and work out job specification; use this information while interviewing the potential engineer for eventual placement
- to schedule meetings with the CEOs of major players in finance and transportation, and initiate measures for strategic alliance.
- to conduct ‘collection drive’ programmes for early recovery of outstanding receivables; empower the key personnel to negotiate for the early and favourable settlement of pending accounts, considering the best interests of the organisation
- to organise sanitation and cleanliness weeks

The above list outlines some of the key issues at every stage of action illustrating how:

- the mission springs out from vision statements
- goals from the mission
- objectives from goals
- strategies from objectives
- and programmes from objectives.

*Debt factoring is a system of taking protection against bad debts.

CORPORATE PLANNING

From the corporate mission statement, the major goals such as profitability, customer service, shareholder satisfaction, employee motivation and so on, can be identified and quantified. Such clarification and definition of the goals is vital because these guide the managerial performance at every stage. The top level planning associated with realisation of these goals is called corporate planning.

The corporate plans provide a rational approach to achieve corporate goals. Since the future is uncertain, the only way, to gain supremacy over it is to plan. In other words, only through corporate planning, uncertain events can be turned to relatively less uncertain, less certain events to more certain. Corporate planning is an intellectually demanding process; it sets the background for a viable course of action based on the organisational goals, skills and resources.

Corporate planning is not an easy task. It involves translation of the vision of the chief executive or top management into achievable targets or goals. Organisations develop mission statements considering the views of the shareholders and stakeholders. It is ideal if both shareholders and stakeholders agree over the given mission statements and corporate policies.

Definition

Corporate planning can be defined as the process of formulating the corporate mission, scanning the business environment, evolving strategies, creating necessary infrastructure, and assigning resources to achieve the given mission. Corporate planning has a company-wide and comprehensive perspective. It is not just a long-term planning where, usually, there is a selective focus like that on a department or product of the organisation. Strategic planning, if done for the entire organisation, can also be called corporate planning.

Elements of Corporate Planning Process

Figure 17.1 outlines the vital components of the corporate planning process. The elements of the corporate planning process can be described as below:

- (a) Identifying corporate mission
- (b) Formulating strategic objectives
- (c) Appraising internal and external environment
- (d) Developing and evaluating alternative strategies
- (e) Selecting the best strategy
- (f) Fixing key targets to strategic business units (SBUs)
- (g) Allot resources to each SBU
- (h) Developing operating plans
- (i) Monitoring the performance
- (j) Revising the plans, where necessary

These elements are discussed below:

- (a) *Identify corporate mission* Identify what the organisation wants to achieve, to start with. For this purpose, it is necessary that all concerned parties understand the overall purpose of the organisation and the methods of attaining them. It is also desirable that they agree on the corporate policies of the organisation.

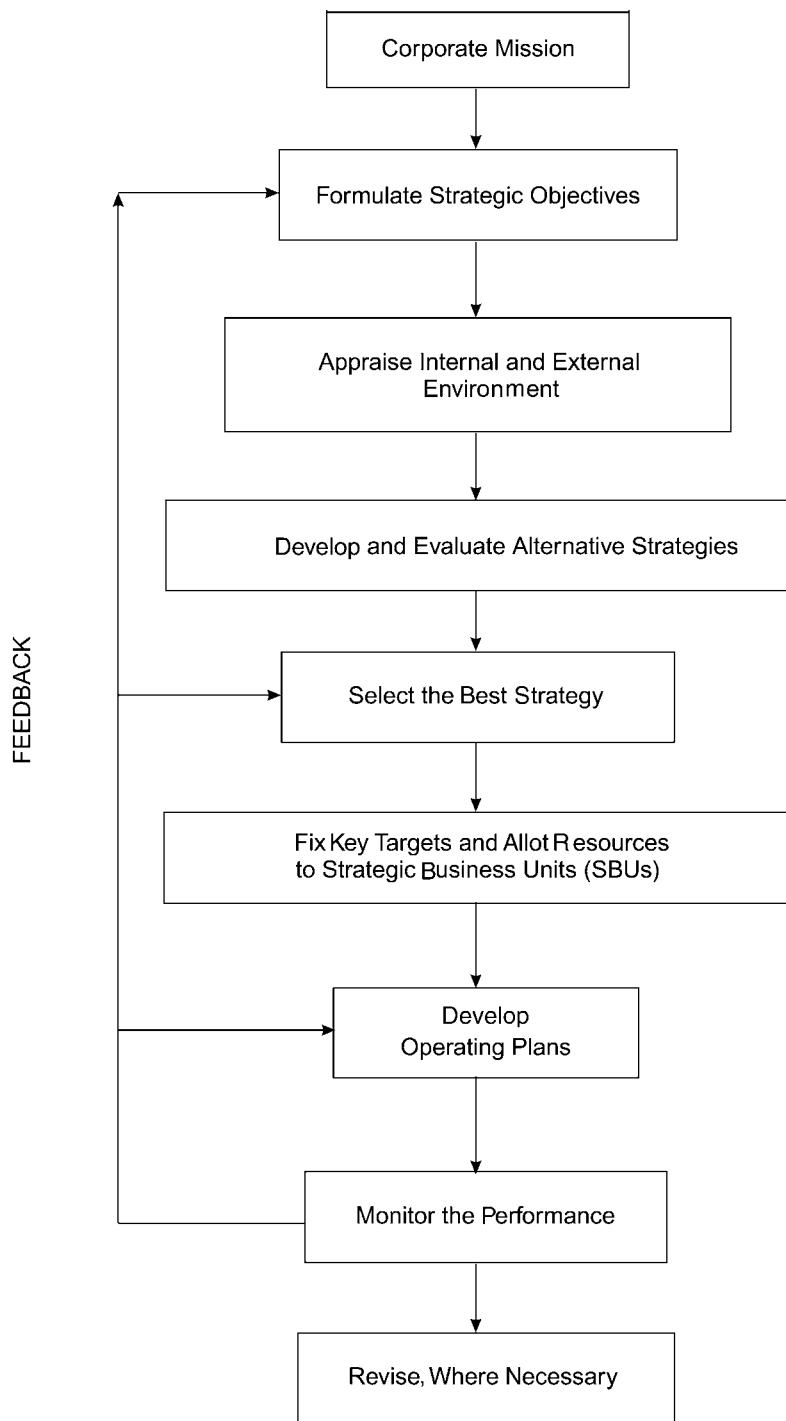


FIGURE 17.1 *An Outline of the corporate planning process*

- (b) *Formulate strategic objectives* By preparing statements of mission, policy, strategy, and goals, the top management establishes the framework within which its divisions or departments prepare their plans. It is essential that the members of the organisation agree on these given strategic objectives. Some companies give a lot of freedom to their business units to set their own sales and profit goals and strategies. In other cases, goals are set for the business units while the managers in these business units are free to develop their own strategies. The goals should be very specific in terms of profits, market share, employee retention and so on. The strategic objectives thus formulated reinforce the commitment of the members of the organisation to achieve the corporate goals.
- (c) *Appraise internal and external environment* To evolve alternative strategies to achieve these goals, a detailed appraisal of both the internal and external environment is carried out. The appraisal of internal environment reveals the strengths and weaknesses of the firm. The appraisal of the external environment reveals the opportunities and threats for the firm. An analysis of strengths, weaknesses, opportunities, and threats, popularly called SWOT analysis, is an essential exercise every firm has to carry out to evolve an appropriate strategy to achieve the given goal. The purpose of SWOT analysis is to capitalise on internal strengths, eliminate or overcome the internal weaknesses, make use of the best opportunities and beware of the threats in the external environment. (The process of environmental scanning, including SWOT analysis, is discussed in detail in Chapter 18.)
- (d) *Develop and evaluate alternative strategies* There could be some alternative strategies to pursue a given goal. If the goal is to expand the business, the following could be the three alternatives:

- Adding new products to the existing product line
- Finding new markets, apart from the present market territories
- Manufacturing within the organisation, the components, which were earlier procured from outside

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

- The existing range of products
- The existing markets
- The functions presently being carried out

To arrive at a feasible strategy, it is necessary to identify the possible alternative strategies. (How to identify alternative strategies for different goals has been discussed in detail in Chapter 19 on Strategy Formulation and Implementation).

- (e) *Select the best strategy* For the firm to be more successful, it is necessary to focus its strategies around its strengths and opportunities. It is a prerequisite that the members of the team or organisation agree on a strategic plan. Such a plan, which has been generally agreed upon, is normally considered as the best strategy. Such strategies ensure a better degree of participation and involvement of its members in the process of achieving the goals.
- (f) *Establish strategic business units* It is more strategic to define a business unit in terms of customer groups, needs, and/or technology and set up the business unit accordingly. This is not followed many a time. Most of the companies define their businesses in terms of products. For instance, if a company defines its business as electronic typewriting machines, it may have to change such a product-based definition when the technology changes. In due course, when the technology changes, the company may prefer to switch over to personal computers. A business must be viewed as a customer-satisfying process, not as a goods-producing process. Hence, the focus of marketing definition for one's products and services should be more on satisfying the customer needs. Defining business units in comprehensive terms comes handy here. Exhibit 17.4 illustrates this point.

Exhibit 17.4: How is a business viewed

<i>Nature of Company</i>	<i>Product Orientation</i>	<i>Marketing Orientation</i>
An engineering enterprise	To sell products or components	To sell solutions
A publishing company	To sell books	To disseminate information
A movie making company	To make movies	To entertain people

Each strategic business unit (SBU) is managed by a person responsible for strategic planning and performance. It is a single business, planned separately from the rest of the company. It has its own set of competitors. Exhibit 17.5 illustrates this point.

Exhibit 17.5: SBUs in a multinational company

To reinforce the accountability dimension, Reebok, one of the multinational shoe companies was restructured into six strategic business units—performance footwear, classic footwear, children footwear (a major growth market), apparel, business development, and retail.

All of these are independent profit centres managed by well-qualified and professional managers. These managers are responsible for managing the global business. In this process, they have to allocate business between the developed and developing countries and be accountable for that.

(g) *Fix targets and allot resources to each SBU* The purpose of identifying the company's strategic business units is to develop separate strategies and assign appropriate funding. The top management knows that its portfolio has certain old, established, relatively new, and brand new products. It cannot rely just on opinions; it needs to classify its businesses by profit potential by using analytical tools. The major factors indicating market attraction are: overall market size, rate of annual increase in the market size, profit margin, degree of competition, technological standards, rate of inflation, energy needs, impact on environmental issues, socio-political and legal implications, and others. These factors affect the decision-making at the macro level. Judging the business strength at the enterprise level also is equally important. The strength of a business proposal is affected by varied factors such as market share, percentage of annual growth in the market share, quality parameters, brand reputation and loyalty, promotion campaigns and distribution network, operating capacity, per unit costs, material and inventory management, research and development strength, need for key managerial professionals, and so on.

Management should visualise what each SBU should become in the next three to five years, given the current strategy. In this process, it is necessary to identify the specific stage for each of its products and services in their product life cycle* and analyse this in relation to the competitor

*Product life cycle has four stages: introduction, growth, maturity and decline. Every product manufactured or service rendered will undergo these four stages. Progressive companies go on introducing new products and services when their present products are in the maturity or decline stage, to maintain the market leadership.

strategies, new technologies, economic events, and the like. The management also has to critically evaluate, from time to time, their portfolio — the list of products and services they have to offer through each SBU.

Resources should be allocated based on market growth rate and relative market share of each SBU. Here, resources mean executive talent, money, and time. The resources have to be assigned in line with the strategy. If the strategy is to expand, then the resources should be adequate enough to reinforce the strategy. Where the resources are not adequate, they fail to give the necessary force to the strategy and the strategy remains a tiger on paper. Resource allocation decisions reinforce the commitment of the organisation to its chosen strategy. It is always preferable to assess each proposal on its merit and then allocate the resources (zero-based budgeting approach) rather than following the traditional formula approach, such as 15 per cent above last year's budget for all the departments.

- (h) *Developing operating plans* The operating or tactical plans explain how the long-term goals of the organisation can be met. The corporate plans reveal how much the projected sales and revenues are. Most often, the management would like to have performed better than these projections. Where the top management finds a significant gap between the targeted sales and actual sales, it can either develop the existing business or acquire a new one to fill the gap.
- (i) *Monitor performance* The results of the operating plans should be well monitored from time to time. In the case of poor or low performance, check up with the members of the team to find out their practical problems and sort these out. Also, it is essential to verify whether there are any gaps in formulating the operating/tactical plans.
- (j) *Revise the operating plans, where necessary* It is necessary to revise the operational plans particularly when the firm does not perform as well as expected. The operating plans can be revised in terms of focus, resources, or time frame. In case of any organisational bottlenecks, suitable changes can be initiated to the organisation structure itself. This would ensure adequate authority or freedom for the members of the team and enable them to achieve the targets.

Strategies to Improve Sales

How to fill the gap, if any, between actual sales and the targeted sales? There are three alternatives² to improve the sales performance of a business unit:

- (a) Intensive growth
- (b) Integrative growth
- (c) Diversification growth

Let us discuss these in detail.

- (a) *Intensive growth* Intensive growth refers to the process of identifying opportunities to achieve further growth within the company's current businesses. To achieve intensive growth, the management should first evaluate the available opportunities to improve the performance of its existing current businesses. It may find three options: to penetrate into existing markets, develop new markets, or develop new products. At times, it may be possible to gain more market share with the current products in their current markets. The strategy of penetrating into the existing markets with the current products is called *market penetration strategy*. For instance, Sony introduced TV sets with trinitron picture tubes into the Indian market in 1996 and priced these at a premium of Rs 10,000 and above over the market. But once the initial rush subsided, the company gradually lowered the price of the products to market levels. However, it also simultaneously launched higher-end products (high-technology products) to

maintain its global image as a technology leader. By lowering the price of TVs with triniton picture tubes, the company could successfully penetrate into the markets to add new customers to its customer base.

Market development strategy is to explore the possibility to find or develop new markets for its current products. If the company is presently operating, for example, in the eastern region, it can explore the possibility of entering other regions also. Most of the multinational companies have been entering Indian markets with this strategy, to develop their markets globally.

Another alternative is to consider whether any new products of potential interest to its current markets can be developed. The strategy of developing new products for the existing markets is called *product development strategy*. Gramophone record companies had to shift, in keeping with the technology trends, from gramophone records to compact discs (CDs). The companies have to review opportunities to develop new products for new markets—as a part of the diversification strategy.

Microsoft's new strategy

Microsoft's new strategy is called PC-plus. It has three elements:

- (a) providing computing power to the most commonly used devices such as cell phone, personal computer, toaster oven, dishwasher, refrigerator, washing machine and so on.
- (b) developing the software to allow those devices to communicate
- (c) investing heavily to help build wireless and high-speed internet access throughout the world to link it all together.

Microsoft envisions a home where everyday appliances and electronics are smart. According to Bill Gates, 'in the near future, PC-based networks will help us control many of our domestic matters with devices that cost no more than \$ 100 each'.

It is also said at Microsoft that VCRs can be programmed via e-mail, laundry washers can be designed to send an instant message to the home computer when the load is done and refrigerators can be made to send an e-mail when there's no more milk. To do that, Microsoft wants to do two things: give these consumer durables 'brains,' and provide them the means to talk to each other. The first part is expected to be accomplished by a new version of its Windows CE operating system.

- (b) *Integrative growth* Integrative growth refers to the process of identifying opportunities to develop or acquire businesses that are related to the company's current businesses. More often, the business processes have to be integrated for linear growth in the profits. The corporate plan may be designed to undertake backward, forward, or horizontal integration within its industry.

If a company operating in music systems takes over the manufacturing business of its plastic material supplier, it would be able to gain more control over the market or generate more profit. This is called *backward integration*.

Alternatively, if this company acquires some of its most profitably operating intermediaries such as wholesalers or retailers, it is called *forward integration*. If the company legally takes over or acquires the business of any of its leading competitors, it is called *horizontal integration*.

- (c) *Diversification growth* Diversification growth refers to the process of identifying opportunities to develop or acquire businesses that are related to the company's current businesses. This makes sense

when good opportunities can be found outside the present businesses. A good opportunity is one in which the industry is highly attractive and the company has some business strengths to be successful. The company could seek new products that have technological and/or marketing synergies with existing product lines to cater to a different group of customers. This strategy is called *concentric diversification strategy*. To illustrate, a printing press using manual operations could shift over to offset printing operations and thus appeal to higher-end customers. The company might search for new products that could be added to its current product line. This strategy is called *horizontal diversification strategy*. In this case, the offset printing press company could start selling stationery also. Alternatively, the company might seek new businesses that have nothing to do with the company's current technology, products, or markets. This strategy is called *conglomerate diversification strategy*. For instance, a company with offset printing operations could explore the potential to develop software applications in the printing operations.

SITUATION ANALYSIS

Sales improvement strategies

- (a) A supplier of computer stationery has decided to set up computer stationery manufacturing unit. What type of strategy is he adopting?
- (b) A vendor supplying engine boxes to Maruti Suzuki finds it convenient to supply the same product to Hyundai also with little modifications. What type of strategy is he adopting?
- (c) A company dealing in computer floppies wants to construct flats. What type of strategy is it adopting?

Downsizing Older Businesses

At times, operating plans may include downsizing the older businesses. It is necessary to reduce the scale of operations of an unprofitable business to ensure that the resources are optimally utilised. A weak business requires higher degree of managerial attention. The management should focus on the company's growth opportunities, not fritter away energy and resources trying to revive tired and old businesses. The recent strategies of the Government of India to disinvest (leaving a percentage of shareholding to private investors), privatise (leaving the total ownership wholly to private investors), or wind up (totally closing down) unprofitable public enterprises are initiatives in this direction.

SUMMARY

- ◆ Corporate planning is the spinal cord of the corporate strategies of the top management.
- ◆ As a part of corporate planning, the organisations scan their internal and external environments to identify what they can achieve in the years to come.
- ◆ Mission is what the management decides to achieve. Mission reflects the vision of the top management.
- ◆ A mission can be put into action by translating it into goals, objectives, strategies, policies and procedures.

- ◆ A mission explains, to all the concerned inside and outside the organisation, what the company wants to achieve, the image it wants to project, and the character it wants to develop. The mission should be clear enough to lead to action. It should be specific in terms of targets. It should be flexible and also promote shared vision.
- ◆ A goal is what the organisation wants to achieve during a given period with a given set of resources. It should be capable of being measured. It should provide a standard to assess the corporate performance.
- ◆ Objectives are the elements of the goals at different levels in the organisation. They are the locus points for managerial performance.
- ◆ Policy is a general statement which guides the managers all through. Policies are intended to bring uniformity in the corporate functioning.
- ◆ Strategy refers to the general or specific programme of action and deployment of resources to attain goals in a set of given conditions. If the conditions change, the strategy also changes.
- ◆ Programme refers to a logical sequence of operations to be performed in a given project or job. A programme tells us what to do.
- ◆ The following are the steps in the corporate planning process:
 - (a) Identifying the corporate mission: It is based on the vision of the organisation.
 - (b) Formulating strategic objectives: It is advisable to involve the key managers in this process.
 - (c) Identifying the opportunities for and threats to the firm by scanning the external environment.
 - (d) Identifying its strengths and weaknesses based on its internal environment.
 - (e) Developing and evaluating alternative strategies to achieve the given goals.
 - (f) Selecting the best strategy through consultation and consensus. There should be consensus among the key managers on the strategic plan. This will reinforce team effort.
 - (g) Creating strategic business units (SBUs): A strategic business unit is defined in terms of customer groups, needs, and/ or technology. Here, each business unit is viewed as a customer-satisfying process. Targets have to be fixed for every SBU.
 - (h) Fixing the tasks and allotting resources to each of the SBUs: The resources assigned must match the complexity of the tasks to be achieved. Here, the resources do not mean only money. It includes time and executive talent also.
 - (i) Developing operating plans: These plans explain how the long-term goals can be met. The operating plans may be designed to achieve intensive growth, integrative growth, or diversification growth. More often, the old businesses are downsized to optimise the utilisation of resources.
 - (j) Monitoring the performance.
 - (k) Revising the plans, where necessary.
- ◆ There are different strategies to improve sales performance of a business unit:
 - (a) Gaining more market share with current products in the current market is called market penetration strategy
 - (b) Exploring the possibility to find or develop new markets is called market development strategy
 - (c) Considering the scope to develop new products of potential interest in the current markets is called product development strategy
 - (d) Reviewing opportunities to develop new products for new markets is called product diversification strategy

- (e) Taking over the manufacture of business of one or more suppliers of material inputs is known as backward integration strategy
- (f) Acquiring some of the profitable intermediaries such as wholesalers/retailers is called forward integration strategy
- (g) Legally taking over the business of competitors is called horizontal integration strategy
- (h) Seeking new products having technological and/or marketing synergies with existing product lines is called concentric diversification strategy
- (i) Searching for new products appealing to its current product line is called horizontal diversification strategy
- (j) Seeking new businesses having no relationship with the company's current technology/product/markets is known as conglomerate diversification strategy.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. What refers to the process of planning undertaken by the top management to achieve their organisational goals?
 - (a) Strategy formulation
 - (b) Corporate planning
 - (c) Environmental scanning
 - (d) Corporate planning
2. Which of the following is not a characteristic of a mission statement?
 - (a) Flexible
 - (b) Provides shared visions
 - (c) Focuses on products
 - (d) Focus on limited
3. What refers to the broad guidelines set by the top management for the purpose of making decisions at different levels in the organisations?
 - (a) Objectives
 - (b) Policies
 - (c) Goals
 - (d) Mission
4. Which of the following is not a feature of policy?
 - (a) Expresses organizational culture
 - (b) Provides discretion to managers
 - (c) Helps in coordinating decisions
 - (d) Brings out uniformity in action
5. What refers to the logical sequence of operations to be performed in a given project or job?
 - (a) Strategy
 - (b) Programmes
 - (c) Purpose
 - (d) Policy

6. What refers to the process of identifying opportunities to develop or acquire businesses that are related to the company current business?
 - (a) Intensive growth
 - (b) Integrative growth
 - (c) Diversification growth
 - (d) Concentric growth
7. What refers to the process wherein a company legally takes over or acquires the business of any of its leading competitors?
 - (a) Backward integration
 - (b) Forward integration
 - (c) Horizontal integration
 - (d) Concentric integration
8. What refers to the process wherein a company could seek new products that have technological and/or marketing synergies with existing product lines to cater to a group of customers?
 - (a) Conglomerate diversification strategy
 - (b) Concentric diversification strategy
 - (c) Horizontal diversification strategy
 - (d) Vertical diversification strategy
9. What reflects the vision of the top management?
 - (a) Goal
 - (b) Policy
 - (c) Mission
 - (d) Strategy
10. What refers to the general of specific programme of action and deployment of resources to all on goals in a set of given conditions?
 - (a) Strategy
 - (b) Goal
 - (c) Programme
 - (d) Objectives

Question II: Fill in the Blanks

1. The basic reason for the existence of an organisation is defined in its
2. Mission statements are communicated down to the lowest levels in the organisation to develop
3. What an organisation wants to achieve during a given period with a given set of resources is called
4. To assess the effectiveness of managerial actions, the goals should be
5. Goal is broken down into for each department, section, unit, or level in the organisation.
6. A unified, comprehensive and integral plan desired to achieve the basic objectives of an enterprise is called
7. Strategy is an tool to achieve the goals set through mission.
8. To emerge stronger, today's corporate strategies include

9. The logical sequence of operations to be performed is called
10. is a tool for coordination and timing of different supporting programmes in a complex project.
11. The process of identifying the overall purpose for the organisation is called
12. A strategic business unit can be defined in terms of
13. A business must be viewed as a process, not as a goods-producing process.
14. A single business planned separately from rest of the company is called
15. The alternative of identifying opportunities to build or acquire businesses that are related to the company's current businesses is called
16. The technique of reducing the operations of the unprofitable business is called
17. Gaining more market share with current products in the current market is called strategy.
18. Taking over the manufacturing business of one or more suppliers of material inputs is called integration.
19. Legally taking over the business of competitors is called integration.
20. Seeking new businesses having no relationship to the company's current technology/product/markets is called strategy.

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Vision and mission
2. The purpose of strategy
3. Steps in corporate planning
4. Alternatives for planning new business
5. Significance of corporate goals

Question IV: Essay Type Questions

1. Is there any link between mission, goal, objective, strategy and programmes in an industrial environment? Illustrate.
2. Explain the concept of corporate planning. Discuss the essential steps in corporate planning through a flow chart.
3. What do you understand by strategic business unit? Discuss its role and relevance in corporate planning?
4. Explain the strategies to improve the sales performance of a strategic business unit.

Answers to Question I

- | | | | | |
|------|------|------|------|-------|
| 1. b | 2. c | 3. b | 4. c | 5. b |
| 6. b | 7. c | 8. b | 9. c | 10. a |

Answers to Question II

- | | |
|-------------------------------|---|
| 1. mission | 11. corporate planning |
| 2. shared vision | 12. customer groups, needs and technology |
| 3. goal | 13. customer-satisfying |
| 4. measurable or quantifiable | 14. strategic business unit |
| 5. objectives | 15. integrative growth |
| 6. strategy | 16. downsizing |
| 7. operational | 17. market penetration |
| 8. mergers or acquisitions | 18. backward integration |
| 9. procedures | 19. horizontal |
| 10. PERT/CPM | 20. conglomerate diversification |

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18

ENVIRONMENTAL SCANNING AND SWOT ANALYSIS

Learning Objectives

By the time you study this chapter, you should be able to

- identify the factors in the external environment and the opportunities and threats associated with it
- analyse the internal environment to identify the strengths and weaknesses
- explain what SWOT analysis is and how it helps to generate alternative corporate strategies

INTRODUCTION

A major purpose of environmental scanning is to identify and understand the new opportunities in which the company can perform profitably. Environmental scanning involves an analysis and diagnosis of the external and internal environments of the business firm.

The external environment of the business consists of three parts: general, industry, and international environment. The results of the diagnosis of these parts of the external environment enable the organisation to identify the opportunities and threats associated with it. The internal environment is scanned to identify the functional areas, their sub-factors, and their relative strengths and weaknesses so that a strategic advantage profile is built up. Thus, the results of the scanning of external and internal environment would form the basis for the generation of a viable strategy.

ENVIRONMENTAL SCANNING

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

It is the crucial job of the top management to analyse and diagnose the environment effectively. The management must determine the crucial factors in the environment. If the environment is ignored or even partially ignored by the corporate planners, this process remains incomplete, and hence, cannot be effective.

The corporate planner, also called strategist, is a key person. He may be a marketing manager or a professional consultant specially hired from outside by the top management for environmental scanning and strategy

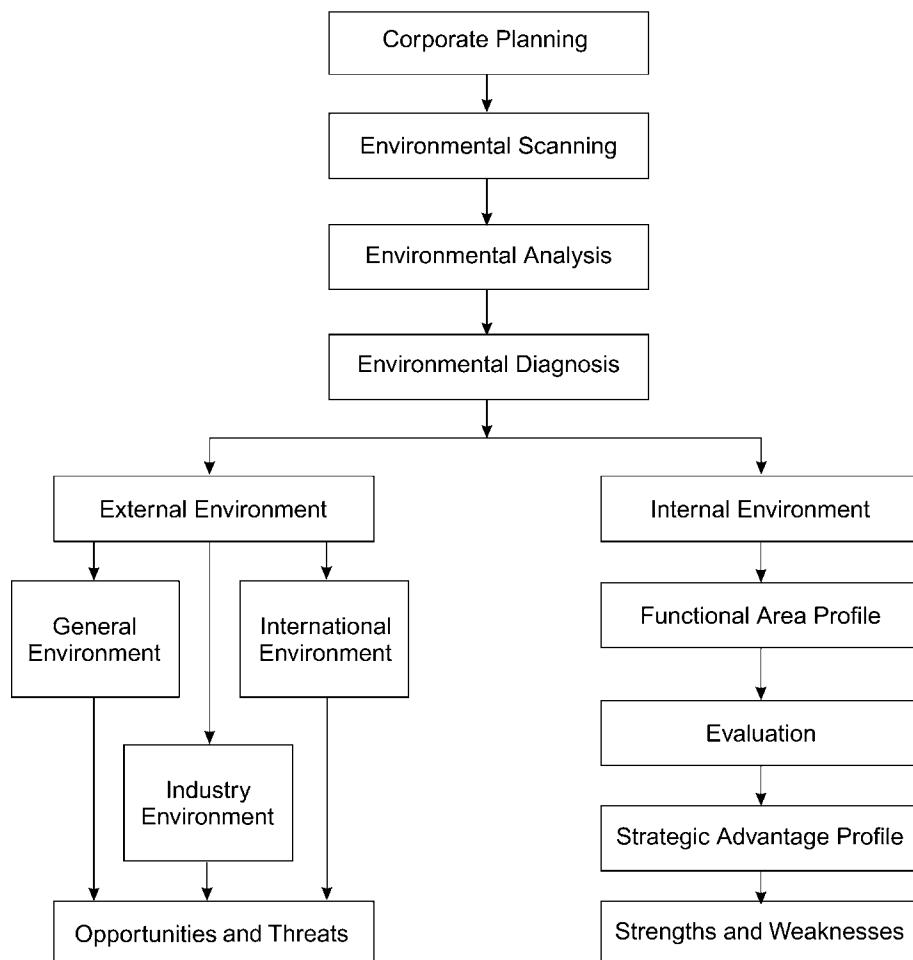


FIGURE 18.1 An overview of the environmental scanning process

formulation. Figure 18.1 outlines the stages in environmental scanning. Environmental scanning is the process by which strategists monitor both parts of the environment:

- The external environment to determine the opportunities and threats
- The internal environment to determine the strengths and weaknesses of their firms

Why Environmental Scanning

The following examples summarise the purpose of environmental scanning.

- (a) The banks and business enterprises in the public sector are being disinvested by the Government.
- (b) The Government policies keep changing. The current focus of the Government of India has been on globalisation, privatisation, and deregulation. As a result, foreign goods are being dumped into the markets. This may dwindle the fortunes of even successful companies.

- (c) Maruti Udyog Ltd., the small car company patronaged for decades by the Government, had to face hard and tough competition from both domestic and foreign car manufacturers such as Tata, Daewoo, Toyota, and others.
- (d) Computers have wiped out the market for typewriters and electronic typewriters.
- (e) Info-tech industry, which was very strong for over decades, suddenly revealed a downtrend.
- (f) The advent of television channels has almost zeroed down the market for VCRs and significantly affected the flow of film viewer traffic.
- (g) Industrial giants like Hindustan Lever are always on a taking-over spree to consolidate their market position and eliminate competition.
- (h) Collaborators (such as Honda) who initially provide technical know-how and expertise to the local companies, get tempted to launch their products of different models, if there is liberalised scenario in the country, and this may affect the future prospects of the local companies (such as in the case of Hero Honda).

From this, it can be concluded that the changes, such as above, are decisive and may affect the functioning of the business very badly. Environmental scanning helps the strategists to identify the warning signals, and thus, allows them time to anticipate what is likely to happen, given the present circumstances. Strategists identify the challenges that could emerge from the future trends and prepare the organisation to face these challenges by converting each challenge into an opportunity.

In environmental scanning, the conditions influencing business politically, technologically, economically, or socially are identified and analysed for the extent to which these constitute a threat for existing strategy or provide an opportunity for a new strategy. For instance, when the Maruti 1000 saloon car was launched, it was the ‘ultimate in luxury’. With more luxurious competitors such as Daewoo Cielo, Ford Escort, and others, Maruti Udyog Limited’s own Esteem, the Maruti 1000 has been repositioned downwards as ‘affordable luxury’.

Environmental scanning is a critical part of strategic management process. The process cannot be effective, if the environment factor is even marginally ignored. The strategists anticipate the future trends and assess the opportunities therefrom. Usually this involves a long lead time and those who have long term strategic vision can utilise this lead time to prepare the organisation for the new environment. In other words, the changes do not occur overnight. If the organisation ignores the warning signals, that means it refuses to help itself. Hindustan Motors did not initiate any change in the design of their premium brand ‘Ambassador’ although it knew about the fact that the Government of India was likely to patronage Maruti-Suzuki Company. Hindustan Motors had enjoyed the supremacy in the car market for over decades. But today it has been reduced to a marginal player in the market. The company had a lot of time to reorganise itself but it failed to act up on the changes which did not come all of a sudden.

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

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

External Environment Analysis (Opportunity and Threat Analysis)

The external environment has a profound impact on the business operations irrespective of the nature of the business. The business has to monitor the key forces both in the micro and macro environment. The forces

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

- General environment
- Industry environment
- International environment

These are discussed below.

General environment A firm is said to be more effective when its strategy caters to the needs of the environment. The additional features added to the main product at times could provide a new life to the main product. The corporate units, which realise this, will survive in the long run. For instance, the watch division of Hindustan Machine Tools (HMT), once ‘the time keeper for the nation’, is a classic case in point. An HMT watch was known for its lower price, simplicity, and reliability. But it is no more perceived so. Titan could successfully demonstrate that the time-watch could be made more fashionable. Today, the time-watch is considered a fashion accessory besides being a timepiece. With the result that a large chunk of the HMT watch customers turned overnight in favour of TITAN. Thus, TITAN successfully usurped a large share of the HMT market.

Thus, the major causes of growth, decline, and other large scale changes in firms are the factors in the external environment, not internal developments. Therefore, maximum information about the trends in the general environment should be sought from all the relevant sectors, such as:

- (a) The *socio-economic sector* (this encompasses all the factors affecting the economy, society, and the business climate)
- (b) The *technological sector* (this affects the flow and development of alternative raw materials, the life cycles of products and services)
- (c) The *government sector* (government departments have multiple roles to play in matters relating to collection of taxes, regulating the markets and industries, R&D, bridging the gap between demand and supply, and so on. The Government is a powerful player in the markets in every sector)

Role of the strategist The job of the strategist starts with the diagnosis of the data analysed. The quality of diagnosis depends on

- the personal capabilities and business insights of the strategist (such as his experience, motivation, ability to lead the groups, perception of opportunities and threats, and frame of mind)
- functional resources of the strategist (such as resource constraints and degree of freedom)
- working environment (which include pressure for achievement of results and ability to work in teams with cohesiveness)

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

Customers The strategist must identify and analyse the customers for the organisation locate the potential customers, and the emerging changes in their buying patterns. It is necessary to identify the profile of buyers in terms of their needs and preferences based on the basic demographic factors such as age, income, size of

households, and consumption pattern. These factors create the primary demand for products or services and help to scan the geographical environment for potential markets and customers. The strategist must:

Role of the strategist illustrated

A marketer must explore how best he can deliver superior value for his product and services. It is interesting to observe how Eutectic Alloy, a unit of Larson and Toubro (L & T), strategically dominated in the business of low temperature welding alloys. Low temperature welding alloys facilitate the conversion of non-renewable metallic resources by reclamation welding. The user can save on re-using expensive worn out parts. As a part of its ambitious plans, the general manager, L & T Eutectic, set a target to achieve 26 per cent annual growth as against 16 per cent target growth for the industry.

One alternative would have been to grab the market from competitors by indulging in a price war. But this could be suicidal in the long run! The other viable alternative is to change orientation from 'selling of products' to 'selling of solutions'. It is definite that any attempt to offer solutions would provide more value to the customer while directly offering competitive advantage to L & T Eutectic. Such a shift in orientation is not possible without a thrust on three areas: cost-effective solutions, state-of-the-art technology, and a high level of service.

But how to implement the strategy of 'selling the solutions'? The general manager formulated a multi-pronged strategy involving simultaneously the employees, stockists, and customers. To motivate its strong team of 300 application engineers and 80 other employees at different levels to perform their best, Eutectic did the following:

- Improved communication
- Provided professional satisfaction
- Fostered strong team spirit
- Provided career/growth opportunities

For the stockists, 210 in number, the company extended full support in terms of transparency in communication, enhancement of motivation, involvement, and an all-round development, with the ultimate motive to make them entrepreneurs of the first order. To ensure all-round development, the company put all the stockists on Wide Area Network (WAN) and helped them to aim for paperless offices.

The customers were promised more cost-effective solutions speedily. To achieve this, the company provided PC notebooks to all application engineers for instant connectivity and prompt accessibility to the data bank of 700 approved applications.

The company also initiated interactive marketing with the customers. Eutectic decided to organise conservation awards to not only motivate customers and to compete, but also to save more. Bombay Electric Supply and Transport (BEST), a recipient of the conservation award could save more than Rs 180 lakh by repairing 16,000 parts by spending a meager Rs 20 lakh on Eutectic Alloys. The customers could achieve maximum value by virtue of saving through the company's strategy of interactive marketing. This in turn helped Eutectic to double its sales every third year, that is, the targeted growth rate of 26 per cent per annum.

- collect data relating to the need profile of each of the market segments (such as children, college students, employees, or senior citizens)
- foresee what the companies are likely to do to compete
- conduct consumer satisfaction surveys to obtain feedback to design the products better around their needs
- conduct front-line employee satisfaction surveys to bridge the gap between the expectations of the top management and the front-line employees

The organisations must listen, understand, internalise, and deliver what the customers want in record time. Federal Express seriously listened to the needs of their customers and reoriented its business around their requirements. The customers of Federal Express can now keep track, on line, of their items sent by courier to different destinations. The modern customer wants to know when the items are likely to reach the given destination. Federal Express could address this demand of its customer effectively by revolutionising their business handling systems and procedures with the state-of-art technology. Dell Computers has reconfigured its traditional PC hardware business around the needs of the customers, giving the big players a run for their money. Toyota knows well its car customers. Instead of putting people into cars, it claims to be committed to build cars around their every detail to meet their specific needs. In the words of Toyota, ‘know-you’ is as important as ‘know-how’.

It may be easy to start with reasonable broad customer segments and work down to the individual level over a period of time. The results of the market research can be built into a powerful database with appropriate investments in a phased manner. Verify the changes in the behavioural patterns through periodical market research studies. This may call for necessary changes in the product positioning strategies. Over the years, the financial services industry expanded because it was thought that it was satisfying the basic customer needs through transacting business on the bank’s premises. The modern customer prefers perfect freedom in matters relating to bank transactions such as time, place, and also the method of interface. The customer does not like to visit the branch except for a complex financial decision such as house loan or gold loan, etc.

Customer segments can be based on revenue potential, type of strategy adopted, or the core-competence of the firm. A product is said to be effectively positioned if it is based on a detailed study of the behaviour of customers and their consumption patterns.

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

Competition The strategist moulds his strategy in the light of the competitor’s strategy. The exit or entry of competitors, the emerging substitutes, and major strategic changes by competitors are some of the important factors to be analysed and diagnosed. For instance, at a time when Ariel appeared on the scene Hindustan Lever introduced multiple extensions in quick succession—Surf Ultramatic, Surf Easywash, Surf Ultra and Surf Excel—only to revive Surf’s image and to strengthen the brand. Castrol, engine oil for automobiles, used ingenuity, resources, and customer insights, as part of its aggressive marketing strategy, to offer a new functional value for its product: With Castrol, a change of engine oil is required only after 4,000–5,000 km as compared to the 1,000 km change needed with other lubricants.

*Outsourcing is a strategy the professional companies pursue to concentrate on activities of their core-competence by buying their inputs from other reliable suppliers who supply at lower costs. For example a computer supplier who assembles computers, networks with other component manufacturers/suppliers for supply of inputs at lower costs.

International environment The strategy of globalisation implies a great source of opportunities and also threats to business firms. Such firms, which can make use of the opportunities, would flourish and those, which cannot gear up, would demise. The global economy is characterised by

- countries with surplus resources (such as oil and petroleum exporting countries)
- countries with abundant or surplus labour (rapidly developing countries such as Hongkong, Singapore, Korea, Mexico, Brazil, Taiwan, India, and others)
- countries with huge markets (such as Europe, Brazil, Mexico, Philippines, India and many South American countries)

Strategists examine and evaluate nation-wise opportunities and threats. For instance, the opportunities could include

- expanding markets in the above countries
- availing the lower labour costs by setting up manufacturing plants in different locations with abundant labour

These opportunities are also associated with certain threats. The threats could be serious in their impact. The different sources of threat could be

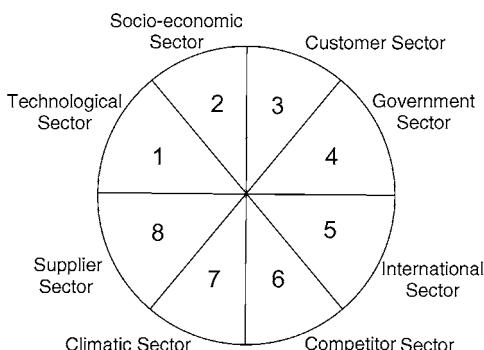
- *political risks* arising from political and ideological differences, political instability, and foreign rule
- *social risks* arising from civil wars, income inequalities, break down in law and order due to religious fanaticism, unionisation, militancy, and so on
- *economic risks* arising from poor GDP growth rate, rapid increase in costs of production
- *financial risks* arising from widely changing financial policies of the country resulting in fluctuating currency exchange rates, reduction in percentage of repatriation of profits and capital, higher taxes, and so on

The corporate planners have to monitor closely the areas, which are likely to offer most significant opportunities and threats. Figure 18.2 illustrates how the *focal zone*¹ of the strategist can be narrowed by the conditions of each factor. For example, if the technology sector is perceived to be volatile and uncertain with the development of cost-effective technologies, it may be essential to focus on this sector and monitor it closely. The government also may prefer to stay away leaving the major decisions to the markets. In other words, the corporate sector will have greater responsibility in terms of addressing emerging problems in the economy or social changes where the numbers in the circle represent the following sectors:

(1) Technological sector (2) Socio-economic sector (3) Customer sector (4) Government sector (5) International sector (6) Competitor sector (7) Climatic sector (8) Supplier sector.

The Figure 18.2 exhibits how the focal zone is narrowed. This reveals the following tenets:

- If the enterprise is more dependent on a sector, it will have to focus more on that sector
- If the sector is more developed, the firm has to focus more on that sector
- If the sector is more hostile or likely to get affected by sudden unfavourable changes, consider that diagnosis of this sector is more vital
- If the sector is more volatile and uncertain, diagnose that sector in depth
- In case the diagnosis of a sector involves greater time pressure and resource constraints, it may be less likely that results are more focussed

**FIGURE 18.2** *Narrowing focal zone*

Internal Environment: Analysis and Diagnosis

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

Conducting internal analysis and diagnosis To conduct internal analysis and diagnosis, identify first the internal strengths and weaknesses. The internal strengths and weaknesses may include the following:

- Marketing factors
- Research and development
- Engineering design and management
- Production management
- Managerial personnel
- Accounting and financial policies and procedures

Each of the above factors has to be further broken down and analysed in terms of its elements. Each element is to be evaluated to judge to what extent it can contribute to the formulation and implementation of a strategy. For instance, the profile of research and development can be outlined as below:

- Financial resources (budget to conduct basic research, to develop new products and processes, improve existing processes, and so on)
- Infrastructure facilities (in terms of state-of-the-art technologies)
- Human resources (how many scientists and engineers are required, presently available, turnover of key personnel)
- Organisational systems (system to monitor technological developments from time to time)
- Technological capabilities (how capable the firm is in terms of number of patents, new products, sales contribution from new products, and so on)

Similarly, the marketing profile can be analysed as below:

- Financial resources (budget for different marketing activities such as personal selling, and promotion, distribution, service, market research, and others)
- Infrastructure facilities (number and location of sales centres, warehouses, and service facilities)

- Human resources (profile of the key sales marketing staff in terms of number, age, and categories, turnover of key personnel)
- Organisational systems (how effective the systems are for distribution, service, pricing and control of credit, and market research)
- Technological capabilities (evident from lower costs of production and servicing, increasing sales, trends in the cost of promotion, distribution and service, the extent of retail outlet coverage, competitiveness of the prices, product line dominance, impeccable brand loyalty, and so on)

After collecting the data and indicators of various sub-factors of each functional area, these have to be compared with those of the competitors on a relative basis. A profile of the strengths and weaknesses will surface this exercise. This profile is based on many factors: the conditions of business in the past, present, and future, business goals and external requirements, the linkages between functional areas and environmental factors such as competitors, technology, suppliers, and the product life cycle. The distinctive competencies can be assessed from seeking answers to certain basic question such as:

- What does the firm do well?
- Do these competencies count?
- What are the areas of poor performance?
- Do these areas really matter?

The ultimate result of such a detailed internal analysis is to build a *strategic advantage profile*. Strategic advantage profile is a tool used to evaluate systematically the enterprise's internal factors. The competitive strengths or weaknesses for each internal area such as marketing, R&D, and others have been identified in Figure 18.3.

Internal Area	Competitive Strength or Weakness
Marketing	+ Product line is extensive + service is excellent – Channels of distribution are weak in the northeast
Research and development	+ four patents – two scientists left
Finance	+ internally generated resources
Operations	+ Plenty of raw materials – outdated machinery
Corporate resources	0 the company is just three years old + the size of the company is more than average – poor union and management relations

Note: (+) indicates strength, (0) indicates neutral, and (–) indicates weakness

FIGURE 18.3 Strategic Advantage Profile²

To be successful, the following basic tenets are to be observed strictly:

- (a) *Compatibility of strategy with environment* A firm whose strategy fits the environment, considering its competitive advantages, will be more effective than one whose strategy does not. The very fact

that company X can maintain market leadership with its low priced products is evidence that it could understand its customers well for such a long time. If company Y takes over X, it may mean that company X has failed to understand any more the changing requirements of its customers. Company Y could successfully design its products and services around the needs of its customers. Thus, failure to recognise the new value providers may lead to the loss in product leadership.

- (b) *Develop distinctive and cost effective competence* A firm, which develops distinctive competence through slack resources will be more effective than the one which does not. For instance, Hindustan Lever, through e-commerce and networking, enabled its supply chain in order to bring down the overall turn-around time from 45 to 20 days.

The environmental scanning comes to an end with a detailed analysis and diagnosis of both the external and the internal environments. External environment shows up the opportunities and threats. Internal environment shows up the strengths and weaknesses. These have to be properly identified, analysed, and diagnosed. A detailed analysis of these factors is presented under SWOT analysis.

SWOT ANALYSIS

Definition

SWOT analysis is defined as the rational and overall evaluation of a company's strengths, weaknesses, opportunities, and threats which are likely to affect the strategic choices significantly.

In every business organisation, the top management carries out this evaluation. However, the companies with a participatory approach involve their managers in such an evaluation process. Individual managers and their advisers in such organisations consider the situation, separately and then jointly, to discuss about

- (a) the nature of the organisational issues such as increasing competition, eroding resources, changing technology, and so on
- (b) the importance of each of these issues as likely determinants of future strategy

Qualitative judgements are used to assess the impact, on the total performance, of quantifiable factors such as customer satisfaction, employee motivation, work processes based on technology, training on latest organisational systems, and others. The managers are more often encouraged to make such a qualitative assessment. However, they should not lose sight of the influence of non-quantifiable factors in the process.

External Environment Analysis (Opportunity and Threat analysis)

The external environment has a profound impact on the business operations irrespective of the nature and size of the business. The business has to monitor its key macro-environment forces and microeconomic parties. The key forces both in the macroeconomic and microeconomic environment are very dynamic. With the result, these forces affect the business operations, both in the short run and the long run.

Opportunities It is necessary that the company should identify what opportunities are available to it to focus upon. The latest technology, deregulated or free markets, liberalised rules and regulations, and others, may make a lot of difference for a business organisation provided it can envision how to avail these. Visionaries identify opportunities from threats. To illustrate, during times of increasing competition, some entrepreneurs are very happy that they can perform better than their competitors. See Exhibit 18.1

Exhibit 18.1: Reaching customers through technology

Reebok envisions reaching its customers directly through technology, doing away with the services of sales people in the process. With the new communication techniques and emerging technologies, the company proposes to present directly to the customer a better story of its products through a small magnetic stamp put on the bottom of every demo-shoe in the retail outlet. The customer can play it over a transponder-type device, and personally see and hear a playback over a digital video instrument (DVI) or a CD-ROM as to why he/she should buy that shoe.

Threats³ Some developments in the external environment represent threats. A threat is a challenge posed by an unfavourable trend or a development that results in the loss of sales or profit till a defensive marketing action is initiated. A few examples of threat could be outlined as change in government policy such as liberalisation, privatisation and globalisation, changing technologies, changing value systems, environmental constraints, deteriorating law and order, and so on.

One of the strategies to protect oneself from this threat may be to prepare contingency plans spelling out the changes the company can make much before or during the threat. Threat is a common factor for every business irrespective of its nature and size. Technology-based companies are more threat-prone. The unrealistic expectations of shareholders also can pose a threat to the company. See Exhibit 18.2.

Exhibit 18.2: Internal threats

Microsoft concentrates on competitive threats and makes sure that it is aware of them well in advance. As Bill Gates, CEO puts it, articulation of possible threats is a way of its corporate culture. The speed with which customer expectations change in software poses the main serious threat. Particularly when a lot of companies make software addressing people's needs, Bill Gates admits that sustaining competitive strength worries everyone. Even a slight degree of complacency from any quarter may prove fatal. Bill Gates feels the major threat is not from external factors but from the internal one, that is, the unrealistic expectations by shareholders.

Based on the degree of threat and its impact on business, the business can be of the following four types:

Ideal business A business is said to be the ideal one when it has a large number of major opportunities and a minimal number of major threats.

Speculative business A business is said to be a speculative one when it has a large number of both opportunities and threats of major magnitude.

Mature business A business is said to be a mature one when it has a lower number of opportunities and threats of major magnitude.

Troubled business A business is said to be a troubled one when it has a lower number of opportunities and a high number of threats.

Internal Environment Analysis (Strength/Weakness Analysis)

It is necessary to analyse one's own strengths and weaknesses periodically to sustain the degree of its competitive strength. Generally top management or an outside consultant reviews competencies pertaining to marketing, financial, manufacturing, and organisational systems and rates each factor as a major strength, minor strength, neutral factor, minor weakness, or a major weakness.

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

The success of the company depends on whether its business strengths not only match the key success requirements for operating in the target market but also excel when compared to those of its competitors. Mere competence does not constitute a competitive advantage. The best-performing company is one, which can generate the greatest customer value and sustain it over a given period of time.

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

Winning companies are those which achieve superior in-company capabilities, not just core competencies. Every company must manage some basic processes such as developing new products, generating more sales, and fulfilling orders. Each process creates value and requires interdepartmental teamwork. Although each department may possess specific core competencies, the challenge is to develop superior and competitive capability in managing the company's key processes. Most of the knowledge companies (such as those operating globally and developing software for live projects) from India are progressing for this reason.

SWOT analysis of a small industrial unit SWOT analysis can be applied to any individual, organisation or a country. Take the case of a small-scale forging unit. What are its opportunities, threats, strengths, and weaknesses in today's Indian context? These are discussed here.

Opportunities The forging firm, in general, has a good number of opportunities such as large potential for exports, access to the new manufacturing processes and technology through organisations such as Central Institute of Tool Design (CITD)* and realignment in the auto supplier industry. The entire forging industry in India can immensely benefit as many multinationals presently source their requirements from India.

Threats The threats faced by the forging industry include dominance of the small-scale sector, customers insisting on just-in-time delivery, absence of entry barriers, demand fluctuations in the domestic market, and so on.

Strengths The strengths of the forging firm include its strong presence in the local market, well-established customer base, its own strong financial performance and background, and its committed skilled workforce.

Weaknesses The weaknesses of the firm include insular and inflexible organisation culture, worn-out plant and equipment, inadequate systems and controls, dependence on automotive end-users, and others.

*Located in different cities, including Hyderabad.

Internal Environment

Strengths (S):

- Strong presence in the local market
- Well established customer base
- Good financial performance
- Availability of skilled workforce
- Backing from financial institutions

Weaknesses (W):

- Insular and inflexible organisational culture
- Worn-out plant and equipment
- Inadequate systems and controls
- Dependence on automotive end-users
- Inadequate knowledge of appropriate technology

External Environment

Opportunities (O):

- Large potential for exports
- India's emergence as a source-base
- Access to new manufacturing process and technology
- Realignment in the auto-supplier industry
- Encouragement from the Government in terms of subsidies, lower taxes, and others

Threats (T):

- Dominance of the small sector
- Customers' emphasis on just-in-time delivery
- Absence of entry barriers into industry
- Demand fluctuations in the domestic market
- High rate of labour turnover

FIGURE 18.4 Summary of strengths, weaknesses, opportunities, and threats of a small-scale forging firm

The strengths, weaknesses, opportunities, and threats as perceived for the above small forging firm are summarised in Figure 18.4.

SWOT Analysis: Significance

SWOT analysis provides four alternative strategies to deal with the factors in the external and the internal environment. They are:

- (a) *The Threat-Weakness (TW) strategy* This attempts to minimise both weaknesses and threats. As a part of this strategy, the firm may have to add to the product base or the range of services by taking over the competitor's business. The Government of India has been disinvesting from most of the public sector units in recent years following this strategy. By disinvestment, the Government considers that both weaknesses and threats for the public sector are minimised.
- (b) *The Opportunity-Weakness (OW) Strategy* Here, the weaknesses are minimised while the opportunities are maximised. As a part of this strategy, the firm can overcome its weaknesses by developing the necessary competencies among the workforce by investing moderately in the latest technology, and thus, offering products of the best quality to its customers. Thus, the market segment for technologically-superior products can also be successfully covered.
- (c) *The Strength-Threat (ST) Strategy* This strategy enables the firm to address the threats through its strengths. The focus is to maximise the strengths and minimise the weaknesses. As a part of this strategy, the firm can seek long-term and low-interest loans to minimise the cost of its operations.
- (d) *The Strength-Opportunity (SO) Strategy* This is the most preferred strategy. Here, the firm can take advantage of the available opportunities through its present strengths. As a part of this strategy, the firm can consider expanding into new markets with the existing products and services. Every firm tries to optimise its resources to make use of its strengths and opportunities. An intelligent and progressive

firm converts, over a period of time, its weaknesses into strengths and the threats in opportunities, by careful planning and implementation.

SITUATION ANALYSIS

Sickness in small industry

The number of small industries turning sick is increasing rampantly in almost every state of our country. Some are being closed down, some are rehabilitated by additional finance, and some are taken over by the medium industrial units. The ultimate result is that in most of the cases the small entrepreneur is at the crossroads. This problem has become more acute with the changes in the macro-level economic environment such as changes in the government policy. Every industrial unit is normally promoted with a given list of strengths and opportunities. Then, why does a particular industrial unit becomes sick? What prevents it to cash upon its strengths and opportunities?

Role of the Time Factor in SWOT Analysis

The above strategies have been identified based on the firm's strengths, weaknesses, opportunities, and threats *at a given point of time*. Over a period of time, business conditions will change in view of the fact that all the factors in the internal and external environment are dynamic. This calls for a change in the strategy also.

Limitation of SWOT analysis

SWOT analysis provides a good basis for evolving a strategy. However, it is assumed that the firm is in a position to identify its real strength, weaknesses, opportunities, and threats. The success of SWOT analysis depends on the degree of accuracy with which the firm can assess its own position. It is always desirable to involve a professional and outside management consultant in this exercise for impartial and reliable results.

SUMMARY

- ◆ Environmental scanning aims at identifying the new opportunities in which the firm can perform profitably.
- ◆ It involves an analysis and diagnosis of the external and the internal business environments.
- ◆ External environment analysis involves identifying the key macroeconomic environment forces such as demographic factors, economic factors, technological factors, and so on. It comprises three parts of the environment: general, industry, and international.
- ◆ A firm whose strategy fits the needs of the environment will be more effective.
- ◆ The strategist should be a competent person or institution. The strategist should be an experienced one. He should be a highly motivated person. He should possess a positive frame of mind. He should be able to work in stress and strain. He should be capable of withstanding the pressures from different quarters in the organisation. He should be capable of leading the team of professionals in a mature way.
- ◆ The important components of the industry environment are: customers, suppliers, and competitors.

- ◆ International environment is characterised by economies, which are surplus in terms of resources, have abundant labour, and huge markets. Each of these economies reflects major opportunities and also equally serious threats.
- ◆ Analysis of the external environment ultimately leads to the identification of opportunities and threats in the business.
- ◆ While analysing and diagnosing the internal environment, the firm's strengths and weaknesses have to be identified in each of the functional areas of the business such as marketing, research and development, production, finance, human resources, and so on.
- ◆ A strategic advantage profile has to be built to analyse the strengths and weaknesses in every internal area of the firm. This is to be carefully and critically compared to those of the competitor.
- ◆ SWOT analysis is an overall rational evaluation of a firm's own strengths, weaknesses, opportunities, and threats at a given point of time. All of these are likely to affect the firm's strategic choice.
- ◆ SWOT analysis provides a strong basis for identifying various alternative strategies such as the threat-weakness strategy, the opportunity-weakness strategy, the strength-threat strategy or the strength-opportunity strategy. Of all these, the strength-opportunity strategy is the best.
- ◆ SWOT analysis is always made at a given point of time. As time changes, there can be significant changes in the firm's over all setting. In other words, it is necessary for every firm to keep analysing its strengths, weaknesses, opportunities, and threats from time to time.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. What involves an analysis and diagnosis of the external and internal environments of a business firm?
 - (a) Environmental analysis
 - (b) SWOT analysis
 - (c) Environmental scanning
 - (d) Strategic analysis
2. What comprises the managerial decisions based on the perceived opportunities and threats of the firm?
 - (a) Environmental analysis
 - (b) Environmental diagnosis
 - (c) Environmental scanning
 - (d) Strategic analysis
3. What refers to the group of firms carrying on similar activity?
 - (a) Suppliers
 - (b) Competitors
 - (c) Industry
 - (d) Strategy
4. What sector affects the flow and development of alternative raw materials, the life cycles of products and services?
 - (a) Socio-economic Sector
 - (b) Government Sector

- (c) Industry Sector
 - (d) Technological Sector
5. What risks arises from income inequalities, breakdown in law and order due to religious fanaticism, unionisation etc..?
- (a) Political risks
 - (b) Social risks
 - (c) Economic risks
 - (d) Financial risks
6. What refers to the process of analysing and diagnosing the firms' internal strengths and weaknesses?
- (a) Internal analysis
 - (b) Strategic analysis
 - (c) Internal analysis and diagnosis
 - (d) Strategic analysis and design
7. Which of the following is neither an internal strength nor a weakness to a particular firm?
- (a) Managerial personnel
 - (b) Research and development
 - (c) Financial policies
 - (d) Organisational systems
8. What is the type of business wherein there are large number of both opportunities and threats of major magnitude?
- (a) Ideal business
 - (b) Speculative business
 - (c) Mature business
 - (d) Troubled business
9. Which of the following is not an alternative strategy to deal with the factors in the external and the internal environment?
- (a) TW Strategy
 - (b) ST Strategy
 - (c) SW Strategy
 - (d) OW Strategy
10. What is the most preferred strategy wherein the firm can take advantage of the available opportunities through its present strengths?
- (a) OW Strategy
 - (b) SO Strategy
 - (c) ST Strategy
 - (d) TW Strategy
11. What is the strategy where in the firm can seek long term and low interest loans to minimise the costs of its organisation?
- (a) ST Strategy
 - (b) SO Strategy
 - (c) OW Strategy
 - (d) TW Strategy
12. What is the strategy wherein the firm may have to add to the product base or the range of services by taking over the competitors' business?
- (a) OW Strategy

- (b) ST Strategy
 - (c) TW Strategy
 - (d) SO Strategy
13. Which of the following is not the component of the industry environment?
- (a) Customers
 - (b) Suppliers
 - (c) Competitors
 - (d) Vendors
14. Which of the following is not a part of the environment?
- (a) General
 - (b) Economy
 - (c) Industry
 - (d) International
15. What is the tool for making a systematic evaluation of the enterprise's internal factors, which are significant for the company in its environment?
- (a) Internal analysis
 - (b) External analysis
 - (c) Strategic analysis
 - (d) Strategic advantage profile
16. Which of the following is always made at a given point of time?
- (a) Internal analysis
 - (b) SWOT analysis
 - (c) External analysis
 - (d) Environmental analysis
17. From where do visionaries identify opportunities?
- (a) Strengths
 - (b) Weaknesses
 - (c) Threats
 - (d) Opportunities

Question II: Fill in the Blanks

1. The process of identifying technological, socio-economic conditions and others, to determine whether they present a threat for the existing strategy or an opportunity for a new strategy is called
2. The process of analysing the environment, component-wise or sector-wise, to provide a basis for further diagnosis is called
3. External environment analysis is also called analysis.
4. A firm whose strategy fulfils the needs of the will be more effective.
5. The fluctuating currency exchange rate is an example for risk.
6. The growing income inequalities is an example for risk.
7. The process of examining the firm's internal factors to determine where the firm has significant strengths and weaknesses is called
8. The tool for making a systematic evaluation of the enterprise's internal factors, which are significant for the company in its environment is called

9. SWOT analysis can be defined as
10. Visionaries identify opportunities from
11. The challenge posed by an unfavourable trend leading to deterioration in the market share is called
12. The most desirable strategy for a business unit is always built around its and

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. International environment
2. External environment analysis
3. The tenets governing different sectors in the external environment
4. Strategic advantage profile
5. Types of threats for a PC hardware company vis-à-vis a construction company
6. SWOT analysis as a tool of personality development

Question IV: Essay Type Questions

1. Identify the factors that are to be diagnosed both in the external and the internal environment to make enough ground for strategy formulation. Illustrate appropriately.
2. What do you understand by SWOT analysis? Discuss how it can be carried out for universities in general and a technological university in particular.
3. What are the internal factors that need to be examined for the firm to assess its strengths and weaknesses? Illustrate.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. c | 2. b | 3. c | 4. d | 5. b |
| 6. c | 7. d | 8. b | 9. c | 10. b |
| 11. a | 12. c | 13. d | 14. b | 15. d |
| 16. b | 17. c | | | |

Answers to Question II

- | | |
|------------------------------------|---|
| 1. environmental scanning | 8. strategic advantage profile |
| 2. environmental analysis | 9. the overall rational evaluation of a company's strengths, weaknesses, opportunities, and threats, which are likely to make an impact on the strategic choices. |
| 3. opportunities and threats | |
| 4. environment | 10. threats |
| 5. financial | 11. threat |
| 6. social | 12. strengths and opportunities |
| 7. internal analysis and diagnosis | |

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19

STRATEGY FORMULATION AND IMPLEMENTATION

Learning Objectives

By the time you complete this chapter, you will be able to

- explain the stages in the strategy formulation and implementation process
- understand the underlying concepts
- examine how these are used by the corporate in their day-to-day life

INTRODUCTION

Strategy formulation and implementation is the crux of the strategic management process. Strategy refers to the course of action desired to achieve the objectives of the enterprise. Formulation, together with its implementation, constitutes an integral part of the managerial activity. Managers use strategies for different purposes such as to overcome competition, to increase sales, to increase production, to motivate the employees to provide their best, and so on. Implementation of a strategy is as crucial a task as the formulation of it. There may be a lot of resistance during the implementation process. It is necessary for the manager to be very tactful to involve the members of his group in the formulation of strategy to facilitate the implementation process. This chapter explains how the strategy is formulated and implemented effectively.

STAGES IN STRATEGY FORMULATION AND IMPLEMENTATION

The process of formulating the strategy and its implementation includes the following stages:

- (a) Identification of mission and objectives
- (b) Environmental scanning
- (c) Generic strategy alternatives
- (d) Strategy variations
- (e) Strategic choice
- (f) Allocation of resources and formulation of organisational structure
- (g) Formulation of plans, policies, programmes, and administration
- (h) Evaluation and control

An outline of these stages is presented in Figure 19.1 in terms of a flow chart. The first two stages, that is, identification of mission and environmental scanning, have been discussed in detail in Chapters 17 and 18 respectively. The next stage is to develop generic strategy alternatives.

Generic Strategy Alternatives

Generic strategy alternatives refer to the strategy alternatives in broader terms. After the nature of business of the firm is defined, the next task is to focus on the type of strategic alternative, in general, the firm should pursue. The strategist seeks to identify the right alternative through questions such as:

- Should we get out of this business entirely?
- Should we try to expand?

Exhibit 19.1 presents the most generic strategy alternatives available to a firm. There are four strategic alternatives for any business. They are: (a) to expand, (b) to wind up or retrench, (c) to stabilise, (d) to combine its operations pertaining to its products, markets, or functions. These are explained below:

- (a) *Expansion strategy* can be adopted in the case of highly competitive and volatile industries, particularly, if they are in the introduction stage of product/service life cycle.
- (b) *Stability strategy* is a better choice when the firm is doing well, the environment is relatively less volatile, and the product/service has reached the stability or maturity stage of the life cycle.
- (c) *Retrenchment strategy* is the obvious choice when the firm is not doing well in terms of sales and revenue and finds greater returns elsewhere, or the product/service is in the finishing stage of the product life cycle.

Exhibit 19.1: Generic strategy alternatives¹

	Expand		Retrench		Stabilise		Combi-nation
	Business Definition	Pace	Business Definition	Pace	Business Definition	Pace	Definition or pace
Products	Add new products	Find new uses	Drop old products	Decrease product development	Maintain	Make package changes, quality improvements	Drop old while adding new products
Markets	Find new territories	Penetrate markets	Drop distribution channels	Reduce market share	Maintain	Protect market shares, focus on market niches	Drop old customers while finding new ones
Functions	Forward, vertical integration	Increase capacity	Become captive company	Decrease process R and D	Maintain	Improve production efficiency	Increase capacity and improve efficiency

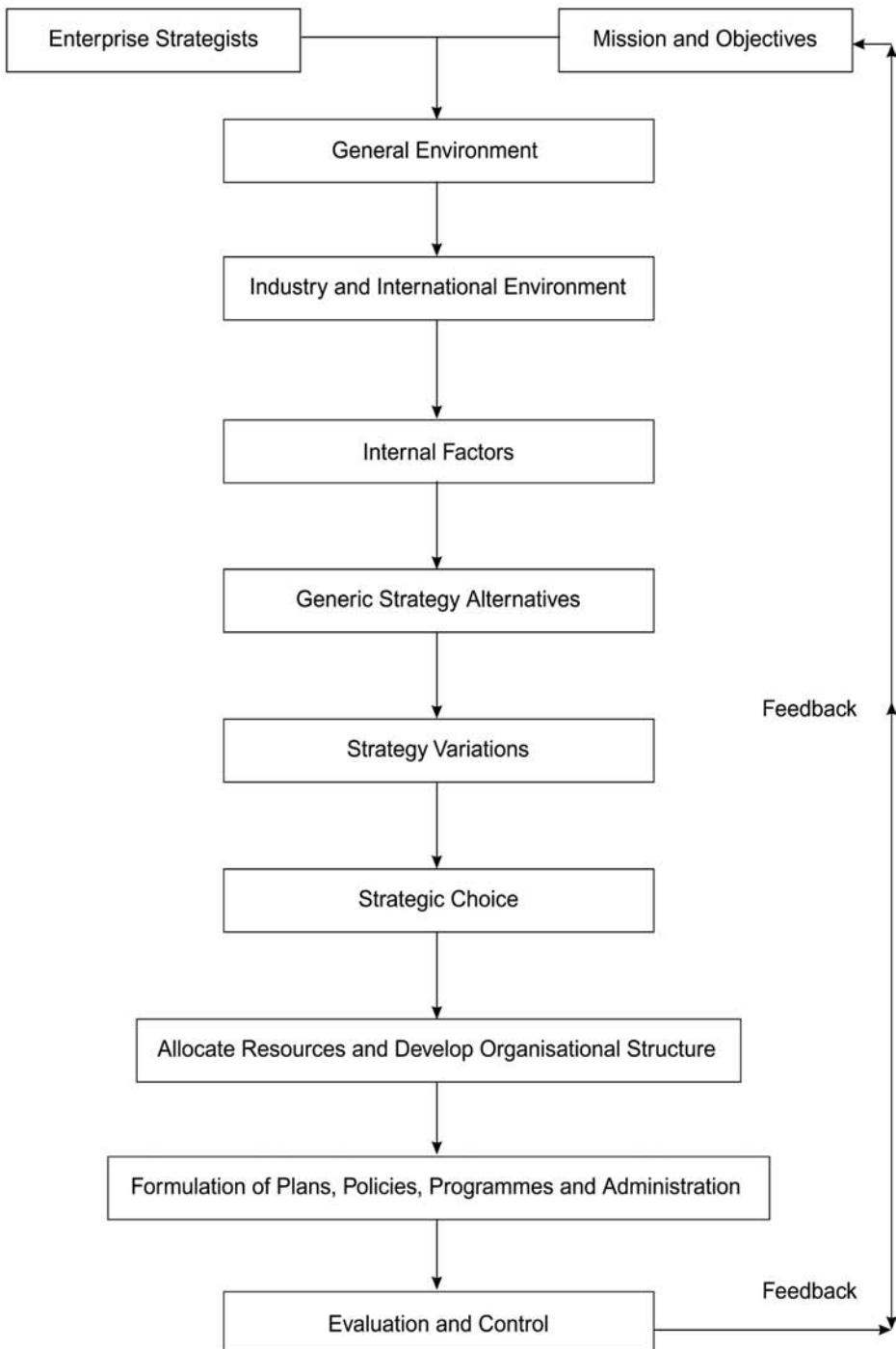


FIGURE 19.1 *Strategy formulation and implementation*²

(d) *Combination strategy* is not a new strategy as it combines the other strategies. It is best suitable for multiple SBU firms in times of economic transition and also when changes occur in the product/service life cycle. If a firm realises that some of its main product lines have outlived their lives, it may not be any more profitable to continue investment with the same product. The firm may choose to withdraw its resources from this area (this strategy is here called retrenchment) and follow an expansion strategy in a new product area. Combination strategy is the best strategy when the firm finds that its product-wise performance is not even, or all its products differ in their future potential.

In such a case, the possible alternatives are expansion, stability, or retrenchment applied to products, markets, or functions. Sometimes, a combination of all these strategies may be necessary. Any change must be contemplated considering what is to be done (business definition) and the speed (pace) with which it is to be done. Each of these alternatives has to be evaluated on its merits. Consider the following examples.

- If the firm wants to grow substantially in terms of size, expansion is the obvious alternative. But in this process, other objectives may take a back seat, at least in the short-run.
- In case of recession, retrenchment is the most preferred strategy. Retrenchment involves dropping of unviable products, reduction in non-performing assets, withdrawal from markets, and reduces the scale of activity. In the process, the overhead costs are purposefully reduced to ensure that the expenditure continues to be productive. These efforts will ultimately enhance the profitability.
- At times, the company may realise more money by liquidating its operations than by continuing. In such a case, to achieve the goal of improving cash value, the strategy is to sell a part of its assets, realise the sale proceeds, and invest the same profitably elsewhere. See Exhibit 19.2.

Exhibit 19.2: Goal of improving cash value

Most of the timber depots in sprawling open places, located in the outskirts of the city for decades, have been making more money by selling a part of their open land than by doing timber business.

In view of the substantial growth in the real estate in the city outskirts, most of them could sell their surplus land (main roadside) to construction firms for phenomenal sums.

In this process, they could successfully create capital assets such as cinema theatres, flats, or independent houses. The capital value of these assets has tremendously appreciated. A retrospective look reveals that the timber depots earned more money on these capital assets than in the timber business.

- If an entrepreneur wants to maintain control over a business, stability strategy may be a better strategy.

A strategy is a means to an end. If an organisation wants to perform better in the long-run, it has to select an appropriate strategy and pursue it vigorously. In this process, it may face certain hardships. The organisation should have the tenacity to overcome these hardships. Also, it has to make necessary changes in its strategy. A change in strategy should not be construed as a sign of failure.

Strategic alliances constitute another viable alternative. Companies can develop alliances with the members of the strategic group and perform more effectively. These alliances may take any of the following forms³:

- (a) *Product and/or service alliance* Two or more companies may get together to synergise their operations, seeking alliance for their products and/or services. The product or service alliance may take any of the following forms:
- A manufacturing company may grant license to another company to produce its products. The necessary market and product support, including technical know-how, is provided as part of the alliance. Coca-cola initially provided such support to Thums Up.
 - Two companies may jointly market their products which are complementary in nature. Chocolate companies more often tie up with toy companies. Doordarshan has recently entered into an alliance with the Cricket Board to broadcast the entire series of cricket matches live.
 - Two companies, who come together in such an alliance, may produce a new product altogether. Sony Music created a retail corner for itself in the ice-cream parlours of Baskin-Robbins.
- (b) *Promotional alliance* Two or more companies may come together to promote their products and services. This is called promotional alliance. A company may agree to carry out a promotion campaign during a given period for the products and/or services of another company. The Cricket Board may permit Coke's products to be displayed during the cricket matches for a period of one year.
- (c) *Logistic alliance* Here the focus is on developing or extending the logistics support. One company extends logistics support for another company's products and services. For example, the outlets of Pizza Hut, Kolkata entered into a logistic alliance with TDK Logistics Limited, Hyderabad, to outsource the requirements of these outlets from more than 30 vendors all over India; for instance, meat and eggs from Hyderabad. Exhibit 19.3 illustrates how Pizza Hut has exact standards for its suppliers and distributors in India and how these are met.

Exhibit 19.3: Logistic alliance

The Pizza Hut restaurants do not stock more than three days of their inventory. The standard for distribution centres or warehouses is a stringent 14 days, to minimise the costs and optimise quality control. This involves a round-the-clock monitoring of pick-ups and truck movements. Most of the items are perishable and the company's standards cover the entire delivery schedules. For in-city delivery, the truck is monitored from the time it leaves the distribution centre till it reaches the restaurant. Not just that—the time taken in offloading is noted too. The restaurant gives a strict 30 minutes window in which time the delivery is to be completed.

- (d) *Pricing collaborations* Companies may join together for special pricing collaborations. It is customary to find that hardware and software companies in information technology sector offer each other price discounts. Companies should be very careful in selecting strategic partners. The strategy should be to select such a partner who has complementary strengths and who can offset the present weaknesses. The acid test of an alliance is greater sales at less cost. It is a common practice to develop organisational structures or modify them, if necessary, to support the alliances and make them successful.

Considering Strategy Variations

There can be a number of variations of the generic strategy alternatives. For instance, if the strategy is to expand, then the alternatives are internal expansion or external expansion. Internal expansion can be achieved through any of the following approaches:

- Penetrate existing markets
- Add new markets
- Add new products, and so on

Similarly, external expansion can be achieved through mergers or acquisitions. In most of the info-tech companies, subsidiaries are created to develop at the earliest upstream capabilities in the IT value-chain. Once these subsidiaries gain the required capabilities in terms of consultancy, system integration, product design and application, development and maintenance, and others, they are merged into a major player. Merger has thus been one of the strategies to benchmark the company in terms of performance globally.

Similarly, if the strategy is to attain stability, then the alternatives could be internal stability or external stability. In some cases, both may be required. Internal stability of a firm can be achieved through (a) seeking production and marketing efficiencies and (b) redefining the existing organisational structure. External stability can be attained by maintaining market share. Exhibit 19.4 outlines possible strategy variations in the following forms:

- Internal or external
- Related or unrelated
- Horizontal or vertical
- Active or passive

Exhibit 19.4: Possible strategy variations⁴

	Expansion	Stability	Retrenchment	Combination
Internal	Penetrate existing markets; add new products; add new markets	Seek production and marketing efficiencies; reorganise	Reduce costs; reduce assets; drop products; drop markets; drop functions	Sub-contracting
External	Acquisitions; mergers	Maintain market shares	Disinvest SBUs; liquidations; bankruptcies	Cross-licensing, joint ventures
Related	Seek synergy from new products, markets, or functions	Improve products	Eliminate related products, markets, or functions	
Unrelated	Conglomerate diversification in products, markets, or functions		Eliminate unrelated products, markets, or functions	
Horizontal	Add complementary products or markets		Eliminate complementary products or markets	
Vertical	Add new functions		Reduce functions	
Active	Innovative, entrepreneurial moves			Grow to sell out
Passive	Imitator in R&D, new products	Reactive defence of position		

Each of these variations has different strategic alternatives considering the major goals of the organisation. For instance, internal strategy variation may be expansion, stability, retrenchment, or combination. If expansion is decided upon, the alternatives could be to penetrate existing markets, add new products, or add new markets, and so on.

Strategy variation is a global phenomenon. When the firm finds that it is not possible to fill up a gap in the market with the existing strategy, it may consider a change in the focus of the strategy. Exhibit 19.5 illustrates how the multinationals Indianised their global strategies to woo their customers in Indian markets.

Exhibit 19.5: *Changing trends in strategies: Global setting to Indian setting⁵*

A keen insight into the strategies adopted by multinational companies dealing in products such as automobiles, beverages, leather products, and so on, reveals the following shift from global strategies to Indianised strategies:

- Indianising the positioning of products, that is, positioning and advertising the products in the Indian context, instead of maintaining a uniform brand image all over the world. Advertisements and brands are designed to appeal to Indian aspirations. For instance, LG, a Korean company, names one of its TVs as Sampoorna.
- Developing exclusive products rather than selling the same product globally. For instance, (a) a made-for-India fridge is designed to serve just three basic purposes: chill drinking water, keep cooked food fresh and withstand long power cuts (Electrolux) (b) one of the soft drink companies has redesigned its distributor-crates as well as trucks for safe delivery through India's poor roads. (Coca-Cola)
- Widening appeal to all the segments of customers rather than focussing on select segments of the market. (Reebok)
- Operating through multi-brand stores rather than own distribution system. (Reebok)
- Entering markets through small cars rather than entering markets with highly priced and large cars. (Hyundai)
- Undertaking manufacturing with locally made products and spares rather than staying with imports only. (Hyundai)
- Using local film and sports stars for advertising, rather than international film stars. For instance, Shah Rukh Khan is preferred to replace Cindy Crawford as its celebrity for India by an international watch company. (Omega)
- Offering free hand on investments to the local managers, considering the huge size of markets, rather than controlling country budgets strictly. (Pepsi)
- Agreeing to enter the market at any cost, sacrificing own terms. Scale of operations continues to be the major attraction. (Pepsi)
- Operating through local managers through more decentralisation, rather than deputing managers from the head office. (Pepsi)
- Appointing an Indian as Chief Executive Officer (CEO) in place of an expatriate CEO. (Carrier Aircorn)

Selection of best alternative The best alternative is the one that can improve the performance. The selection of the right alternative depends upon the

- particular configuration of objectives
- environmental threat and opportunity profile
- strategic advantage profile
- the generic strategy itself

If a company has higher growth as objective, it is better to expand from a base of proven or time-tested competencies (such as cost leadership or market leadership) and organise the departments to provide new opportunities while taking moderate risks.

Every company must tailor an appropriate strategy for achieving its goals. The most generic types to initiate strategic thinking, as suggested by Michael Porter⁶, are (a) overall cost leadership, (b) differentiation, and (c) focus.

- (a) *Overall cost leadership* The company is said to attain overall cost leadership when it offers its products or services at the lowest price (due to its lowest cost of production) in the entire industry. The company thus maintains the largest market share. Companies, which pursue this strategy, have to sharply focus on cost-effective strategies in all the areas pertaining to engineering, purchases, manufacturing, and physical distribution. Any breakdown could cost the company very badly. A standby arrangement is vital.

Mergers and take-overs reflect the common route for the companies to optimise their resources and costs. Hindustan Lever emerged stronger with the acquisition of Brook Bond.

- (b) *Differentiation* The company should be capable of demonstrating a superior performance through its products and services. And this should benefit a large number of customers in saving their resources in terms of time and money. Hero Honda could design its motor cycle differently to offer higher mileage for every litre of petrol consumed. This saved the petrol expenditure for the consumer. Thus, the strategy mostly followed is to differentiate the products and services sharply through quality in a market dumped with stocks. A photocopying company can demonstrate its excellence by minimising the defects per thousand pages of its output. Constant adaptation to changing technology and large-scale initiatives in R&D would provide a shot in the arm for the company. Infosys and Wipro are some of the examples that made a niche in the software industry through differentiation.

Exhibit 19.6: Innovative practices

- Housing Development Finance Corporation introduced a high degree of innovation in its activities relating to customer friendliness, technology adaptation (by computerising its operations), slashing the loan processing time, and so on.
- British Airways provided creative interactive video services on the new Boeing 777s. Passengers will, now, be able to complain to the customer relations department in-flight, order duty-free goods, get the latest news on business, fashion, and so forth.

- (c) *Focus* The company may concentrate on a narrow market segment and obtain full market information about it. It may pursue either overall cost leadership or differentiation strategy within that target segment. Such companies, which pursue the same strategy directed to the same target market, are

called the strategic group of companies. The companies, which relentlessly pursue their strategy, are bound to succeed. This leads to benchmarking* of the strategies. There is a danger here. Others can copy these strategies in the name of benchmarks! This danger can be avoided by performing similar activities in an innovative and swift way, which the competitors cannot catch up with. There are certain issues, which the competitors cannot copy, at least, in the short run. Exhibit 19.6 shows how innovation can be built into the products and services, organisation culture, value system, commitment of the staff, and so forth.

Strategic Choice

Here the exact strategy is chosen. Strategic choice involves the decision to select, from among the alternatives, the best strategy which effectively contributes to the business objectives. The spade work to be undertaken before making a strategic choice consists of

- identifying the few viable alternative course of action
- considering the parameters for selection of best alternative
- evaluating each alternative on its own merits and in relation to other alternatives
- making the final choice
- keeping the next best alternative as stand by (to take care of the contingencies)

The following are the questions in terms of which environmental and internal conditions are analysed:

- What are the main business objectives?
- Does the selected strategy contribute to these objectives?
- What is the business definition—is it product-based, market-based, or function-based?
- Will it be achieved in the future?

These questions help us to examine the performance gap between the expected and the ideal outcomes in relation to the alternatives under consideration. If the gap is narrow or negligible, the stability strategy is the best strategy. Stability strategy focuses on ‘doing in the best way what we do’. Most of the prestigious international airliners such as Delta or Transworld Airlines TWA lease most of their operations such as computerised reservation systems, maintenance, ground halting work, and others to professional agencies to improve their overall performance in general and increase the pace of its own activities in particular. The focus will be on better implementation initiating certain pace changes** internally. If the gap is large and significant, the probable alternatives are either to expand or to withdraw from the unrelated areas. Mergers, acquisitions, disinvestments are some of the measures that initiate changes in the pace of growth.

The decision-maker considers different choices closest to the present strategy. In the process, he identifies the most preferred strategy. Some of the parameters that help him in this process are:

- Is it politically acceptable or not?
- What is the degree of risk involved?
- To what extent is the enterprise dependent on external factors?

*Benchmarking is the process of creating certain benchmarks or standards in terms of best performance. The practices initiated by the best companies are termed as benchmarks.

**Pace changes here refer to any of the following: (a) finding new uses for the existing product, (b) increase or decrease in the market share, and (c) increase or decrease in the existing level of production.

Such an evaluation leads to the choice of an appropriate strategy, and at this point, it appears to the decision-maker that the gap between the expected and the ideal outcomes is closed. Relying excessively on one corporate plan with one or two variations more often, may not be adequate. Hence, it is desirable to keep a contingency plan ready as standby.

Exhibit 19.7: *Strategy formulation and implementation*

- Nokia studies closely each of the subsets of its customer segments. It carefully assesses what appeals to each of them most. After identifying their purchasing power, it chooses the appropriate technology and then formulates the strategy.

When Motorola could not take off with seven varieties of its cell phones, Nokia struck gold when it introduced just two plain models.⁷ The secret of success was that the products were changed or adapted to the local conditions. In other words, the products and services were more Indianised to ensure survival in the Indian markets. Nokia could thus successfully formulate its strategy around its different customer segments, varying appeals, and affordable technology.

- Taparia, CEO, Rajashree cements followed a value enhancement strategy to capture cement market which was dominated by 43 grade cement, and ACC, L & T, and others were the market leaders. Taparia noticed that nobody thought of the market-positioning slot for superior grade 53. In fact, grade 53, despite its high price, leads to overall savings due to less consumption. Taparia expected that a shift from grades 43 to 53 would require convincing, for which channel support and its participation in communication task were essential.

To popularise Grade 53 cement, Taparia launched the Shoppe concept by associating with 'weak and small channel' members. The Shoppe concept empowered them with the services of a civil/structural engineer at Rajashree's cost for any type of consultation with the customers visiting the shoppe.

The neat and clean environment of the cement outlets attracted the customers who were otherwise used to the dirty and dusty environment of cement outlets. The customers were assured of the availability and reliability of the quality products. The customer could avail the services of a civil engineer and also sit in an air-conditioned chamber of the Shoppe and watch a video film on Grade 53.

The quality of documentation (invoices, challans) also was improved to create confidence in the customer. The success of the Shoppe concept was evident from a rise in demand from 5000 tonnes per month to 45,000 tonnes per month in the city of Pune alone! Even established giants like ACC and L & T had to follow the footsteps of Taparia by introducing Grade 53 and also developing their own exclusive outlets like 'ACC ki dunia' and 'L & T Station'.

Since strategic choice is a managerial decision, care should be taken that it is not affected by bias, intuition, or politics. These constraints, if allowed to prevail, will limit the choice. Progressive companies hold formal meetings involving all or most of their managers at the top level while choosing strategy and to record the criteria used. Most often, a company may not have total freedom in choosing the strategy as it is dependent for its survival on one or more of the following: owners, competitors, suppliers, the Government, and the

community. The strategic choice is also affected by relative volatility of the market sector wherein the firm chooses to operate. If the sector is more volatile, it needs a flexible and strategic response to be more effective.

Strategic choice and its effectiveness is often restricted by various factors such as the strategies earlier followed, the attitudes of the managers to risk (most of the managers are averse to risk), and lobby for power (some managers wish to be close to the boss to garner influence) in the organisation, internal and external alliances, and so on.

All said and done, what is very important is the overall commitment to the chosen strategy. The cases of L&T Eutectic (discussed in the previous chapter), Taparia of Rajashree Cements, and Nokia illustrate amply (see Exhibit 19.7) how the strategies were formulated and implemented successfully.

Allocation of Resources and Development of Organisational Structure

The process of strategy implementation calls for an integrated set of choices and activities. These include allocating resources, organising, assigning appropriate authority to the key managers, setting policies, and developing procedures. It is necessary to establish an operative system to reinforce, control, and evaluate a strategy.

A good strategy with effective implementation has a higher probability of success. The resource allocation decisions—such as, which department is sanctioned how much amount of money and resources, in the name of budget, and so on—set the operative strategy of the firm. Budgets are formulated after a series of negotiations across different levels in the organisation. Budgets may be of different types: corporate budgets, capital budgets, departmental budgets, sales budgets, expense budgets, and others.

An effective co-ordination and efficient division of labour requires an appropriate organisation structure. The best organisation structure is one, which fits into the organisational environment. Also its internal characteristics should give rise to an effective strategy. Appropriate changes in the organisation structure may be initiated to ensure strategic implementation of the proposed strategy. Effective strategic management practices suggest that organisation structure also should change if the strategy changes or if the organisation experiences any bottlenecks in this regard.

Formulation of Policies, Plans, Programmes, and Administration

The resources allocated are said to be well utilised only when they are well monitored. For this purpose, it is essential

- to develop policies and plans
- to assign or reassign leaders the tasks and decisions to support the chosen strategy
- to provide a conducive environment in the organisation through proper administration to achieve the given objectives directly and indirectly

The implementation of plans and policies is designed in accordance with the strategy chosen. The firm creates plans and policies to guide managerial performance, and these make the chosen strategies work. The corporate success lies ultimately in the ability to convert the corporate strategy into plans and policies that are compatible and workable.

The implementation of the strategy becomes easy when the organisation

- plans for career development of its personnel at all levels
- applies organisational development concepts* in its normal functioning

*Organisational development aims at enhancing organisational effectiveness by applying diagnostic and problem solving skills through behavioural approach.

- ensures that the strategist is capable, experienced, and versatile enough to match the strategy demands

It is always prudent to develop minimal plans, policies and programmes in all the functional areas such as marketing, production, R&D, Finance, human resource development (HRD), and others. For instance, if the company wants to retain its staff, the following programmes may be helpful:

- Focus on periodical appraisal through an objective and participative performance appraisal system.
- Measure employee satisfaction levels regularly and respond promptly by launching corrective measures to any signs of employee dissatisfaction or frustration.
- Institutionalise the career-counseling function and fill the vacancies that arise by promoting the qualified candidates.
- Do not depend on one single employee or group at any level in the organisation. Create multiple responsibilities on the well-chosen group of managers at different levels. Also ensure that the functional heads and the CEO are involved in this process.
- Recognise those variations, which are bound to exist across organisational levels and functions, and formulate specific retention strategies to suit them.

Detailed support programmes must be developed to support the given strategies.

Implementation: Evaluation and Control of Strategy

Evaluation is the last phase of the strategic management process. It is at this stage that the success of the programmes can be assessed. There should be a built-in mechanism to examine the deviations and initiate corrections as and when required. This assures that the chosen strategies will be implemented properly.

The control process requires identifying a set of parameters for evaluating and measuring the performance at the individual level and also at the department level. The performance has to be evaluated to identify deviations and take the corrective action. The control and evaluation takes place not only at the SBU level but also at the corporate level. This process may involve the participation of all the executives at all levels. Corrective actions are required wherever the evaluation reveals deviations between the actual performance and the projected one, over a given period of time. Timely measurement of performance and feedback determines the effectiveness of the implementation of the strategy.

The parameters should be, as a part of the checklist, evolved to check the nature of objectives, environmental assumptions, internal organisation, resources, attitudes to risk, timing of decisions and actions, feasibility, and organisational commitment. Managers may consider, in the order of priority, the changes in the parameters, implementation, strategy, and finally the objectives themselves, if performance levels are lower than expected.

The evaluation system, thus, provides a feedback to the entire strategic management process. Such a follow up calls for good objectives and performance standards, effective rewards, and accurate and complete feedback. Managers should have total access to every type of information they look for so that they can focus on objective-oriented performance. Thus, Management Information System (MIS)* and Management by Objectives (MBO)** system can be useful tools for managers. But as with any system, effective application requires hard work on the part of the staff at different levels.

*Management Information System (MIS) provides appropriate information to managers as and when they need it.

**Management by Objectives (MBO) focuses on a new approach to management, wherein the managers can set objectives for themselves and strive to achieve them. This will assist in meeting overall organisational goals. This approach was popularised by Peter F. Drucker.

A strategy can well be implemented if the staff is efficient, has a shared vision, and a developed work culture and value system. It is the management's responsibility to ensure a conducive environment that fosters the effective implementation of strategies. For want of committed workforce, most of the organisations fail at this stage.

SUMMARY

- ◆ The significant stages underlying strategy formulation and implementation are: (a) corporate planning, (b) environmental scanning, (c) generic strategy alternatives, (d) strategic choice, (e) allocation of resources and formulation of organisational structure, (f) formulating and implementing the policies, plans, programmes, and administration, and (g) evaluation and control.
- ◆ Generic strategy alternatives are the alternative approaches available for the firm to achieve its goals. To identify these alternatives, it is necessary to define one's business and the pace with which it can operate. These keep changing depending upon the firm's overall mission and its products, markets, and functions.
- ◆ Strategic alliances may take any of the following forms: (a) product or service alliance, (b) promotional alliance, (c) logistic alliance, and (d) pricing collaborations.
- ◆ Strategy variations refer to varying the strategy to address the specific requirements of the markets or customer segments or to take advantage of the available opportunities. Strategy variation is a global phenomenon.
- ◆ The most generic types to initiate strategic thinking are: (a) overall cost leadership (b) differentiation (c) focus.
- ◆ Strategic choice is the decision to select that strategy which will best meet the enterprise objectives. It is necessary to keep the contingency plan ready as standby.
- ◆ The resources and organisational structure should necessarily match the needs of the strategy.
- ◆ Formulate the policies, plans, and programmes to give enough force to the strategy. Detailed support programmes have to be worked out to support the strategies developed.
- ◆ Periodic evaluation and feedback enables the top management to assess the progress from stage to stage. Corrective measures have to be taken, as the situation demands.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Which of the following refers to the course of action desired to achieve the objectives of the enterprise?
 - (a) Schedule
 - (b) Strategy
 - (c) Scanning
 - (d) Evaluation
2. Which of the following is not a generic strategy alternative?
 - (a) Stability strategy
 - (b) Expansion strategy

- (c) Retrenchment strategy
 - (d) Allocation strategy
3. One of the following strategies implies that unviable products and services can be dropped. Name it.
- (a) Expansion strategy
 - (b) Retrenchment strategy
 - (c) Stability strategy
 - (d) Combination strategy
4. What alliance refers to the process wherein two or more companies may get together to synergise their operations?
- (a) Promotional alliance
 - (b) Logistics alliance
 - (c) Product/service alliance
 - (d) Pricing collaboration
5. Which of the following is not an approach to internal expansion?
- (a) Penetrate existing markets
 - (b) Mergers and acquisitions
 - (c) Add new products
 - (d) Add new markets
6. Which of the following is not a possible strategy variation?
- (a) Unrelated strategy
 - (b) Passive strategy
 - (c) External
 - (d) Diagnol
7. Which of the following is not one of the most generic types to initiate strategic thinking?
- (a) Overall cost leadership
 - (b) Differentiation
 - (c) Diversification
 - (d) Focus
8. At what stage, can the success of the programmer be assessed?
- (a) Implementation
 - (b) Evaluation
 - (c) Development
 - (d) Design
9. Which of the following is not a stage in the process of strategy formulation and implementation?
- (a) Corporate planning
 - (b) Formulating policies
 - (c) Generic alternatives
 - (d) Plans and administration
10. Which of the following refers to varying the strategy to address the specific requirements of the markets?
- (a) Strategic alliances
 - (b) Strategy variations
 - (c) Promotional alliance
 - (d) Logistic alliance

11. What refers to the decision of selection of the strategy that will best meet the enterprise objectives?
 - (a) Strategic alliances
 - (b) Strategy variations
 - (c) Strategic choice
 - (d) Pricing collaborations
12. Name the best strategy from the following for a firm whose divisions perform unevenly or do not have the same future potential?
 - (a) Expansion
 - (b) Combination
 - (c) Stability
 - (d) Combination
13. A good strategy with effective implementation has probability of success.
 - (a) lower
 - (b) higher
 - (c) moderate
 - (d) least
14. What strategy can be adopted in case of highly competitive and volatile markets?
 - (a) Stability strategy
 - (b) Combination strategy
 - (c) Retrenchment strategy
 - (d) Expansion strategy
15. What strategy would be a better choice when the firm is doing well and the environment is relatively less volatile?
 - (a) Expansion strategy
 - (b) Stability strategy
 - (c) Combination strategy
 - (d) Retrenchment strategy
16. Which of the following refers to the kind of alliance where in two or more companies come together to promote their products/services?
 - (a) Product/service alliance
 - (b) Logistic alliance
 - (c) Promotional alliance
 - (d) Pricing collaboration

Question II: Fill in the Blanks

1. In highly competitive industries, particularly in the early stage of product life cycle, strategy is followed.
2. The best strategy for a firm, whose divisions perform unevenly or do not have the same future potential, is
3. Seeking production and marketing efficiency is an example for strategy.
4. Subcontracting is an example for strategy.
5. The strategist considers choices closest to the present strategy and incrementally moves from the most preferred strategies to the least preferred. He stops when it appears that the is closed.

6. Measuring employee satisfaction levels regularly is a strategy most of the progressive companies follow.
7. Strategic management process starts with
8. A good strategy with implementation has a higher probability of success.
9. Appropriate changes in are initiated to ensure strategic implementation of the proposed strategy.
10. A new strategy is considered necessary if there is a significant gap between the expected outcome and the outcome.
11. The companies pursuing the same strategy directed to the same target market constitute the group.
12. An acid test for an alliance is greater sales at cost.

Question III: Short-answer Questions

Write short notes on the following (in not more than six lines each):

1. Generic strategy alternatives
2. Possible strategy variations
3. Pricing collaborations
4. Strategic deviations
5. Differentiation

Question IV: Essay Type Questions

1. Identify and discuss the stages in the process of strategy formulation and implementation. Illustrate.
2. Explain and illustrate how the corporate companies, in particular, the transnational, Indianised their global strategies. Also assess how far they were successful because of this strategy.

Answers to Question I

- | | | | | |
|-------|-------|-------|-------|-------|
| 1. b | 2. d | 3. b | 4. c | 5. b |
| 6. d | 7. c | 8. b | 9. c | 10. b |
| 11. c | 12. b | 13. b | 14. d | 15. b |
| 16. c | | | | |

Answers to Question II

- | | |
|-------------------------|---------------------------|
| 1. expansion | 7. mission and goals |
| 2. combination strategy | 8. effective |
| 3. stability | 9. organisation structure |
| 4. combination | 10. ideal |
| 5. gap | 11. strategic |
| 6. retention | 12. less |

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vides managers with the tools for organising, evaluating and efficiently running their departments. Within companies and large organisations, the department responsible for computer systems is sometimes called the MIS department. It is the responsibility of MIS Department to develop and design the reporting formats for various functional departments such as Production, Finance, Marketing, Projects, HR etc. MIS Department is increasingly sought after for every type of information that is necessary for both operational, tactical and strategic decisions by using decision support systems, expert systems and artificial intelligence.

End User Computing

End User Computing (EUC) is a group of approaches to computing that aims at better integrating end users into the computing environment. It also attempts to realise the potential for high-end computing to perform in a trustworthy manner in problem solving of the highest order.

EUC attempts to integrate the human interface ergonomically into a user centered design system throughout its life cycle. In this sense, the goal of EUC is to allow unskilled staff to use expensive and highly skilled knowledge in their jobs, by putting the knowledge and expertise into the computer and teaching the end user how to access it. EUC is used when highly critical tasks are supported by computational systems such as commercial flights and nuclear plants.

The EUC describes two types of approaches, A and B, that are at different ends of a spectrum. One simple example of these two extremes can use the Structured Query Language (SQL) context. The approach A would have canned queries and reports that for the most part would be invoked with buttons and/or simple commands. Here, a computing group would keep these canned routines up-to-date through the normal development/maintenance methods. It looks easier to teach, say, factory workers how to read dials, push buttons, pull levers, and log results than to teach them the manufacturing process and mathematical models. The present computing trend is to simulate a console with similar dials, sliders, levers, and switches, which the end user learns to use. Computer consoles all contain components which are shaped, labeled, coloured, and function similarly, and this further reduces end-user training.

For the approach B, SQL administration permits the end-user involvement at several levels including administration itself. Users can also shoot queries though the supporting devices. This is already visible in some business intelligence methods which build SQL, including new databases. In this type of EUC, it has been argued that (teaching programming and computing concepts to a functional expert) is easier than (teaching the intricacies of a complex discipline to a software engineer), is the normal approach of the IT-driven situation. has been the reality right from the beginning of computing in many disciplines. In this sense, there may be software professionals supporting decisions about architecture, process, and Graphic User Interface (GUI). Between these two extreme views of EUC there are many combinations. Some of the factors contributing to the need for further EUC research are knowledge processing, pervasive computing, issues of ontology, interactive visualisation and analysis coupling schemes.

Materials Requirement Planning (MRP)

MRP is a software based production planning and inventory control system used to manage manufacturing processes. The main objectives of MRP system are:

- to ensure the availability of materials and products for production and delivery to customers.
- to maintain the lowest possible level of inventory.
- to plan manufacturing activities, delivery schedules and purchasing activities.

Manufacturing organisations, irrespective of the nature their products, face the same problem every day i.e., the customers want products to be available in a shorter time. This obviously necessitates a large degree of planning. It is necessary to control the types and quantities of materials purchased, plan the products that are to be produced and corresponding input quantities. What is all the more important is to ensure that they are able to meet the current and future customer demand, all at the lowest possible cost. The company is likely to lose money if any decision turns out to be wrong. The following examples illustrate this point:

- If a company purchases inadequate quantities of an item used in manufacturing, or buys the wrong item, they may be unable to meet delivery schedules.
- If a company purchases quantities of an item more than required, money is wasted. In addition, the cash gets locked in the excess quantity bought and such excess quantity may never be used. This is a particularly severe problem for food manufacturers and companies with very short product life cycles.

MRP is used by a large number of organisations as a tool to deal with these problems. It answers questions such as : what items are required, how many are required and by when are they required. This applies to items that are bought in and also to sub-assemblies that go into more complex items. It covers bills of materials that provides details of the materials, components and subassemblies required to make each product. It provides all the planning data that includes all the restraints in and directions to produce the end items. It covers items such as routings, labour and machine standards, pull/work cell and push commands, lot sizing technique(s) (i.e. fixed lot size, lot-for-lot, economic order quantity), scrap percentages and other inputs.

Outputs There are only two outputs, A and B, and a variety of messages/reports. Output A is the "Recommended Production Schedule". This lays out a detailed schedule of the required minimum start and completion dates, with quantities, for each step of the routing and bill of material required to satisfy the demand from the MPS.

Output B is the "Recommended Purchasing Schedule". This lays out the dates that the purchased items should be received both into the facility and these date(s) the purchase orders, or blanket order release should occur to match the production schedules.

Messages and Reports: These include purchase orders (an order to a supplier to provide materials) reschedule notices (that recommend cancel, increase, delay or speed up existing orders).

It is always desirable that the recommended outputs need to be reviewed by trained people to group orders for benefits in set-up or freight savings as these actions are beyond the linear calculations of the MRP computer software.

MRP-I/ERP evolved with the change in hardware/software capability and "Interface" interpretations between software. The system which considers financial constraints has further evolved as MRP II. An MRP II system can include finite/infinite capacity planning.

MRP II concept considers fluctuations in forecast data by including simulation of the master production schedule, thus creating a long-term control. MRP II is an extension to purchasing, to marketing and to finance (integration of all the modules of the company). The next development to MRP-II has been ERP.

Just-in-time (JIT) When the components arrive as and when required in a manufacturing operation, it is called just in time. Conceptually speaking, JIT has no need for inventory or stock. Adopting a JIT system is also sometimes referred to as adopting a lean production system.

JIT originated in Japan. It is a philosophy of working is generally associated with the Toyota. JIT being initially known as the "Toyota Production System". JIT is a new system of production based on the elimination of waste.

There are several sources of waste that should be eliminated. These include overproduction, time spent waiting, transportation/movement (time lost in material handling, processing time, inventory upkeeping), waste associated with defective items

Japanese Terms

Japanese terms used in JIT are given below with the meanings in brackets:

Just In Time (JIT) at General Motors

General Motors, USA has 1700 suppliers who ship to 31 assembly plants scattered throughout USA. These shipments total about 30 million metric tons per day and GM spends about \$1,000 million a year in transport costs on these shipments (in the year 1990). The concept of JIT implies frequent, small, shipments. When GM moved to JIT there were simply too many (lightly loaded) trucks attempting to deliver to each assembly plant. GM solved this problem by introducing consolidation centres at which full truckloads were consolidated from supplier deliveries. This obviously required deciding the number of consolidation centres required, their locations, their capacity or size, and which suppliers should ship to which consolidation centres etc.

By 1990, some 20% by weight of shipments go through consolidation centres and about 98% of suppliers ship at least one item through a consolidation centre. All this has been achieved without sacrificing the benefits of JIT.

This is the reason why it is often said: Japanese industry works just-in-time, Western industry works just-in-case.

Just in Time (JIT) at Maruti Udyog

Can you imagine manufacturing 1200 to 1500 vehicles, co-ordinating the sales of an equal number of vehicles through a 250-strong dealer network throughout the country and handling some 7,000 consignments of spare parts from nearly 350 vendors? It's a gigantic and Herculean task for any organisation to carry out on a daily basis. Any small error in this delicately-balanced chain can throw the entire chain out of gear. This poses risk not only to the company but also to the stakeholders including ancillary units, the sales and dealer network, and even the customers. For Maruti Udyog the entire process is a child's play. It is all managed smoothly.

Delivery Instruction System Implementation at Maruti demonstrated the true potential of JIT. This resulted in complete supply chain inventory reduction. While the vendors receive communication of the firm schedule two weeks in advance, they are also provided with instructions, including the date and even the exact workstation. This has resulted in inventory reduction for a large tyre vendor by some 33 per cent. The company has also implemented a vehicle-tracking system, wherein computers directly control the process workstations and the car production schedule is fed directly into the process automation system. The machines know 'what' car to produce and this has benefited in mass customisation. Maruti has also taken other initiatives such as warehouse reengineering through barcoding and some more such as pre-owned car business, corporate fleet management, auto finance and auto insurance.

- Andon (trouble lights): These immediately signal to the production line that there is a problem to be resolved.

- Jikoda (autonomation): This enables machines to be autonomous and able to detect defects automatically.
- Muda: Waste
- Mura: Unevenness
- Muri: Excess
- Poka-yoke (foolproof): Maintain machines and methods so as to prevent mistakes in production processes
- Shojinka (flexible) Develop a workforce flexible enough to cope with changes in production and using different machines
- Soikufu (thinking creatively) having inventive and innovative ideas

JIT is also called as stockless production or lean production. JIT is a suitable production system when:

- it is possible to produce clearly defined standard products
- a reasonable number of units are made
- product is of high value
- there is scope for flexible working practices and we can develop a disciplined workforce
- there is scope for short setup times on machines
- we can assure quality in terms of zero defects

Kanban Kanban is a signal or message or communication, used to control the flow of items through the production process. Even waving hands or shouting, sending a card could be a few examples for Kanban.

Benefits of JIT The benefits of JIT include better quality products, quality consciousness, worker accepting quality as his/her responsibility, reduced scrap and rework, reduced cycle times, lower setup times, smoother flow of production, less inventory (of raw materials, work-in-progress and finished goods), cost savings, higher productivity, higher worker participation, more skilled workforce, the workers accepting to improve their competencies and willing to switch roles, reduced space requirements and improved relationships with vendors.

Total Quality Management (TQM)

TQM is a set of management practices followed organisation-wide, geared to ensure the organisation consistently meets or exceeds customer requirements. Process measurement and controls constitute major focus in TQM as means of continuous improvement. In a TQM effort, all members of the organisation participate in improving processes, products, services and the culture in which they work.

If the company is committed to provide its customers with products and services that satisfy their needs, its culture, attitude and organisation also should speak so.

Not many companies that implemented TQM have been successful. Surveys reveal that only 20-36% of companies that have undertaken TQM have achieved either significant or even tangible improvements in quality, productivity, competitiveness or financial return.

Prerequisites for TQM There are some prerequisites for successful implementation of TQM. These are customer-driven quality, top management leadership and commitment, continuous improvement, fast response, actions based on facts, employee participation, and a TQM culture.

How products are developed in TQM environment It is interesting to see the process of product development in a TQM environment. Without a TQM approach, product development is usually carried on in a an atmosphere where each department acts independently. Short-term results drive behavior so scrap, changes, work-arounds, waste, and rework are part of routine. Most often, the attention of management is lost in supervising individuals, fire-fighting and rewarding individuals for their performance.

Product development in a TQM environment is always customer-driven and focussed only on quality. Teams in TQM environment are process-oriented, and interact with their internal customers to deliver the required results. The focus of top management is on controlling the overall process, and rewarding teamwork, not individuals.

A core concept in implementing TQM is Deming's 14 points which refer to the set of management practices to help companies to increase their quality and productivity. These have been discussed in the chapter on Statistical Quality Control.

International Organisation for Standardisation (ISO) defines TQM as 'a management approach for an organisation, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organisation and to society'.

TQM at Tata Motors

Tata Motors had all along believed in developing strong inhouse design, engineering, and manufacturing capabilities. It performed a large part of its manufacturing activities in-house. It had installed facilities to manufacture engines, gearboxes and transmission mechanisms, body panels, castings and forgings and important components and sub-assemblies. It even manufactured its own machine tools, dyes and fixtures, in its machine tools division.

Tata Motors started a comprehensive quality improvement initiative in September 2000. The initiative played an important role in the company's turnaround, from a loss of Rs. 500 crores in the year ended March 2001 to a profit of Rs. 28 crores in the first quarter of 2002-03. Every year, about a quarter of Tata Motors' workforce went through training courses, which were rated highly in the Indian engineering industry.

Personnel were trained before building workshops. In case of imported machines, engineers and workers were sent to the foreign manufacturer's facilities to receive training well before the arrival of the machine. The top management at Tata Motors, thus, strived hard to develop TQM culture through out the organisation. There were efforts visibly seen for continuous improvement, fast response and employee participation.

Every process so that greater consistency of effort is obtained. In Japan, TQM comprises the following four process steps:

1. *Kaizen*—focuses on continuous process improvement by making processes visible, repeatable and measurable.
2. *Atarimae Hinshitsu*—make things work as they are meant for (i.e., a pen is meant for writing).
3. *Kansei*—examine the way the user applies the product leads to improvement in the product itself.
4. *Miryokuteki Hinshitsu*—things should have an aesthetic quality (for instance, a pen will write in a way that is pleasing to the writer).

TQM requires that the company maintain this quality standard in all aspects of its business. To achieve the objective of TQM, it is necessary that things are done right the first time and that defects and waste are eliminated from operations.

Six Sigma

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

- continuous efforts to reduce variation in process outputs is key to business success
- manufacturing and business processes can be measured, analysed, improved and controlled
- succeeding at achieving sustained quality improvement requires commitment from the entire organisation, particularly from top-level management

Six sigma refers to the ability of highly capable processes to produce output within specification. In particular, processes that operate with six sigma quality produce at defect levels below 3.4 defects per (one) million opportunities (DPMO). The implicit goal of six sigma is to improve all processes to that level of quality or better.

Six sigma simply means a measure of quality that strives for near perfection. six sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process – from manufacturing to transactional and from product to service.

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

The six sigma methodology aims at the implementation of a measurement-based strategy that focuses on process improvement and variation reduction through the application of six sigma improvement projects. This is achieved through the use of two six sigma sub-methodologies: DMAIC and DMADV. The six sigma DMAIC process (define, measure, analyse, improve, control) is an improvement system for existing processes falling below specification and looking for incremental improvement. The six sigma DMADV process (define, measure, analyse, design, verify) is an improvement system used to develop new processes or products at six sigma quality levels. It can also be employed if a current process requires more than just incremental improvement. Both six sigma processes are executed by six sigma *green belts* and six sigma *black belts*, and are overseen by six sigma *master black belts*.

Black belts save companies approximately \$230,000 per project and can complete four to six projects per year. General Electric has estimated benefits on the order of \$10 billion during the first five years of implementation. GE first began six sigma in 1995 after Motorola and Allied Signal blazed the six sigma trail. Then onwards, thousands of companies around the world have experienced the far reaching benefits of six sigma.

Six sigma is a registered service mark and trademark of Motorola. In addition to Motorola, companies that also adopted six sigma methodologies early-on and continue to practice it today include Bank of America, Caterpillar, Honeywell International (previously known as Allied Signal), Raytheon, Merrill Lynch and General Electric.

Methodology Six sigma has two key methodologies: DMAIC and DMADV. DMAIC is used to improve an existing business process, and DMADV is used to create new product or process designs for predictable, defect-free performance.

DMAIC Basic methodology consists of the following five steps:

- *Define* the process improvement goals that are consistent with customer demands and enterprise strategy.
- *Measure* the current process and collect relevant data for future comparison.
- *Analyze* to verify relationship and causality of factors. Determine what the relationship is, and attempt to ensure that all factors have been considered.
- *Improve* or optimize the process based upon the analysis using techniques like Design of Experiments.
- *Control* to ensure that any variances are corrected before they result in defects. Set up pilot runs to establish process capability, transition to production and thereafter continuously measure the process and institute control mechanisms.

GE's six sigma Experience

Before six sigma was implemented, GE's operations were carried out between 3-4 sigma, i.e., about 35,000 defects per million opportunities. There was an avoidable expenditure of \$7-10 billion in the form of scrap, reworking of parts, correction of transactional errors, inefficiencies, and lost productivity.

Six sigma was implemented at GE in 1988 in the form of an initiative called the 'WorkOut' program. The company realised that employees constituted an important source of intellectual power for new and creative ideas. The WorkOut program gave each employee an opportunity to influence and improve GE's operations through continuous interaction. The program had set the following four major goals that later laid foundation for six sigma:

- *Build Trust:* Employees were encouraged to criticise GE without negative consequences to their careers.
- *Empower Employees:* As employees who performed a particular task knew how to do it perfectly, GE encouraged them by giving more power to motivate them to take more responsibility for their jobs.

DMADV The basic methodology consists of the following five steps:

- *Define* the goals of the design activity that are consistent with customer demands and enterprise strategy.
- *Measure* and identify CTQs (critical to qualities), product capabilities, production process capability, and risk assessments.
- *Analyse* to develop and design alternatives, create high-level design and evaluate design capability to select the best design.
- *Design* details, optimise the design, and plan for design verification. This phase may require simulations.
- *Verify* the design, set up pilot runs, implement production process and handover to process owners.

Six sigma identifies several key roles for its successful implementation.^[9]

- *Executive Leadership* includes the support of CEO and other key top management team members. They are responsible for setting up a vision for six sigma implementation. They also empower the other employees with the freedom and resources to explore new ideas for breakthrough improvements.
- *Champions* are responsible for the six sigma implementation across the organisation in an integrated way. Champions also act as mentors to *black belts*.
- *Master black belts*, identified by champions, act as in-house expert coaches for the organisation on six sigma. They assist champions and guide *black belts and green belts*.
- *Experts* work across company boundaries, improving services, processes, and products for their suppliers, their entire campuses, and for their customers.
- *Black Belts* operate under *master black belts* to apply six sigma methodology to specific projects. They primarily focus on six sigma project execution, whereas *champions* and *master black belts* focus on identifying projects/functions for six sigma.
- *Green Belts* are the employees who take up six sigma implementation along with their other job responsibilities. They operate under the guidance of *black belts* and support them in achieving the overall results.
- *Yellow Belts* are employees who have been trained in six sigma techniques as part of a corporate-wide initiative, but have not completed a six sigma project and are not expected to actively engage in quality improvement activities.

In many recent programs, *green belts* and *black belts* are empowered to initiate, expand, and lead projects in their area of responsibility.

Capability Maturity Model (CMM)

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

The CMM ranks software development organisations in a hierarchy of five levels. Each level has a progressively greater capability of producing quality software. Each level is described as a level of maturity. Those five levels are equipped with different number of instructions to follow.

Maturity Model: A maturity model is a structured collection of elements that describe characteristics of effective processes. A maturity model provides a place to start, the benefit of a community's prior experiences, a common language and a shared vision, a framework for prioritising actions and a way to define what improvement means for your organisation. A maturity model can be used as a benchmark to assess different organisations for equivalent comparison. The Capability Maturity Model Integration (CMMI) is a new version of CMM.

Structure of CMM: The structure comprises maturity levels, key process areas (that identifies a cluster of related activities that, when performed collectively, achieve a set of goals considered important), goals (that signify the scope, boundaries, and intent of each key process area), common features (practices that implement and institutionalise a key process area) and **key practices** (these describe the elements of infrastructure and practice that contribute most effectively to the implementation and institutionalisation of the key process areas).

Levels of the CMM There are five levels of the CMM. The predictability, effectiveness, and control of an organisation's software processes are believed to improve as the organisation moves up these five levels. These are explained here:

Level 1 - Initial At maturity level 1, processes are usually *ad hoc* and the organisation usually does not provide a stable environment.

Level 2 - Repeatable At this maturity level, software development successes are repeatable. The organisation may use some basic project management to track cost and schedule.

Level 3 - Defined At this maturity level, processes are well characterised and understood, and are described in standards, procedures, tools, and methods.

Level 4 - Managed Using precise measurements, the management can effectively manage and control the software development effort. In particular, it can identify ways to adjust and adapt the process to particular projects without measurable losses of quality or deviations from specifications.

Level 5 - Optimising This maturity level focuses on continually improving process performance through both incremental and innovative technological improvements.

People Capability Maturity Model (PCMM)

People CMM is a framework that helps organisations successfully address their critical people issues. In Human Resource Management, knowledge management and organisational development, People CMM guides organisations in improving their processes for managing and developing their workforces. People CMM helps organisations characterise the maturity of their workforce practices, work out a program of continuous workforce development, set priorities for improvement actions, integrate workforce development with process improvement, and establish a culture of excellence.

Maturity Levels People CMM consists of five maturity levels that establish successive foundations for continuously improving individual competencies, developing effective teams, motivating improved performance, and shaping the workforce the organisation needs to accomplish its future business plans.

Initial Level This level is characterised by inconsistency in performing practices, displacement of responsibility, ritualistic practices and an emotionally detached workforce.

Managed Level This level is identified by work overload, environmental distractions, unclear performance objectives or feedback, lack of relevant knowledge or skill, poor communication and low morale.

Defined Level Here, although there are performing basic workforce practices, there is inconsistency in how these practices are performed across units and little synergy across the organisation. In the process of standardising workforce practices, the organisation misses opportunities because the common knowledge and skills needed for conducting its business activities have not been identified.

Predictable Level At this level, the organisation manages and exploits the capability created by its framework of workforce competencies. The organisation is now able of managing its capability and performance quantitatively. In addition, the organisation is able to predict its capability for performing work because it can quantify the capability of its workforce and of the competency-based processes they use in performing their assignments.

Optimizing Level When the improvements are made in the capability of individuals and workgroups, to the performance of competency-based processes, and to workforce practices and activities in the direction of continual improvement, the organisation is said to have reached optimising level. Maturity Level 5 organisations treat change management as an ordinary business process to be performed in an orderly way on a regular basis.

Value Chain Analysis

Value chain analysis, as described by Michael Porter, is a chain of activities through which a product or service passes in order to gain value in every activity. The chain of activities gives the products more added value than the sum of added values of all activities. For instance, take the case of a diamond cutter. The cost of the cutting activity may be lower, but the activity adds to much of the value of the end product. The value of a rough diamond is a lot less when compared to that of a cut diamond.

The value chain analysis categorises the generic value-adding activities of an organisation into a) primary activities and b) support activities. The primary activities include inbound logistics, operations (production), outbound logistics, marketing and sales, and services (maintenance). The support activities cover: administration, human resources, R&D, and procurement. For every activity, the costs and value drivers are identified. The value chain framework has been identified as a powerful analytical tool for strategic planning because it aims at maximising value creation while minimising costs. The concept of value chain analysis can apply to whole supply chains and distribution networks.

Dell's Supply Chain Management Practices

Before Dell pioneered a unique direct model of selling PCs, there was a conventional model of selling them through the reseller channel. In the conventional model, resellers purchased PCs from manufacturers and distributed them to the customers. In the direct model, Dell provided consumers with tailor-made products, built only after procuring the order from them. In the process, it was able to reduce inventory costs and overheads as it didn't need any intermediaries. This model facilitated Dell to provide its customers the latest available technologies, performance, and superior value at competitive price.

Dell's Suppliers For the purpose of managing its operations with low inventory levels, Dell collaborated closely with its suppliers. The company decided on procurement-related issues based on four parameters i.e., quality, cost, delivery and technology. The suppliers were selected on the basis of cost (given a weightage of 30%) and quality, service and flexibility (with a weightage of 70%).

Balancing Demand and Supply A database was maintained at Dell to track the purchasing patterns of corporate customers and their budget cycles, in order to forecast demand. A similar database for individual customers was also maintained in order to cater to their future requirements for PCs. Through its forecasting techniques, Dell was able to forecast demand with 75% accuracy. Thrice a day, the changing demand patterns were communicated to the major suppliers. In all the countries in which Dell operated it had a direct sales force with appropriate instructions from the marketing department located at the headquarters.

Production Process Dell leveraged on technology. It received orders via the telephone, Internet, e-mail, etc. Orders were received by business units, which downloaded the orders every 15 minutes. With advancement in technologies, the choices available for the consumers also widened. Customers could use Dell's website www.dell.com, to configure their customised computer and place an order for it. Customers could choose from a variety of products offered by Dell ranging from desktops, notebooks, servers, printers, etc. Different segments of customers like individuals, home office customers, small businesses, medium businesses, large businesses and public sector customers like Government departments, educational institutions and healthcare institutions... all visited the Dell website for placing orders.

The Benefits Dell maintained nearly zero inventories for some of its components. With the value of inventory declining rapidly at an average of 0.5% a week, there was no need to hold a significant amount of inventory. This further benefited Dell as it did not have to sell technologically obsolete products at a discount. New products according to the needs of the customers could be brought into the market faster than its competitors. In 2004, the inventory turnover rate in Dell was at 107 times a year, compared to 8.5 times at HP and 17.5 times in IBM.

Supply Chain Management

Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain as efficiently as possible.

It spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.

Supply Chain Management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. Supply chain management is also a category of software products.

Supply chain management problems Supply chain management must address the following problems:

- Distribution Network Configuration: Number and location of suppliers, production facilities, distribution centers, warehouses and customers.
- Distribution Strategy: Centralised versus decentralised, direct shipment, cross docking, pull or push strategies, third party logistics.
- Information: Integrate systems and processes through the supply chain to share valuable information, including demand signals, forecasts, inventory and transportation, etc.
- Inventory Management: Quantity and location of inventory including raw materials, work-in-process and finished goods.
- Cash-Flow: Arranging the payment terms and the methodologies for exchanging funds across entities within the supply chain.

Supply chain execution is managing and coordinating the movement of materials, information and funds across the supply chain in a bi-directional flow.

Activities/functions Supply chain management is a cross-functional approach to managing the movement of raw materials into an organisation and the movement of finished goods out of the organisation toward the end-consumer. As the focus of the companies is more and more on core competencies, they have reduced their ownership of raw materials sources and distribution channels. These functions are increasingly being outsourced to other firms that can perform the activities better or more cost effectively. This has resulted in an increase in the number of companies involved in satisfying consumer demand, while reducing management control of daily logistics operations. Less control and more supply chain partners led to the creation of supply chain management concepts. The purpose of supply chain management is to improve trust and collaboration among supply chain partners, thus improving inventory visibility and improving inventory velocity.

Strategic

- Strategic network optimisation, including the number, location, and size of warehouses, distribution centers and facilities.
- Strategic partnership with suppliers, distributors, and customers, creating communication channels for critical information and operational improvements such as cross docking, direct shipping, and third-party logistics.
- Product design coordination, so that new and existing products can be optimally integrated into the supply chain, load management
- Information technology infrastructure, to support supply chain operations.
- Where to make and what to make or buy decisions
- Align overall organisational strategy with supply strategy

Tactical

- Sourcing contracts and other purchasing decisions
- Production decisions, including contracting, locations, scheduling, and planning process definition
- Inventory decisions, including quantity, location, and quality of inventory
- Transportation strategy, including frequency, routes, and contracting
- Benchmarking of all operations against competitors and implementation of best practices throughout the enterprise
- Milestone payments

Operational

- Daily production and distribution planning, including all nodes in the supply chain
- Production scheduling for each manufacturing facility in the supply chain (minute by minute)
- Demand planning and forecasting, coordinating the demand forecast of all customers and sharing the forecast with all suppliers
- Sourcing planning, including current inventory and forecast demand, in collaboration with all suppliers
- Inbound operations, including transportation from suppliers and receiving inventory
- Production operations, including the consumption of materials and flow of finished goods.
- Outbound operations, including all fulfillment activities and transportation to customers.

- Order promising, accounting for all constraints in the supply chain, including all suppliers, manufacturing facilities, distribution centers, and other customers
- Shared information between supply chain partners such as production department, marketing department, etc, can only be fully leveraged only through process integration. Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information

Enterprise Resource Planning (ERP)

Enterprise Resource Planning market, is one of a mature solution segments for the reasons well known. Mature ERP customers looking to improve their return on investment (ROI) in ERP-related maintenance and support. Having realised the benefits of the transaction systems, ERP customers are wanting to extend it to areas such as customer relationship management (CRM), supply chain management (SCM) and collaboration. Small and medium firms aiming at a first time implementation of an end-to-end ERP solution in a cost effective manner.

Enterprise Resource Planning systems (ERPs) integrate all data and processes of an organisation into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data.

ERP systems cover all basic functions of an organisation, regardless of the organisation's business or charter whether it is business, non-profit organisation, nongovernmental organisation or government.

When ERP system is introduced it replaces two or more independent applications and eliminates the need for external interfaces previously required between systems, and provides additional benefits that range from standardisation and lower maintenance (one system instead of two or more) to easier and/or greater reporting capabilities (as all data is typically kept in one database). Some organizations—typically those with sufficient in-house IT skills to integrate multiple software products—choose to implement only portions of an ERP system and develop an external interface to other ERP or stand-alone systems for their other application needs. For instance, the PeopleSoft HRMS and financials systems may be perceived to be better than SAP's HRMS solution. And likewise, some may perceive SAP's manufacturing and CRM systems as better than PeopleSoft's equivalents. In this case, these organisations may justify the purchase of an ERP system, but choose to purchase the PeopleSoft HRMS and financials modules from Oracle, and their remaining applications from SAP.

Ideally, ERP delivers a single database that contains all data for the software modules, which would include:

Enterprise Resource Planning at Sanyo through SAP

Sanyo is a major player in consumer and commercial electronics market, with more than 170 subsidiaries worldwide. Its companies make a variety of electrical devices and appliances, including industrial and commercial equipment, audio and video equipment, semiconductors, communications equipment, batteries, and home appliances.

Challenge Sanyo had eight locations in five countries and is involved in inter-company transactions in the Asia Pacific region working on three different languages, namely, English, Taiwanese and Mandarin. Each location followed its own business process models, capturing data differently in AS400 legacy systems. The market demand was characterised by widely fluctuating demand cycles. To respond to changes in consumer demand quickly, Sanyo had to speed up its decision making process but this was not happening. This in turn led to cost inefficiencies across business units in the region.

How the Problem was Addressed Sanyo partnered with Wipro, one of the giants in providing software solutions, for enabling itself quick and efficient decisions across all the geographies by integrating them over a common platform. Wipro facilitated the implementation of SAP R/3 across Sanyo's eight locations. This created a Global Management Information system for Sanyo. In addition, an organisational change framework was setup for Sanyo through this ERP initiative through SAP.

In two phases, Wipro implemented SAP R/3 in Mandarin, Cantonese and English languages across Sanyo's locations, while reengineering over 30 business process. With standardisation of processes models, the global MIS system enabled common data definitions and standards. To facilitate smooth transition from AS400 driven non-standard processes to SAP, Wipro championed organisational change management framework. This ensured robust disaster and business continuity planning while meeting tight schedules and dead lines.

Benefits With SAP implementation, there was real time information transmission between sales and manufacturing teams and this helped the Sanyo to quickly adjust to demand uncertainties without affecting downstream processes. There was clear, consistent and standardised understanding of cost component structures across all implementation locations. This further enhanced the reporting capabilities on profitability of specific product lines.

- **Manufacturing:** Engineering, Bills of Material, Scheduling, Capacity, Workflow Management, Quality Control, Cost Management, Manufacturing Process, Manufacturing Projects, Manufacturing Flow
- **Supply Chain Management:** Inventory, Order Entry, Purchasing, Product Configurator, Supply Chain Planning, Supplier Scheduling, Inspection of goods, Claim Processing, Commission Calculation
- **Financials** General Ledger, Cash Management, Accounts Payable, Accounts Receivable, Fixed Assets
- **Projects** Costing, Billing, Time and Expense, Activity Management
- **Human Resources** Human Resources, Payroll, Training, Time & Attendance, Benefits
- **Customer Relationship Management** Sales and Marketing, Commissions, Service, Customer Contact and Call Center support
- **Data Warehouse and various Self-Service interfaces** for Customers, Suppliers, and Employees

Performance Management

Performance management is a strategic and integrated approach to delivering sustained success to organisations by improving the performance of the people who work in them and by developing their capabilities as teams and individuals. It is an approach to creating a shared vision of the purpose and aims of the organisation, helping each employee understand and recognise their part in contributing to them and in so doing, managing and enhancing the performance of both individuals and the organisation.

In the words of Armstrong and Murlis, performance management is concerned with communication. This is done by creating a climate in which a continuing dialogue between managers and the members of their teams takes place to define expectations and share information on the organisation's mission, values and objectives. This establishes mutual understanding of what is to be achieved and a framework for managing and developing people to ensure that it will be achieved.

Performance management processes should operate in accordance with agreed ethical principles: *respect for the individual, mutual respect, procedural fairness and transparency*. If you can't define performance,

you can't measure or manage it. Performance is a multi-dimensional construct, the measurement of which varies, depending on a variety of factors. Performance management aims to improve strategic focus and organisational effectiveness through continuously securing improvements in the performance of individuals and teams.

Performance management as an interlinked process Performance management should be integrated into the way the performance of the business is managed and it should be linked with other key processes such as business strategy, employee development, and total quality management.

Performance measurement is the process of assessing progress toward achieving predetermined goals. Performance management is building on that process, adding the relevant communication and action on the progress achieved against these predetermined goals. In Organisational Development (OD), performance can be thought of as actual results vs desired results. Any discrepancy, where actual is less than desired, could constitute the performance improvement zone. Performance management and improvement can be thought of as a cycle:

1. *Performance planning* where goals and objectives are established
2. *Performance coaching* where a manager intervenes to give feedback and adjust performance
3. *Performance appraisal* where individual performance is formally documented and feedback delivered

Coaching and Counselling To bridge the gap between the actual performance and desired performance, employees require support in terms of mentoring, coaching, counseling and the removal of any barriers that may prevent excellent performance. Support can and should be provided on an everyday basis, as the need arises. But it can be given more specifically through coaching and counseling, which take place during formal performance review meetings, but should be carried out at any time of the year as required. And coaching may well play an important part in a personal development plan.

Performance management can be explained in terms of Application Performance Management (APM), Business Performance Management (BPM) and Operational Performance Management (OPM).

Application Performance Management (APM) refers to the discipline within systems management. It focuses on monitoring and managing the performance and availability of software applications. APM can be defined as workflow and related IT tools deployed to detect, diagnose, remedy and report on application performance issues to ensure that application performance meets or exceeds end-users' and businesses' expectations.

Business Performance Management (BPM) is a set of processes that help businesses discover efficient use of their business units, financial, human and material resources.

Operational Performance Management (OPM) focus is on creating methodical and predictable ways to improve business results, or performance, across organisations.

Performance Management enables organisations to achieve their strategic goals. Rather than discarding the data accessibility previous systems fostered, performance management makes use of it to ensure that an organisation's data works in the service of organisational goals to provide information that is actually useful in achieving them. and focusses on the Operational Networking Processes between that performance level.

Business Process Outsourcing (BPO)

When some or all non-core processes are subcontracted, it is called Business Process Outsourcing. The main aim of Business Process Outsourcing is to allow the company to invest more time, money and human resources into core activities and building strategies, which fuel company growth.

BPO is the current trend in view of the vibrant global markets which are dynamic and highly competitive. A company must focus on improving productivity and yet, cut down costs. Therefore, all such tasks that use up precious time, resources and energy are being outsourced. BPOs, or the units to which work is being outsourced, are highly flexible, quicker, cheaper and very efficient.

BPO helps free up a firm's capital while reducing costs. The functions or processes being outsourced range from manufacturing to customer service to software development and much more. Many of the companies that seek to outsource are in the western hemisphere and most of the BPO units are in the east, like India, China, Malaysia and even Russia.

Business Process Outsourcing (BPO) is the contracting of a specific business task, such as payroll, to a third-party service provider. Usually, BPO is implemented as a cost-saving measure for tasks that a company requires but does not depend upon to maintain its position in the marketplace. BPO is often divided into two categories: back office outsourcing, which includes internal business functions such as billing or purchasing, and front office outsourcing, which includes customer-related services such as marketing or tech support.

BPO that is contracted outside a company's own country is sometimes called offshore outsourcing. BPO that is contracted to a company's neighboring country is sometimes called near-shore outsourcing, and BPO that is contracted within the company's own country is sometimes called onshore outsourcing.

The most common examples of BPO are call centers, human resources, accounting and payroll outsourcing.

Business Process Reengineering (BPR)

BPR is a management approach aiming at improvements by means of elevating efficiency and effectiveness of the processes that exist within and across organisations. The key to BPR is for organisations to look at their business processes from a "clean slate" perspective and determine how they can best construct these processes to improve how they conduct business. Business process reengineering is also known as BPR, Business Process Redesign, Business Transformation, or Business Process Change Management.

BPR at Mahindra & Mahindra

Business Process Re-engineering (BPR) had become a popular tool globally in the mid 1990s. However, when Mahindra & Mahindra (M&M) implemented BPR, it was still a novel concept in India.

M&M's workforce resisted this attempt to reengineer the organisation. The workers went on strike for five months. After five months, the workers ended the strike and began work in exchange for a 30% wage hike. As the situation returned to normalcy, BPR implementation gained momentum. The first signs of the benefits of BPR became evident soon after the senior staff began working on the shop-floors. Around a 100 officers produced 35 engines a day as compared to the 1200 employees producing 70 engines before BPR was implemented.

M&M focussed on two issues while implementing the BPR: reengineering the layout and method of working, and productivity. Summing up the company's BPR experience, Anand Mahindra said, "Let me put it in a simple way. If we have facilities in Kandivili today, which are not just surviving but thriving, it is all due to BPR."

In the words of Hammer and Champy BPR is 'the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed.'

Thomas H. Davenport says BPR is process innovation that encompasses the envisioning of new work strategies, the actual process design activity, and the implementation of the change in all its complex technological, human, and organisational dimensions. Additionally, Davenport explains the major difference between BPR and other approaches to organisation development (OD), especially the continuous improvement or TQM movement, when he states:

“Business Process Reengineering, although a close relative, seeks radical rather than merely continuous improvement. It escalates the efforts of JIT and TQM to make process orientation a strategic tool and a core competence of the organisation. BPR concentrates on core business processes, and uses the specific techniques within the JIT and TQM ‘toolboxes’ as enablers, while broadening the process vision.”

In order to achieve the major improvements BPR is seeking for, the change of structural organisational variables, and other ways of managing and performing work is often considered as being insufficient. For being able to reap the achievable benefits fully, the use of information technology (IT) is conceived as a major contributing factor. While IT traditionally has been used for supporting the existing business functions, i.e. it was used for increasing organisational efficiency, it now plays a role as enabler of new organisational forms, and patterns of collaboration within and between organisations.

BPR derives its existence from different disciplines, and four major areas can be identified as being subjected to change in BPR—organisation, technology, strategy, and people—where a process view is used as common framework for considering these dimensions.

Business strategy is the primary driver of BPR initiatives and the other dimensions are governed by strategy’s encompassing role. The organisation dimension reflects the structural elements of the company, such as hierarchical levels, the composition of organisational units, and the distribution of work between them. Technology is concerned with the use of computer systems and other forms of communication technology in the business. In BPR, information technology is generally considered as playing a role as enabler of new forms of organizing and collaborating, rather than supporting existing business functions. The people/human resources dimension deals with aspects such as education, training, motivation and reward systems. The concept of business processes—interrelated activities aiming at creating a value added output to a customer—is the basic underlying idea of BPR. These processes are characterised by a number of attributes: process ownership, customer focus, value-adding, and cross-functionality.

Successes BPR has shown huge returns to several companies where it has been well implemented. Proctor and Gamble and General Motors were some of the companies where BPR helped the companies to turnaround after financial drawbacks due to competition. BPR helped American Airlines to recover after it incurred several bad debts.

Benchmarking, The Xerox Way

The ‘Leadership through Quality’ program introduced at Xerox revitalised the company on all fronts. The program inspired Xerox to find ways to reduce their manufacturing costs. When Xerox verified its activities against the benchmarks available with its Japanese competitors, it found out that it took twice as long as its Japanese competitors to bring a product to market, five times the number of engineers, four times the number of design changes, and three times the design costs. This obviously gave enough ground to work for better strategies at Xerox to get more competitive.

Supplier Management System Xerox found that all the Japanese copier companies put together, had only 1,000 suppliers, while Xerox alone had 5,000. To maintain the number of suppliers at lower levels, Japanese companies standardised many parts. For instance, quite often, half the components of similar machines were identical. To ensure part standardisation, Japanese companies worked very closely with their suppliers. They, quite often, trained vendor’s employees in quality control, manufacturing automation and other key areas. There was close cooperation between the company and the vendor extended to just-in-time production scheduling wherein delivery in small quantities was ensured, as per the customer’s production schedule.

I Benefits The benchmarking initiative yielded benefits in quick succession. When Xerox focused on benchmarking and customer satisfaction, there was an increase in the number of satisfied customers. Highly satisfied customers for its copier/duplicator and printing systems increased by 38% and 39% respectively. Customer complaints to the President's office declined by more than 60%. Customer satisfaction with Xerox's sales processes improved by 40%, service processes by 18% and administrative processes by 21%.

Benchmarking

Benchmarking is the process of comparing an organisation's operations and internal processes against those of other organisations within or outside its industry. The other organisations against which the comparisons are made, known as 'benchmark partners', are usually those that are perceived to be the best performers in their class. The purpose of benchmarking is to identify and adopt best known practices that can lead to superior performance. It was a buzzword in the 80's and 90's, but continues to be strongly practiced in various industries today.

Benchmarking is a systematic process—it must have a framework and use a standard set of attributes that are measurable to compare multiple organisations objectively. Benchmarking must be performed on a specific area or activity only, such as operational best practices, information technology, staffing, compensation packages, distribution systems, budgeting, and the like. Limiting the scope of the benchmarking activity allows the formulation of a more focused agenda that provides more useful information from better-targeted benchmark partners.

In general, benchmarking partners are classified into four (4) categories: 1) internal, which pertains to departments, factories, etc. of the same company; 2) competitive, which pertains to direct competitors; 3) functional, which pertains to best-in-class organisations who are in the same field or activities; and 4) generic, which pertains to leading organisations from various fields and industries.

Balanced Scorecard (BSC)

Balanced Scorecard is a new approach to strategic management developed in 1990's by Robert Kaplan and David Norton. This approach replaces the customary practice of

- evaluating the performance of an organisation or individual in the organisation in terms of profits made or market share gained etc.
- designing the performance management systems around the annual budget and operating plan. These promote short term, incremental tactical behaviour.

Though these constitute a necessary part of management, it is not enough. Strategy cannot be implemented just with a system designed for tactics. There is a need for a tool that can balance among various factors which share a view of the organisation' strategy for its future development. This tool is called 'Balanced Scorecard'. It links short-term operational control to long term vision and strategy with a focus on a few critical key performance indicators in target areas. It also directs how best day-to-day operations can be controlled and monitored as these govern the tomorrow's development. The BSC approach provides a clear prescription as to what companies should measure in order to 'balance' the financial perspective.

Balanced Scorecard defined as 'a strategic feedback system that enables program managers to make better decisions faster, smarter, and easier then ever before'. BSC aims at focusing on metrics that matter as seen from a strategic point of view. To avoid focusing only on short term financial measures the scorecard comprises metrics from areas such as customer, internal processes, and learning and growth perspectives

respectively. It integrates, analyses, and distributes information to support total performance management of the project. Setting up the goals for implementation of the balanced score card is the complex task. For instance, the financial success is measured through project performance and project pipeline, people's perspective is measured through skills, employee satisfaction, and customer satisfaction is viewed from sufficiency reviews, customer surveys, portfolio management and lean engineering.

Benefits The benefits of balanced scorecard are as given below:

- It focuses on few key things needed to create breakthrough performance in the entire organisation
- It helps to integrate various corporate programs, such as quality, re-engineering, and customer service initiatives.
- It breaks down strategic measures to local levels so that unit managers, operators, and employees can see what's required at their level to bring about excellent performance overall.

Balanced scorecard is a flexible tool. It can be used to describe, manage and implement strategy through an organisation by linking outcomes and measures to strategic direction. It integrates top level, process, team and individual objectives, outcomes and measures. The balanced scorecard brings together financial, customer, internal process and people into one performance monitoring system. It enables managers to understand the linkages between these areas and helps them focus their efforts.

In the traditional management system, we have many monthly performance reports. The balanced scorecard brings together the key indicators for management to run their organisation. It is a dynamic system where measures are reviewed in light of changes to vision, strategy or mission of an organisation.

Kaplan and Norton describe the innovation of the balanced scorecard as follows:

Balanced Scorecard & Tata Group

Tata Motors' Commercial Vehicles Business Unit (CVBU): With the Balanced Scorecard, Tata Motors CVBU achieved a significant turnaround in its overall performance. It moved from a loss of US108.62millionintheyear2000toaprofitofUS 107 million in 2002.

Trent, the Tata Group's Main Retail Player: With Balanced Scorecard initiative, Trent, the Tata Group's main retail player, to achieve organisational coherence and, with it, greater customer satisfaction and profitability. In 2005, four years after it decided to implement the balanced scorecard management system, Trent, the parent company of the Westside chain of retail stores, became the second company in India - after Tata Motors, another Tata Group company - to be inducted into the Balanced Scorecard Hall of Fame. This honour was bestowed on only 58 other organisations in the world at the time.

"The balanced scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation."

The balanced scorecard suggests that we view the organisation from four perspectives. Each of the above perspectives will be analysed in terms of objectives, measures, targets and initiatives. All these are integrated with vision and strategy. The questions that are asked in each of learning and growth perspective. The process

of preparation of balanced scorecard involves developing metrics, collecting data and analysing it relative to each of these perspectives:

- The Learning and Growth Perspective: This explains how we will sustain in our ability to change and improve to achieve our vision.
- The Business Process Perspective: This analyses what business processes we must excel at in internal business processes to satisfy our shareholders and customers.
- The Customer Perspective: This explains how we should appear to our customers in improving customer relations to achieve our vision.
- The Financial Perspective: This outlines how we should appear to our shareholders in financing enterprise to succeed financially.

REVIEW QUESTIONS

Question I: Multiple Choice Questions

1. Just in time concept eliminates
 - (a) Operations
 - (b) Inventory
 - (c) Man power
 - (d) WIP
2. JIT system is sometimes referred to adapting
 - (a) Linear system
 - (b) Lean Production system
 - (c) TQM
 - (d) None
3. Kanban is
 - (a) Information as to what has to be done
 - (b) Over production
 - (c) Inventory control
 - (d) Automation
4. EOQ is
 - (a) Equal order quantity
 - (b) Estimated overall quantity
 - (c) Economic order quantity
 - (d) Equilibrium open quantity
5. EOQ is the order quantity that
 - (a) Maximizes total annual carrying cost
 - (b) Equates total cost
 - (c) Multiplies total annual carrying cost
 - (d) Minimizes total annual carrying cost
6. One of the following is a dynamic linked system. What is that?
 - (a) JIT

- (b) MRP
 - (c) EOQ
 - (d) TQM
7. Jikoda means
- (a) machines are maintained by workers
 - (b) Machine monitoring taken care of by consultants
 - (c) Providing machines with autonomous capability to use judgment
 - (d) minimization of work
8. TQM was first coined by
- (a) Toyota
 - (b) US Naval Air Systems Command
 - (c) General Electric
 - (d) Mitsubishi
9. In Six sigma context, which one of the following is valid?
- (a) 3.4 defects per hundred units of production
 - (b) 3.4 defects per trillion units of production
 - (c) 3.4 defects per million units of production
 - (d) 3.4 defects per one lakh units of production
10. Six sigma methodology is accomplished through the use of
- (a) DMAIC + DMADV
 - (b) DMADV x DMAIC
 - (c) DMAIC and DMADV
 - (d) DMAIC minus DMADV
11. Which of the following companies is the pioneer of Six sigma?
- (a) General Motors
 - (b) General Electric
 - (c) Motorola
 - (d) Wal Mart
12. If a product or service does not confirm to the given specification, it is called to have
- (a) Defect
 - (b) Quality
 - (c) Design
 - (d) defective
13. Six sigma is registered trademark of
- (a) GE
 - (b) United Bank of Switzerland
 - (c) Honeywell International
 - (d) Yes Bank
14. In Six sigma methodology, DMAIC is to improve
- (a) New Business process
 - (b) Existing business process
 - (c) future business processes
 - (d) vendor development

15. DMADV is used for
 - (a) New process designs
 - (b) Existing process designs
 - (c) vendor development
 - (d) stock turnover
16. Which of the following do you consider for process capability study?
 - (a) Process with multiple errors
 - (b) If one has six standard deviations between mean of a process and nearest specification limit there will be practically zero errors
 - (c) Process with minimum errors
 - (d) If one has six standard deviations between mean of a process and farthest specification limit there will be practically 20 errors
17. Capability Maturity Model (CMM) deals with the
 - (a) Instructions an organization can follow to gain better control over its software
 - (b) Instructions to frame HR policy in software organizations
 - (c) Process for effective utilization of software
 - (d) products with effective quality
18. CMM ranks software development organization in a hierarchy of
 - (a) Fourlevels
 - (b) Three levels
 - (c) Six levels
 - (d) Five levels
19. One of the following identifies cluster of related activities achieve a set of goals.
 - (a) Key process area
 - (b) Origin
 - (c) Timelines
 - (d) CMM
20. Which of the following signify the scope, boundaries and intent of each key process area?
 - (a) Origins
 - (b) Projects
 - (c) Goals
 - (d) Strategy
21. Which of the following implements and institutionalizes a key process area?
 - (a) Goals
 - (b) KPA
 - (c) Origins
 - (d) Common features
22. The elements of infrastructure and practice for effective implementation are best described by
 - (a) Key practices
 - (b) Goals
 - (c) Timelines
 - (d) Strategies
23. CMMI is an acronym for
 - (a) Capability Maturity Model Improvement

- (b) Capability Maturity Model Integration
 - (c) Capability Maturity Model Initialization
 - (d) Capability Maturity Model Initiation
24. Which of the following organizations treat change management as an ordinary business process in orderly way?
- (a) Maturity level 1
 - (b) Maturity level 3
 - (c) Maturity level 5
 - (d) Maturity level 7
25. Which of the following refers to the process of planning and management of sourcing, procurement, conversion and logistics activities?
- (a) Supply Chain Management
 - (b) Inventory Management
 - (c) Logistics Management
 - (d) procurement management
26. Information technology infrastructure for Supply chain management is grouped under
- (a) Operational activity
 - (b) planning activity
 - (c) Strategic activity
 - (d) managerial activity
27. Production decisions and scheduling activities of Supply chain management are grouped under
- (a) Operational activity
 - (b) Tactical Activity
 - (c) Strategic Activity
 - (d) Operational and tactical activities
28. Inbound and outbound logistics form
- (a) Operational activity
 - (b) Tactical Activity
 - (c) Strategic Activity
 - (d) expansion activity
29. The major concern of CRM is
- (a) Relationship between organization and customers
 - (b) Relationship between organization and consumers
 - (c) Relationship between different customers
 - (d) Relationship between competitors
30. Supply sourcing and negotiation is part of
- (a) CRM
 - (b) Production Planning
 - (c) Procurement
 - (d) BPO
31. In physical distribution, the final destination of marketing channel is
- (a) Service Provider
 - (b) Manufacturer
 - (c) Customer
 - (d) retailer

32. ERP is
- (a) Economic resource planning
 - (b) Enterprise resource planning
 - (c) Emerging resource planning
 - (d) Economic review periodical
33. Which of the following is a key ingredient of ERP system?
- (a) Multiple database
 - (b) Diversified database
 - (c) Unified database
 - (d) modular base
34. MRP is
- (a) Material requirement Planning
 - (b) Manufacturing requirement planning
 - (c) Multiple resource planning
 - (d) maximum resource provider
35. Which of the following has the responsibility of Initial ERP implementation?
- (a) Consulting team
 - (b) Customization team
 - (c) Support team
 - (d) project team
36. The process of extending or changing system work by writing new user interface and underlying code is
- (a) Consulting
 - (b) Implementation
 - (c) Customization
 - (d) Customer briefing
37. The process of assessing progress in achieving predetermined goals is called
- (a) Performance management
 - (b) Assessment
 - (c) performance measurement
 - (d) Ranking
38. The process where a manager intervenes to give feed back & adjust performance is called
- (a) Performance planning
 - (b) Performance coaching
 - (c) Performance appraisal
 - (d) Performance management
39. Which of the following refers to the discipline within systems management that focuses on monitoring & managing performance
- (a) Performance improvement
 - (b) Application performance management
 - (c) Performance measurement
 - (d) performance coaching
40. Which of the following focuses on creating methodical & predictable ways to improve business results?
- (a) APE
 - (b) BPM

- (c) OPM
 - (d) BPO
41. Which of the following involves decision to sub contract some or all non core processes?
- (a) BPR
 - (b) BPO
 - (c) APM
 - (d) MIS
42. BPO contracted outside a company's own country is called
- (a) Offshore outsourcing
 - (b) Onshore outsourcing
 - (c) onsite outsourcing
 - (d) offsite outsourcing
43. The technique of improvements by means of elevating efficiency & effectiveness of processes is called
- (a) BPR
 - (b) BPO
 - (c) ITES
 - (d) MBO
44. The process of comparing organizations operations & internal processes against other organizations in/outside industry is called
- (a) TQM
 - (b) Benchmarking
 - (c) SQC
 - (d) Balanced scorecard
45. Balanced scorecard was developed by
- (a) Robert Kaplan
 - (b) David Norton
 - (c) Robert Kaplan & David Norton
 - (d) Herald Koontz & Weihrich
46. In the context of JIT, Muri means
- (a) unevenness
 - (b) waste
 - (c) excess
 - (d) creativity
47. In the context of JIT, Muda means
- (a) unevenness
 - (b) waste
 - (c) excess
 - (d) creativity
48. Which of the following refers to 'thinking creatively' in the JIT context?
- (a) Muri
 - (b) Muda
 - (c) Mura
 - (d) Soikufu
49. Green belts refers to
- (a) employees implementing six sigma

- (b) lenders following six sigma
 - (c) competitors working under six sigma
 - (d) government collecting taxes
50. Shojinka means
- (a) a flexible workforce
 - (b) rigid workforce
 - (c) careful workforce
 - (d) skillful workforce

Question II: Fill in the Blanks

1. Management Information Systems (MIS) refers to the process of covering the application of people, technologies, and procedures
2. MIS is different from Enterprise Resource Planning (ERP) as ERP incorporates elements.....
3. MIS is also called
4. End User Computing aims at better integrating end users into the
5. The goal of End User Computing is to allow to use expensive and highly skilled knowledge in their jobs.
6. Maintaining the Lowest possible level of inventory is the one of the main objectives of
7. Economic order quantity is an example for data.
8. MRP II refers to a system with integrated financials.
9. JIT originated in
10. JIT being initially known as
11. The process of enabling machines to be autonomous and able to automatically detect defects is called
12. Muda means
13. Shojinka - The workforce flexible enough to cope with changes in production and using different machines is called
14. The process of thinking creatively, having inventive ideas is called
15. The effort wherein all members of an organization participate in improving processes, products, services and the culture in which they work is known as
16. The set of practices meant to systematically improve processes by eliminating defects is called
17. A defect is defined as
18. In Six Sigma, the processes that operate with six sigma quality produce at defect levels below defects per one million opportunities.
19. A Six Sigma defect is defined as anything of customer specifications.
20. Two Six Sigma sub-methodologies are DMAIC and
21. Black Belts operate under
22. The employees who take up Six Sigma implementation along with their other job responsibilities are called

23. The employees who have been trained in Six Sigma techniques as part of a corporate-wide initiative are called
24. Maturity Level 5 of CMM is called
25. The concept of Value Chain Analysis was first given by
26. Supply chain management is a approach to managing the movement of raw materials into an organization and the movement of finished goods out of the organization toward the end-consumer.
27. Enterprise Resource Planning systems integrate all data and processes of an organization into a system.
28. Performance measurement is the process of assessing progress toward achieving goals.
29. BPO is often divided into two categories: back office outsourcing and
30. The management approach that aims at improvements by means of elevating efficiency and effectiveness of the processes that exist within and across organizations is called
31. The process of comparing an organization's operations against those of other organizations within or outside its industry is known as
32. The balanced scorecard is a that enables organizations to clarify their vision and strategy and translate them into action.

Question III: Short-answer Question

1. Basic concepts of MIS
2. End User Computing
3. Materials Requirement Planning (MRP)
4. Just in Time (JIT) Systems
5. Total Quality management (TQM)
6. Six Sigma
7. Business Process Outsourcing (BPO)
8. Business Process Re-engineering (BPR)
9. Bench Marking
10. Balanced Score Card.

Question III: Essay Questions

1. What do you understand by End User Computing? How is it useful for the end-user?
2. Explain how modern concepts like JIT, MRP, Six Sigma changed the production environment?
3. 'Business Process Reengineering deals with the restructuring the processes associated with the products or services'. Do you agree? Illustrate.
4. What is bench marking? How is useful?
5. Explain what different levels mean under Capability Maturity Models.

Answers to Question I

- | | | | | |
|------|------|------|------|-------|
| 1. b | 2. c | 3. a | 4. d | 5. d |
| 6. a | 7. c | 8. b | 9. c | 10. c |

11. c	12. a	13. d	14. b	15. a
16. b	17. a	18. d	19. a	20. c
21. b	22. a	23. b	24. c	25. a
26. c	27. b	28. a	29. a	30. c
31. c	32. b	33. c	34. a	35. a
36. c	37. a	38. b	39. b	40. c
41. b	42. a	43. a	44. b	45. c
46. c	47. b	48. d	49. a	50. a

Answers to Question II

1. *to solve business problems*
2. *that are not necessarily focused on decision support*
3. *Information system or information technology*
4. *computing environment*
5. *unskilled staff*
6. *MRP*
7. *Planning*
8. *integrated financials*
9. *Japan*
10. *Toyota Production system*
11. *Jikoda*
12. *Waste*
13. *Shojinka*
14. *Soikufu*
15. *TQM effort*
16. *Six Sigma*
17. *non-conformity of a product or service to specifications*
18. *3.4*
19. *outside*
20. *DMADV*
21. *Master Black Belts*
22. *Green Belts*
23. *Yellow Belts*
24. *Optimising*
25. *Michael Porter*
26. *Cross Functional approach*
27. *Unified*
28. *predetermined*
29. *front office outsourcing*
30. *Business Process Re-engineering*
31. *Bench Marking*
32. *Management System*

Set No. 1

III B.Tech I Semester Supplementary Examinations, February 2007 MANAGEMENT SCIENCE

(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Electronics & Control Engineering, Mechatronics, Computer Science & Systems Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any **FIVE** Questions

All Questions carry equal marks

1. (a) Discuss the main components of Theory of Scientific Management.
(b) How has it influenced the thinking of managers? Explain. [8+8]
2. Discuss the features of Line and Staff organization For what type activities it is best suited? [16]
3. (a) What are the objectives of plant layout?
(b) Explain the factors influencing plant layout. [8+8]
4. (a) Explain the concept of 'Economic Order Quantity'.
(b) Explain the variables that go into the determination of EOQ.
(c) Show how the formula is derived. [5+6+5]
5. Discuss in detail the objectives and functions of Human Resource Management? [16]
6. What is grievance handling? How will you set up machinery for redressing the grievance? [16]
7. Identify the factors that are to be diagnosed in external and internal environment of a business organization. [16]
8. With the help of the following data, draw the network.
(a) Draw the network
(b) Find project duration for the following project and
(c) Identify the critical path. [6+4+6]

Activity	1-2	1-3	1-4	2-4	2-5	3-4	3-7	4-6	4-7	5-6	5-7
Time(months)	4	6	12	7	11	7	8	8	13	4	4

Set No. 2

III B.Tech I Semester Supplementary Examinations, February 2007 MANAGEMENT SCIENCE

(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Electronics & Control Engineering, Mechatronics, Computer Science & Systems Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Can you Consider management either as an art or science? Justify your answer.
(b) What are the features of Management? Explain. [8+8]
2. (a) Explain and illustrate authority and responsibility. How do you relate and differentiate them?
(b) Explain how do you resolve the conflicts between line managers and staff managers? [8+8]
3. An operator was kept under observation for 25 days. He was found working 320 occasions out of 400 observations. He produced 20 jobs during these days. The observation per day was only for four hours. Consider a performance rating of 140 for the operator and 30% allowance. Calculate standard time. [16]
4. (a) Explain the features of good stores layout?
(b) Explain the formats of different documents used in a store? [8+8]
5. 'The success of an organization to a greater extent depends on how the HRD acts'-Substantiate. [16]
6. What do you understand by 'Job analysis'? What benefits do you derive from Job analysis. [16]
7. What is environmental scanning? Why is it carried out? [16]
8. The following is the list of events found in the process of organizing a student's convention. Identify the logical sequence and fix the duration as per the estimate. Draw a PERT network, with assumed data
 - (a) Set convention date.
 - (b) Set convention location.
 - (c) Select convention chairman
 - (d) Select convention facilities.
 - (e) Develop convention programme
 - (f) Select convention speakers
 - (g) Set convention cost
 - (h) Notify the members of convention programme
 - (i) Print programme
 - (j) Notify convention facility of desired setup of each meeting room
 - (k) Select banquet menu
 - (l) Determine recipient of outstanding member award
 - (m) Prepare citation for outstanding member award
 - (n) Determine honorarium for speakers
 - (o) Arrange for registration
 - (p) Make boarding and lodging arrangements
 - (q) Arrange transportation from airport
 - (r) Await convention[16]

Set No. 3

III B.Tech I Semester Supplementary Examinations, February 2007 MANAGEMENT SCIENCE

(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Electronics & Control Engineering, Mechatronics, Computer Science & Systems Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

*Answer any FIVE Questions
All Questions carry equal marks*

1. Critically evaluate Taylor's theory of scientific management. [16]
2. What is matrix organization and what is uniqueness? [16]
3. (a) What is the Work Sampling?
(b) How do you use work sampling to arrive at the standard time? [6+10]
4. (a) What are the objectives of purchasing?
(b) Evaluate different methods of purchasing? [8+8]
5. Discuss in detail the objectives and functions of Human Resource Management? [16]
6. (a) What is Induction? What is the purpose of induction?
(b) What is the difference between Training and Development? Explain. [16]
7. What are the detailed steps involved in corporate planning? Discuss.
8. Draw the network for the following project, identify
(a) the critical path,
(b) find the project duration and
(c) indicate slack at each event. [6+4+6]

Activity	0-1	1-3	1-2	2-3	1-4	3-4	4-5
Time(months)	3	16	6	8	10	5	3

Set No. 4

III B.Tech I Semester Supplementary Examinations, February 2007 MANAGEMENT SCIENCE

(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Electronics & Control Engineering, Mechatronics, Computer Science & Systems Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

*Answer any FIVE Questions
All Questions carry equal marks*

1. What is Maslow's hierarchy of human needs? Explain. [16]
2. (a) What do you understand by decentralization?
(b) How do you determine the need for decentralization? Explain. [8+8]
3. (a) What are the objectives of plant layout?
(b) Explain the factors influencing plant layout. [8+8]
4. (a) Explain the features of good stores layout?
(b) Explain the formats of different documents used in a store? [8+8]
5. How is Human Resource Manager different from other functional managers? Explain. [16]
6. What are the objectives and activities associated with manpower planning? Explain. [16]
7. (a) What is the need for corporate planning?
(b) Explain the main elements of corporate planning process. [8+8]
8. Draw the network for the following project; it is further given that project completion time is 42 days. Find the find the project duration. Also identify the critical path. [16]

Activity	Description	Duration-days
1-2	Idea generation	7
1-3	Market survey	10
2-4	Prototype making	7
3-5	Advertisement campaign	9
4-5	Distribute samples	5
4-6	Commencement of production	5
5-7	Fixing up sales outlet	7
6-7	Manufacture	14

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