

MATERIALS MANAGEMENT



Materials Management

MIT | School of
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Course Objectives and Learning Outcomes

The course “Materials Management” helps you to understand the concepts, processes and applications of materials management in a simple language. The book explains various aspects of materials management with the help of diagrams, charts, photos and solved examples.

After studying this subject, you should be able to:

- Explain the concept of materials management
- Discuss the internal and external interfaces of materials management
- Discuss the guidelines given by the International Standards Organization (ISO)
- Explain the objectives of material handling
- Discuss the principles of material handling
- Describe the cost factor in materials management
- Discuss the importance of quality in materials management
- Describe various tools of quality control
- Describe the supplier quality management
- Discuss the role of the purchasing manager in managing supplier quality
- Explain Total Quality Management (TQM)
- Discuss the concept of supplier performance measurement
- Explain how to create a manageable supply base
- Discuss the concepts, evolution, objectives, functions and the importance of purchase management
- Explain the methods of purchases
- Describe the role of different types of vendors
- Explain the importance of vendor evaluation and selection process
- Discuss the value analysis framework
- List objectives of value analysis
- Describe advantages of value analysis
- State the objectives of negotiation
- Discuss the process of negotiation
- Explain the importance of legalities
- Describe the main postulates of the Indian Contract Act,1872
- Elucidate the Sales of Goods Act, 1930
- Discuss the structured approach to cost reduction
- Explain the concept of price analysis
- Describe the concept of Materials Management (MM) and its implementation in ERP
- Outline the functions of the MM module of SAP

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Curriculum

MATERIALS MANAGEMENT

Concept of Materials Management- Internal and External Interfaces of Materials Management- International Standards Organization (ISO)- Classification of Material- Modern Trends in Materials Management- Objectives of Material Handling- Methods of Material Handling- Material Handling Equipment- Importance of Quality in Materials Management- Various Tools of Quality Control- Quality Costs- Purchasing Manager's Role in Managing Supplier Quality- TQM Approach to Manage Supplier Quality- Supplier Performance Measurement- Creating a Manageable Supply Base- Concept of Purchase Management- Methods of Purchases- Centralised and Decentralised Purchasing- Make-or-Buy Decisions- Types of Vendors- Vendor Selection and Evaluation Process- Vendor Evaluation Methods- Challenges in Evaluation- Value Analysis Framework- Advanced Value Analysis Tools- Value Analysis Questionnaire- Concept of Negotiation- Negotiation Process- Negotiations Strategy and Tactics- Importance of Legalities- The Indian Contract Act, 1872- Sale of Goods Act, 1930 - Structured Approach to Cost Reduction- Price Analysis- Materials Management in ERP- E-Sourcing- Supplier Relationship Management (SRM)

Materials Management. The subject is divided into 12 chapters. A brief description of all the 12 chapters is given below:

Chapter 1: An Introduction to Materials Management
Concept of Materials Management, Internal and External Interfaces of Materials Management, Standardisation and Simplification, International Standards Organization (ISO), Classification of Material, Codification of Materials, Different Systems of Codification, Modern Trends in Materials Management
Chapter 2: Material Handling
Objectives of Material Handling, Principles of Material Handling, Material Handling Cost, Methods of Material Handling, Evaluation of Material Handling, Material Handling Equipment
Chapter 3: Quality Control in Materials Management
Importance of Quality in Materials Management, Various Tools of Quality Control, Quality Costs, Questionnaire for Sample Inspection, Quality Standards
Chapter 4: Supplier Quality Management
Purchasing Manager's Role in Managing Supplier Quality, TQM Approach to Manage Supplier Quality, Six Sigma Approach to Supplier Quality
Chapter 5: Supplier Development
Supplier Performance Measurement, Creating a Manageable Supply Base, Supply Base Rationalisation Process, Supplier Development – A Strategy for Improvement, Overcoming Barriers to Supplier Development

Chapter 6: Purchase Management
Concept of Purchase Management, Evolution of Purchase Management, Objectives of Purchase Management, Methods of Purchases, Centralised and Decentralised Purchasing, Make-or-Buy Decisions, Purchasing Cycle, Roles and Responsibilities of a Purchase Manager
Chapter 7: Vendor Selection
Types of Vendors, Vendor Selection and Evaluation Process, Carter's 10 Cs Model of Vendor Evaluation, Vendor Evaluation Methods, Categorical Plan, Weighted-Point Method, Cost-Ratio Method, Eavaston's Vendor Selection, Forced Decision Matrix, Service Cost Ratio, Challenges in Evaluation
Chapter 8: Value Analysis
Value Analysis Framework, Objectives of Value Analysis, Advantages of Value Analysis, Advanced Value Analysis Tools, Value Analysis Questionnaire
Chapter 9: Negotiations in Purchasing
Concept of Negotiation, Objectives of Negotiation, Types of Negotiation, Negotiation Process, Negotiations Strategy and Tactics, Guidelines for Negotiations, Qualities of a Good Negotiator
Chapter 10: Legal Aspects in Purchasing
Importance of Legalities, The Indian Contract Act, 1872, Essentials of a Contract, Types of Contracts, Sale of Goods Act, 1930, Special Purchase Contracts, Fixed-Price Contracts, Cost-Reimbursable Contracts, Time and Materials Contracts, Negotiable Instruments, Promissory Notes, Bills of Exchange, Cheques
Chapter 11: Strategic Cost Management
Structured Approach to Cost Reduction, Cost Reduction Procedure, Approaches to Cost Reduction, Price Analysis, Cost Analysis Techniques, Total Cost of Ownership, Collaborative Approach to Cost Management
Chapter 12: Technology in Materials Management
Materials Management in ERP, MM Module of SAP, E-Sourcing, Supplier Relationship Management (SRM), SAP SRM, Collaborative Planning, Forecasting and Replenishment (CPFR)

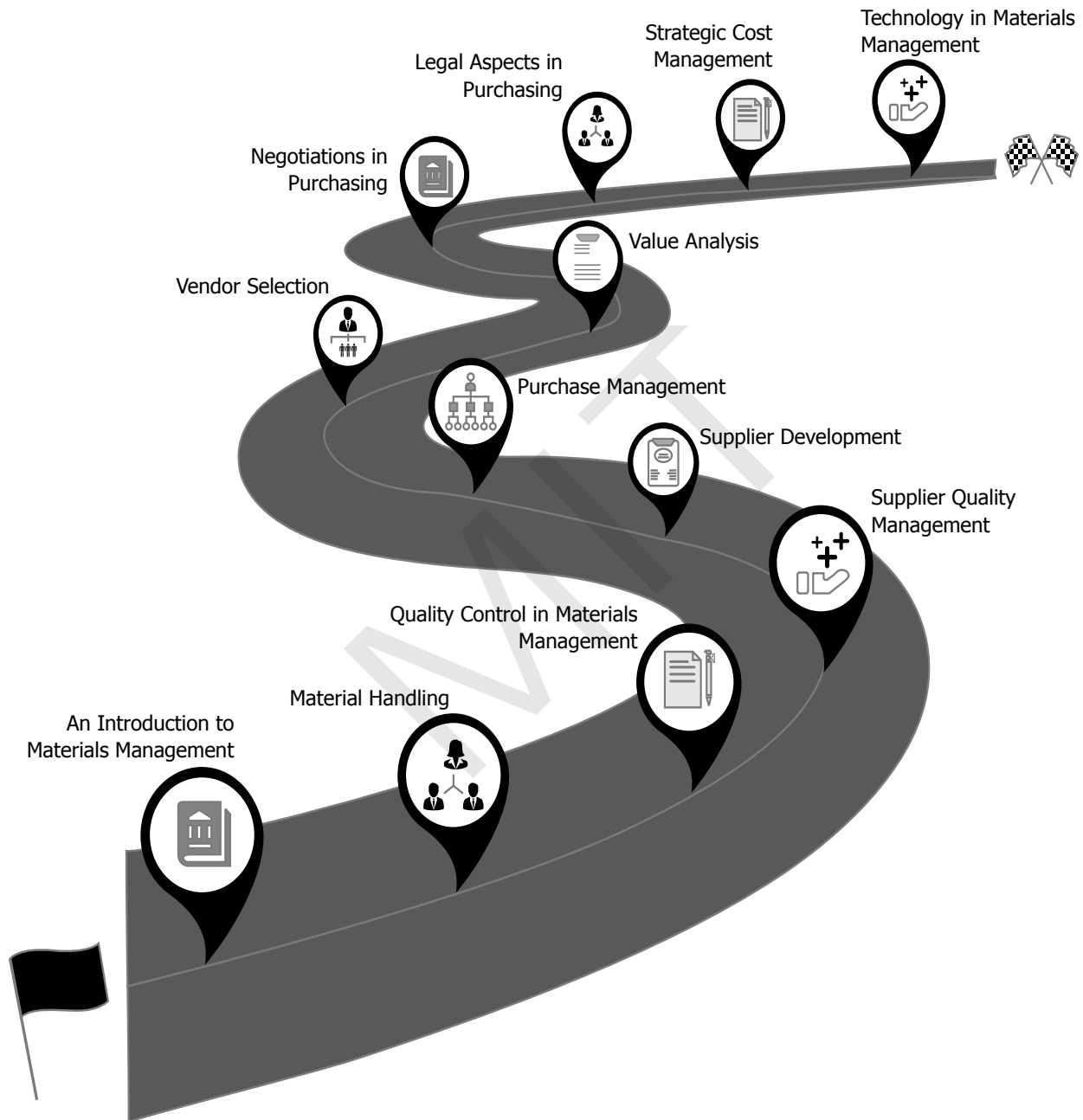
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ROAD MAP



MIT

AN INTRODUCTION TO MATERIALS MANAGEMENT

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- » Explain the concept of materials management
- » Discuss the internal and external interfaces of materials management
- » Discuss the guidelines given by the International Standards Organization (ISO)
- » Classify materials on the basis of nature, condition and usability
- » Describe the different systems of codification in materials management



INTRODUCTION

Materials management is defined as a process that helps in determining the material requirements of an organisation, planning for the procurement of material resources and allocating these resources in the production of finished products. According to the **International Federation of Purchasing and Materials Management (IFPMM)**, *materials management is a total concept involving an organisation structure unifying into a single responsibility, the systematic flow and control of material from identification of the need through customer delivery.* Materials management, thus, can be defined as that business function which is responsible for the coordination of planning, procuring, handling, storing, transporting and controlling materials in order to ensure the optimum utilisation of an organisation's resources and to improve customers' satisfaction by providing them products at a minimal cost.

Materials management brings in an efficient codification system for the classification of equipment, raw materials, and components, and spare parts in such a manner which suits the requirements of an organisation. An organisation's success or failure largely depends on how they manage materials. Materials management also helps in monitoring inventory at each stage of the production process in order to prevent the tying up of capital in excess stocks and to avoid the condition of understocking.

In this chapter, you will learn the concept of materials management along with its importance, objectives and challenges. Further, you will study the internal and external interfaces of materials management, classification of materials on the basis of nature, condition and usability of materials, and codification of materials through a number of systems. You will attain knowledge of standardisation and simplification. You will also gain information related to the International Standards Organization (ISO). Finally, you will study modern trends in materials management.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Elaborate on the evolution of materials management
- State the importance of materials management
- Justify challenges in materials management
- Discuss standardisation and simplification in materials management
- Give an opinion on modern trends in materials management

1.1 CONCEPT OF MATERIALS MANAGEMENT

Important Concept

According to **Thomas F. Wallace and John R. Dougherty**, *Materials management is the grouping of management functions supporting the complete cycle of material flow, from the purchase and internal control of production materials to the planning and control of work in process to the warehousing, shipping, and distribution of the finished product.*

Materials management is the specialised study of management which is concerned about the management of material resources. In materials management, managers attempt to reduce and control the cost of the material resource. Generally, the cost of the material resource accounts for about 50% of the total cost of production. For instance, if the total cost of producing a product is ₹ 100, then it is assumed that ₹ 50 will be the cost of the material resource used for producing a product.

Traditionally, it was assumed that the cost of a material resource is the amount paid for its acquaintance, i.e., the basic cost of the material resource. This basic cost is usually displayed in the organisation's statement of accounts.

Materials management is not only concerned with the cost of the material resource, but also with other costs that add to the price of the product. Other costs are, therefore, termed as 'cost in materials'. This means that the manager needs to make an attempt for reducing and controlling the cost of materials.

Materials management plays a significant role in the production process as it is concerned with different aspects of the input process, such as planning and purchasing of raw materials, components, spare parts, supplies, and equipment required at the best price, at the desired quality and specification, and at the time needed. It is also concerned with the market research in order to obtain current information about the items that have to be procured, demand forecasting, inventory control, inspection of materials at the time of delivery, transportation and handling of materials, issuance and disposal of materials, etc. Thus, it can be assumed that the materials management is the key to the survival of any organisation.

1.1.1 OBJECTIVES OF MATERIALS MANAGEMENT

The basic role of materials management is to coordinate all material-related business functions and to ensure the procurement of materials at the right time, and in the right quantity, right quality, right price and from the right source. These are often called the 5 Rs of materials management. Materials management has a number of objectives that make an impact on the survival and profits of a business. The objectives are classified as primary and secondary objectives of materials management. These objectives ensure that sufficient materials are available at the lowest possible costs when needed.

PRIMARY OBJECTIVES

Figure 1 displays the primary objectives of materials management:



FIGURE 1: Primary Objectives of Materials Management

As depicted in Figure 1, the primary objectives are discussed in detail as follows:

- **Low prices:** One of the key objectives of materials management is to obtain materials, components and services at the lowest possible price. This helps an organisation in minimising operating costs and maximising profits.
- **Material selection:** Determining the right specification of materials and components is an important objective of materials management. Standardisation of requirements may allow a business to minimise cost and effort for procurement and replacements, if any.
- **High inventory turnover:** A high inventory turnover means that less capital is locked up in inventory. This helps in increasing the efficiency with which an organisation utilises its capital and, thereby, increasing the return on investments. Moreover, materials management helps in reducing the storage and carrying costs of inventories. It also helps in determining if there are any stocks in excess and taking steps to minimise it.
- **Low cost handling and storage:** Efficient management of materials during handling and storage helps bring down the actual costs of acquiring and possessing. For example, if large quantities are ordered, it brings down the costs with the help of bulk discounts and low shipping costs while it can increase the storage and handling costs.
- **Continuity of supply:** Continuity of supply is another objective of materials management. It helps prevent disruptions in the production process which occurred due to excess in production costs, expediting costs, etc. This objective becomes even more significant for a highly automated process wherein the costs are rigid and are incurred even when there are disruptions in the supply chain.
- **Maintain consistency in quality:** The quality of the end products depends on the quality of materials used in production. Thus, maintaining consistency

in quality is an important objective of materials management. Receiving materials, components and services safely and in good condition is also a part of materials management.

- **Standardisation:** Bringing standardised materials and components into product designs helps in improving the overall production process and in bringing down costs. It also helps in encouraging suppliers for the supply of standardised materials.
- **Maintain supplier relations:** Maintaining good relationships with suppliers helps an organisation in providing better services at a better price. This helps in enhancing the position of the organisation in the society as well as the entire business community.
- **Development of personnel:** Materials management helps the manager in assisting the hiring process of personnel for the materials department. It also helps the manager in recognising that personnel who can take up the executive position in the future.
- **Maintain records:** Materials management is needed to maintain accurate records for materials in order to ensure transparency and efficiency in the procurement process.

SECONDARY OBJECTIVES

The secondary objectives of materials management are listed in Figure 2:

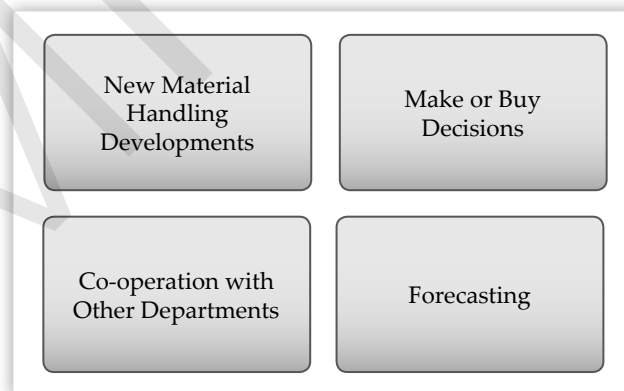


FIGURE 2: Secondary Objectives of Materials Management

As depicted in Figure 2, the secondary objectives are discussed in detail as follows:

- **New material handling developments:** Manufacturers and engineers are always concerned about the new developments, so that they can handle the material more efficiently and, thereby, achieve the primary objective. Therefore, the materials department is in regular contact with suppliers who devise new developments in order to ease manufacturers and engineers.
- **Make or buy decisions:** They are basically strategic decisions wherein an organisation assesses whether it should produce an item internally or buy from an outside supplier. In an organisation, make or buy decisions are taken at the top level. The need for make or buy decisions arises due to various reasons. In most cases, the organisation needs to take these decisions due to consistent failure on part of suppliers in the supply of items. Sometimes, the

availability of items from suppliers is not adequate due to stiff competition in the market. However, these decisions require thorough analysis of different costs by the organisation.

To decide whether to produce an item internally or buy it from outside, there needs to be a great deal of coordination between materials management and production departments for collecting, collating and analysing data related to quality and quantity requirements, equipment requirements, plant capacity and so on.



EXHIBIT

EXAMPLE OF MAKE OR BUY DECISIONS

Let us understand an example of a make or buy decision. Suppose a manufacturing company requires particular types of submersible cooler pumps to produce air coolers. Presently, the company purchases pumps from a supplier at a price of ₹ 700 per unit. The company can itself produce the pumps. As per its demand forecasts, the company has anticipated a need for 20,000 such pumps. In case the company produces pumps internally, it has to bear the following costs:

Direct labour = ₹ 70/unit

Direct material = ₹ 100/unit

Variable overhead = ₹40/unit

To produce submersible cooler pumps, the company will need to purchase tools used within a year. The cost of purchasing such tools for the 20,000 pumps is ₹ 40,000. Based on above information, the company performs the following analysis:

Cost Item	Per Unit Cost (₹)	Total Cost for 20,000 Units (₹)
Direct labour	70	1400000
Direct materials	100	2000000
Variable overhead	40	800000
Annual tooling	N/A	40000
Total cost		4240000

From the table above, it will cost ₹ 4240000 to manufacture 20,000 pumps. At the same time, it only costs ₹ 4000000 to buy the pumps from the supplier. Therefore, the company should continue buying pumps from the supplier.

- **Co-operation with other departments:** The materials management function of an organisation is considered to have close interaction with other functions of the organisation like production, marketing, finance and personnel. For example, smooth and timely production depends on the availability of materials. Ordering these materials and ensuring their availability is the responsibility of the purchasing department. The production staff communicates its requirements to the purchasing department in terms of what is needed, when is needed and how much is needed. In turn the purchasing department provides information to the production department on the lead time for procuring the materials, primary/multiple sources of purchasing and so on.

Similarly, the purchasing department shares a close relationship with the finance department. The purchasing department procures materials by keeping into the consideration the opportunities and constraints of the finance department. These include new sources of capital that can lead to advantageous inventory purchases and cash flow difficulties that limit purchasing power.

- **Forecasting:** Generally, forecasts help in channelising the activities of the materials department in a more efficient manner. In large organisations, professional economists make forecasts related to the price and cost of material, and other business activities. These forecasts are used by the sales and purchase department of an organisation. This is a two-way process in which the purchasing department first translates the general forecasts into specific forecasts and uses these in material purchases, whereas this department provides information related to market conditions to the economists by making regular contact with them.

1.1.2 | EVOLUTION OF MATERIALS MANAGEMENT

The evolution of materials management can be classified into three distinct periods. The first period is the early part of the twentieth century, wherein the function of materials management was nominal and restricted to clerical and responsive jobs while it was not considered as an important part of the management.

The second period is the phase after the Second World War. The demands of the consumer got increased after the Second World War, which led to the shortage of raw materials. This, in turn, led to the development of innovative concepts, such as the substitution of material and value engineering. The other significant event in this period was the oil crisis of the 1970s. This led to a steep increase in raw material prices causing purchase managers to develop further innovative and proactive practices. The following measures were taken into consideration:

- Identifying alternative sources of supply
- Value analysis of purchased materials
- Altering specifications to allow substitution with less expensive materials
- Using scientific approaches to inventory control
- Including selected suppliers at the initial stages in project design
- Integrating information system

With this, the role of the materials manager elevated to an active contributor to the profits in an organisation through controlling and monitoring the organisation's expenditure.

The third period of materials management began in the later part of the twentieth century. The shift to purchasing fewer raw materials and outsourcing began in this period. Afterwards, the responsibilities of the material department include material planning and decision making regarding outsourcing. This period also saw huge advancements in technology, such as the emergence of information technology. Thus, it can be said that this phase includes the integration of the rapidly evolving technology with the existing materials management system of an organisation.

India was a little slower to pick up the practices of materials management than the rest of the world. The armed forces of India were the first to embrace materials management in India through their 'Logistics Management'. TISCO was the first corporate to set up a central purchase department in India. Globalisation brought about a structural change in the Indian economy through a shift from a government-protected system to a system where organisations had to face new challenges in dealing with market forces and large corporations. This had a tremendous impact on how organisations worked in India and led to the rapid development of materials management. Competing with multinationals and the emergence of a global economy meant that the Indian enterprises had to develop and integrate new and emerging technologies, such as information technology, in their materials management. Understanding and adopting the latest trends in materials management has enabled the Indian enterprises to integrate themselves within the global economy.

1.1.3 | IMPORTANCE OF MATERIALS MANAGEMENT

Materials management impacts not only a particular industry, but also the whole economy. Material costs constitute the single largest expenditure item in most manufacturing environments. As such, its importance cannot be overstated. Materials management helps establish three cost categories in an organisation, namely material costs, capital costs and overhead expenses. These cost categories can considerably influence the profits of the organisation. These cost categories are discussed as follows:

- **Material costs:** Costs incurred in the procurement of raw materials, indirect materials, components, semi-finished goods, finished goods and transportation are known as material costs.
- **Capital costs:** Capital costs generally include interest that accumulates for the capital tied up in inventory. It also includes depreciation costs.
- **Overhead expenses:** Overhead expenses cover indirect costs that are necessary to run a business, such as the cost of rent, electricity, packaging and handling, and disposal.

The extent of the influence that the materials management department can have on the profits of a business largely depends on the importance of material costs in the business, the level of control materials management wields on the inventory of goods (semi-finished, work in process and finished), and the staff working in the materials management team.

Materials management is important to an organisation due to the following reasons:

- It helps minimise the costs mentioned in the above three categories.
- It ensures a high turnover of inventory and keeps less amount of capital locked up in inventory and supply chain.
- It helps in the management of the built-up inventory.
- It helps reach the full potential of the available opportunities when purchasing.
- It helps in introducing the knowledge in the design and development phase of the production process after a thorough review of the market



STUDY HINT

Whatever margin is added in between the raw material and the finished product, it is termed as value added by production.

**NOTE**

A materials manager is in-charge of supervising inventory and purchasing activities within the supply chain of an organisation. He must ensure that the materials are acquired as per the quality requirements and within the scheduled time. He must also ensure that the purchased materials and products meet the expectations of consumers.

1.1.4 CHALLENGES IN MATERIALS MANAGEMENT

There are many issues that can pose a challenge to materials management. These are discussed as follows:

- Receipt of materials before they are needed which can lead to higher inventory carrying costs and increase the risk of deterioration in quality and obsolescence.
- Delay in the supply of materials which can lead to a delay in the productivity of the finished products.
- Introduction of incorrect materials at the design and development phase of a product.
- Modifications in the initial design of the product.
- Damage, loss or deterioration of materials.
- Difficulty in the installation of purchased equipment.
- Difficulty in the selection of the right supplier.
- Difficulty in identifying the type of contract to be selected for acquiring a specific material.
- Build-up of inventory.

**SELF ASSESSMENT QUESTIONS**

1. Materials management is not only concerned with the cost of the material resource, but also with other costs that add to the price of the product. (True/False)
2. The _____ of materials management are the procurement of materials at the right time, and in right quantity, right quality, right price and from the right source.

**ACTIVITY 1**

Suppose you are the head of the materials management department of Asian Paints Ltd. Your department has two vacancies for Assistant Materials Manager (AMM). You are asked by the HR Manager of the company to prepare a Job Description (JD) for the post of AMM so that these job openings can be posted on job portals. Prepare a JD for AMM which should comprise job purpose, responsibility areas, key performance indicators, essential qualifications and so on.

1.2 INTERNAL AND EXTERNAL INTERFACES OF MATERIALS MANAGEMENT

Materials management has two interfaces, i.e., internal interface and external interface. A relational approach has a direct influence on the cost-economics within a firm or industry because, in materials management, there is an integrated flow of materials inside and outside the organisation. Let us learn about these two interfaces of materials management.

**Quick TIP**

One of the most difficult challenges for a materials manager is the discontinuity of supplies because this can result in the loss of sales and customer dissatisfaction. Therefore, it is important to identify reliable suppliers for the supply of materials.

1.2.1 | INTERNAL INTERFACE

This concept is explained through the following points:

- **Forecasting:** Organisations, generally, forecast the demand for their products. Whatever information the organisation receives about the predicted market conditions is then used to satisfy the future demands. Thus, we can say that on the basis of existing or expanded facilities, processes, materials, equipment and manpower, materials managers try to determine production. Sometimes, due to changes in business conditions, state of the economy, actions and reactions of the competitors, market trends, technological innovations, style and fashion, the demand forecast may become ineffective. Yet these need to be made.
- **Production:** Materials management entails control of the flow of materials throughout the entire production cycle. This implies that materials management is not only concerned with the flow of material throughout the production process, but also the process before and after the actual production. Since, in the production process, the flow of materials needs to be uninterrupted, therefore, the materials manager needs to pronounce the function's sensitiveness throughout the production cycle. Thus, the interaction and interrelationship of materials management and production function make the process more efficient.
- **Finance:** The availability of finance is a major concern for the management since it is a scarce resource available within the organisation. Therefore, the demand for the availability of finance is made with equal force as the demand for other input factors. It is, thus, the prime responsibility of the top management to make the balance between the two. But, when we talk about the need for materials for the successful operation of the organisation, a major amount is invested in inventories. The organisations run all the processes involved in the production process smoothly when the finance is easily available but, when it is difficult to manage, the management becomes conscious of cost reduction. This affects the budget for materials.
- **Material handling, traffic and physical distribution logistics:** Materials management needs to handle operations and physical flow of materials at many stages of production operations in order to carry the smooth flow control of materials. Materials management must ensure that the materials are physically distributed at the right time, at the minimum handling cost and by maintaining the continuous physical flow.

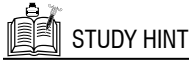
**STUDY HINT**

Short-term forecasting helps in determining the levels of input and output, whereas long-term forecasting helps in maintaining a connection between the internal and external environment of the organisation.

1.2.2 | EXTERNAL INTERFACE

This concept is explained through the following points:

- **Consumers:** The interfaces of materials management are often indirect with customers in the case of consumer-product industries because in these industries, the activities of mass production and mass consumption are involved. These activities involve the possibilities of high risks of obsolescence and large scale of procurement activities. There is a direct contact of materials management with customers in the organisations where products are featured by relatively simple assemblies because, in

**STUDY HINT**

If an organisation is producing products in which a high degree of complexities is involved, then, in order to meet the demands of a particular consumer, production schedules need to be changed as per the delivery timings.

these organisations, the contact helps in determining the expectations of customers and their purchasing habits, attitudes, preferences and behaviour. The interfaces of materials management are often direct with customers in the case of component-product industries because, in these industries, some extent of integration is essential between design, product development, construction and manufacturing.

- **Suppliers/Other companies:** Interfaces of materials management are often direct with suppliers/vendors and other companies because it upholds the philosophy of maintaining good relations for the smooth flow of materials from outside the organisation. The selection of an annual supplier is done on the basis of price and cost negotiations, delivery lead times, quality levels, plant capacity, delivery charges, and reputation and delivery promises of suppliers. Thus, retaining a good supplier with organisations not only makes sound relationships, but it also helps in building the image of the organisation. Materials managers need to have complete knowledge of the market conditions, recent developments in the market and the analysis of supplier's performances on the rational basis to establish the performance criteria for the suppliers and to carry out their workings without any bias.

**SELF ASSESSMENT QUESTIONS**

3. A relational approach has an indirect influence on the cost-economics within a firm or industry. (True/False)
4. The selection of _____ is done on the basis of price and cost negotiations, delivery lead times, quality levels, plant capacity, delivery charges, and reputation and delivery promises of suppliers.

**ACTIVITY 2**

Imagine you are the materials manager of an organisation. Write down how you will schedule the materials at the right place and at the right time.

1.3 STANDARDISATION AND SIMPLIFICATION

A standard is referred to as a model or a general agreement established by an authority, and created and used at various levels of interest. Standardisation is referred to as a systematic formulation, adoption, application and review of industrial standards directed towards simplification and variety reduction. The Bureau of Indian Standards (BIS), formerly known as the Indian Standards Institute (ISI), is the organisation that manages standardisation in India. It comprises several committees dealing with the industries that develop different standards at the national level. BIS works in collaboration with NTH (National Test House) and its control laboratories to issue the ISI certification mark to products and materials that pass the minimum quality standards. Most countries in the world have their own national standards; for example, British Standard (BS) in the UK, American Standards Association (ASA) or the American Society for Testing Materials (ASTM) in the USA. In contrast, the International Standards Organization (ISO) issues international specifications that most nations adhere to.

Standardisation in materials management refers to the qualities of uniformity and interchangeability of various materials, components and spare parts used in the production process. A standard in the product design refers to the specification determined after thorough research related to the material, size, finish, etc., of the product. It is such that every product made to a given specification will be the same and can be interchanged. A well-known example of standardisation is the production of light bulbs. Standardisation reduces the variety of components needed. It also facilitates mass production because of the ease with which the parts fit together. These factors lead to reduced inventory and operational costs.

In the context of materials management, standardisation is important due to the following reasons:

- It allows the identification of factors affecting the development of inventory control programs.
- It allows a reduction in the costs of materials, components and spare parts.
- It helps reduce wastage.
- It helps minimise inventory.
- It helps reduce overstocking and understocking of inventory.
- It simplifies inventory which assists in rationalised codification due to reduction in variety

Simplification

Simplification is defined as the practice of making the production process simpler. The aim of simplification is to eliminate waste by removing unnecessary varieties, types and sizes of products. One should keep in mind that simplification is not only concerned about reducing the product variety, but it also focusses on eliminating needless products and variety. Apart from this, simplification is also done by simplifying product design and process. As a result, simplification reduces the costs of operations and materials.



SELF ASSESSMENT QUESTIONS

5. Standardised materials have the qualities of _____ and _____.
6. The _____ is the organisation that manages standardisation in India.

1.4 INTERNATIONAL STANDARDS ORGANIZATION (ISO)



NOTE

The acronym ISO, is derived from the Greek word 'ISOS' which means equality.

The International Standards Organization (ISO) is a non-governmental organisation established in Geneva, Switzerland in the year 1947. ISO comprises 164 national standards bodies worldwide. Most of the national standards bodies are a part of their government's structure, but some are established through government-industry partnerships.

ISO is the leading developer of voluntary international standards and it allows nations to use common standards in the trade activities globally. ISO standards

have been developed to cover almost all trades, ranging from manufactured goods to technology, food safety, agriculture and healthcare. Using these standards, industries ensure the quality, safety and reliability of their goods and services. These standards support fair global trade. These also help minimise errors and waste. Standards also safeguard the interests of consumers by ensuring compliance of products and services to the fixed standards.

ISO works through certification groups known as registrars. The registrars generally audit and certify the quality management systems of an organisation for compliance. A separate standard called the ISO/IEC TS 17021 is used to certify these registrars. If the organisation is found to be compliant after assessment, it is granted an ISO 9001:2015 certification which is valid for three years after which the process needs to be repeated.

ISO 9001:2015 is currently used to certify over a million companies worldwide. Some other commonly used ISO standards are explained as follows:

- **ISO 14001:** The ISO 14001 family comprises the criteria for an environmental management system. It provides a framework that an organisation can follow to set up an effective environmental management system irrespective of its activity or sector. Other standards in the family focus on specific approaches such as audits, communications, labelling and life cycle analysis, as well as environmental challenges such as climate change.
- **ISO/TS 16949:2009:** ISO/TS 16949:2009, in conjunction with ISO 9001:2008, defines the quality management system requirements for the design and development, production and, when relevant, installation and service of automotive-related products.



**SELF
ASSESSMENT
QUESTIONS**

7. The International Standards Organization (ISO) is a _____ organisation established in Geneva, Switzerland in the year 1947.
8. ISO works through certification groups known as registrars. (True/False)

1.5 CLASSIFICATION OF MATERIAL

Any inventory comprising more than one kind of item will have some items that are more important than others. Some of the items will be higher in value than others, while some will have a very high consumption rate. Therefore, in any inventory comprising a variety of items, it is important to monitor and control the levels carefully using some sort of system. The classification of materials is important to facilitate both the inventory management and the inventory control. The inventory management deals with the purchase and storage of materials, whereas the inventory control deals with the number of activities, such as identifying the location of each product in the warehouse, ensuring that materials remain in good condition and organising the warehouse for smooth material flow. Classification of the material increases the efficiency of materials management by allowing the concentration of efforts where they are most required.

1.5.1 | GENERAL CLASSIFICATION

In general, classification of materials can be done on the following bases:

- **Frequency of purchase:** This refers to the classification of materials based on how often the materials are purchased. For example, expensive equipment is purchased by a manufacturer only once in a while, but spare parts may be purchased on a regular basis.
- **Standard materials:** Standard or stock materials are the ones that are required on a regular basis and are always kept ready in the stock. Buying and carrying them a little over the current requirements is not detrimental. An example is 'packaging material'.
- **Source:** Materials that are sourced from local suppliers often require different handling (in terms of purchase, payment and shipment) than materials that are imported from overseas suppliers. These are, therefore, classified into separate categories.
- **Cost:** Materials can also be classified according to their usage value. Usage value is the usage rate multiplied by the individual value of the material. Items with the higher cost or usage value need to be monitored and handled more carefully as they usually account for a large part of the total usage value.

1.5.2 | CLASSIFICATION BASED ON NATURE OF MATERIALS

Classification of materials can be done on the basis of their physical or chemical nature. According to this method, materials that need special handling are placed into separate categories from those materials that require ordinary handling. The special handling material category typically requires special transport, handling and warehousing procedures. Often, they are also purchased stand-alone as they might require special licenses and approvals.

1.5.3 | CLASSIFICATION BASED ON CONDITION OF MATERIALS

According to the condition of materials, they are classified as follows:

- **Raw materials:** Raw materials are purchased by the manufacturer to produce finished goods for sale. Some raw materials can directly be incorporated into the finished product. For example, steel and wood. Some raw materials are not a component of the finished goods, but are needed as a part of the manufacturing process; for example, light bulbs and containers.
- **Work-in-progress materials:** These are materials that have partially fulfilled the production process. They need to be classified separately from raw materials as an excess of work-in-progress materials hinders the process flow.
- **Finished goods:** Finished goods are items that are procured in a complete form.

1.5.4 CLASSIFICATION BASED ON USABILITY OF MATERIALS

Materials can also be classified on the basis of their functions. Their functions are as follows:

- **Cycle inventory:** Cycle inventory consists of materials needed to satisfy a regular demand. It is named so because it turns over or refreshes itself over time as new items substitute the ones that have been used. Stock-outs of these are considered to be undesirable, although they need to be maintained at the lowest level possible to minimise shipping and holding costs.
- **Safety inventory:** Safety inventory refers to the extra quantity of materials held in inventory to act as a buffer against the risk of stock-outs.
- **Pipeline inventory:** Pipeline inventory refers to the items that have left the firm's warehouse, but haven't yet reached the ultimate recipient and are still in the organisation's shipping chain.
- **Anticipation inventory:** Anticipation inventory is referred to as the surplus level of an item held to cope with uncertainty in the demand due to fluctuations in buying patterns, seasonal variations in demand and inaccuracies in sales forecasts.



SELF ASSESSMENT QUESTIONS

9. _____ refers to the extra quantity of materials held in inventory to act as a buffer against the risk of stock-outs.
10. The classification of materials decreases the efficiency of materials management by allowing the concentration of efforts where they are most required. (True/False)

1.6 CODIFICATION OF MATERIAL

An inventory item is usually identified by a simple description or name, but ambiguity may occur if the item is known by different names. Therefore, codification is needed to stop ambiguity, save effort and time, etc.

The advantages of the codification of materials are as follows:

- It helps avoid a lengthy description of materials.
- It enables accurate and logical identification of materials.
- It helps avoid ambiguity.
- It allows the standardisation of items.
- It increases ease of location and provides a proper system of indexing.
- It increases efficiency in book-keeping.
- It aids automation.
- It helps in auditing the entire process.

The features of a good codification system are as follows:

- The codification system should be concise, i.e., it should contain the least number of digits. However, the length of the code depends on the number and variety of the items and the amount of information needed to recognise the code.
- It should be logical which means that the codification system should be logically sound and make sense to users.
- It should be adaptable to accommodate changes and additions without upsetting the existing codes.
- It should be unique such that each code should be exclusive to the item it is assigned to.
- It should be easy to recognise by users

1.6.1 | DIFFERENT SYSTEMS OF CODIFICATION

The fundamental requirement for the codification of materials is to understand the basic features and characteristics of all the relevant materials before classifying them into broad groups. Afterwards, materials managers need to sub-group materials as per the codes in the logical progression of type, class, size, etc. Thus, each item is represented by a number whose digits indicate the group, sub-group, type and size of the item. Typically, the first two digits indicate the type and class of materials, such as building material, tools, furniture, stationery, oil and lubricants. The next three digits indicate the size and characteristics of the item and the last digit is set aside for small variations.

Some popular systems of codification are given in Figure 3:

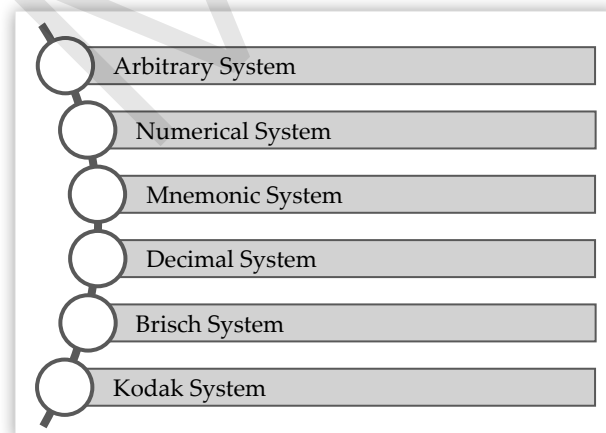


FIGURE 3: Popular Codification Systems

Let us learn about these systems one by one in the following sub-sections.

Arbitrary System

As its name suggests, in this approach, an arbitrary number is assigned to an item when it reaches the warehouse. This number is based on the serial number under which an item is received by the warehouse-keeper. In this system, each item has a

unique number allotted to it, but there is no logical pattern in the numbers allotted to similar items. Therefore, it may happen that the codes of two related items may be apart by several thousand digits. For example, if a storekeeper allotted a code number 5030 to the last item received and he received bearings today, then he allots code number 5031 to the bearings that are received today. The benefit of using this system is that there is no set limit for the codification of the number of items. But there is a huge limitation of not knowing the characteristics or history of the items, which is why, this system is not commonly used.

Numerical System

In this system, only a simple numerical sequence is allotted for codification. It is a simple and easy-to-understand system. In this system, six- to ten-digit code numbers are assigned to each item. The first several digits of the code represent the classification to which the item belongs, the next three digits represent the sub-class and the last three digits generally remain uncoded. Let us take an example to understand the system better. A storekeeper assigns the number to the item received on the following bases:

General class	Generic class	Subclass	Specific item number
3	129	017	503

It can be observed that this is an eight-digit code number which is allotted by the storekeeper of an organisation to a $\frac{1}{4}$ by $\frac{3}{4}$ inch stainless steel square neck carriage bolt. The first number indicates that it is a purchased item as per the following general classification:

Code number 1 is allotted to the raw materials

Code number 2 is allotted to the manufactured parts
 Code number 3 is allotted to the purchased parts
 Code number 4 is allotted to the MRO supplies
 Code number 5 is allotted to the work-in-process

The three digits represent the general classification according to the nature of the item. Here, the digits range from 000 to 999. In the mentioned example, 129 represents that it is a fastener.

The next three digits, i.e., 017, represent the sub-class of the item it belongs to. Here, it is a carriage bolt with a square neck. The digits for representing the sub-class of the item range from 000 to 999.

The last three digits represent the code number assigned to the specific part of an item. Here, in this example, it is 503 which represents the $\frac{1}{4}$ by $\frac{3}{4}$ inch stainless steel (as per the given specification).

Code numbers under 500 indicate plain steel. Code numbers over 500 indicate various alloys.

The drawbacks of using this method are as follows:

- It lacks a memory aid
- A lot of time may be needed to match code numbers in codebooks.

Mnemonic System

Mnemonic system uses a code designed with the aim of easy memorisation. While this system is similar to a numerical system for codification, it uses both numeric and alphabetic symbols in the code. For example, a carriage bolt with a square neck has assigned a code P Fa BCS 503 under this system.

P represents that it is a purchased part. Fa represents that it is a fastener.

BCS represents that it is a carriage bolt with a square neck. 503 represents the specific number of the bolt.

Mnemonic systems have the advantage of providing some sort of visual identification as they are usually self-explanatory. But, in cases where there are many different items added, this system becomes less useful as there is a limit to the number of symbols that can be used.

Decimal System

The decimal system is classified on the basis of a dash/stroke numerical codification system. In the decimal system, numbers are allotted in such a manner that each digit denotes a sub-group of the preceding digit. The code number allotted in this system represents three categories. The first category indicates the general classification of the material, such as raw materials, packaged materials and finished materials. The second category indicates the sub-classification of the materials as per their nature, use, quality and characteristics. The next category indicates the sub-classification on the basis of its components, price, facial appearance, and its availability. In this system, each category is separated by a decimal point. An example as to where the departmental storekeeper assigns some code to the items on the following bases is as follows:



Quick TIP

The code number does not have more than four digits in between two decimal numbers.

Particulars	General Classification	Sub-classification (I)	Sub-classification (II)	Code
Stationery	47			47
Pen	–	01	–	47.01
• Ball-point		–	51	47.01.51
• Fountain		–	52	47.01.52
Paper	–	02	–	47.02
• White		–	61	47.02.61
• Coloured		–	62	47.02.62
Pencil	–	03	–	47.03
• Lead		–	71	47.03.71
• Coloured		–	72	47.03.72
Ink	–	04	–	47.04
• Blue		–	81	47.04.81
• Black		–	82	47.04.82

Here, 47 indicates that it is a stationery item. 01 to 04 represent the sub-category as pen, paper, pencil, ink, etc. 51, 52, 61, 62, 71, 72 and 81, 82 represent the further categorisation of the items as a ball-point pen, fountain pen, white paper, coloured paper, lead pencil, coloured pencil, blue ink and black ink.

**NOTE**

It is best to have a code that is short, simple, practical and easy to understand. The code layout should be such that lengthier codes are divided into smaller sections for ease and simplicity. Characters with similar appearances should not be used.

Decimal systems have the benefit of having unlimited ability to accommodate a new item. Each digit is able to provide the history, size, specification, etc., of the item. But, in cases where a basic unit has various minor assemblies and sub-assemblies, this system can become quite tedious.

Brisch System

The Brisch system assigns a code of seven digits to items and this code is allotted in three stages. The items are first categorised in appropriate initial groups, such as assemblies, sub-assemblies, components and off-the-shelf items. Once this has been done, items are sorted within the respective groups to put together the related items. Therefore, even though there are only seven digits used in the assigned code, it is a logical and comprehensive way of codifying items.

Kodak System

The Kodak system uses a 10-digit numerical code for the codification of the items. The logic behind major grouping is based on the sources of supply. The number of categories is restricted to 100 and is based only on the source of procurement. For example, if a screw is listed in a hardware catalogue and is available with the hardware suppliers, then it can be categorised as a hardware item, but if it is listed as a part of equipment, then it is categorised as a spare part.

**SELF ASSESSMENT QUESTIONS**

11. _____ uses a code designed with an aim of easy memorisation.
12. In the numerical system, numbers are so allotted that each digit denotes a sub-group of the preceding digit. (True/False)

1.7 MODERN TRENDS IN MATERIALS MANAGEMENT

Disruptive technologies that have rapidly changed the face of society have also influenced the supply chain and materials management. Integrating these technologies helps lower costs, reduce errors and increase the speed of movement of materials. These technologies are as follows:

- **MRP:** Material Requirements Planning (MRP) is a widely used computer-based inventory management system. It is used for determining the dependent demand inventory, i.e., raw materials and components needed to produce a finished good. In this system, materials managers first configure the available stock of the raw materials. Then they evaluate the need for raw materials for the purpose of production of the finished goods. Afterwards, materials managers place the orders accordingly. The main aim of MRP is to ensure that the inventory level is optimum. It also helps in planning the purchase, production and delivery of materials. MRP is a very efficient system and it comprises an effective structure of processes and calculations.
- **ERP:** ERP or Enterprise Resource Planning is a system that enables an organisation to use a centralised system of cohesive and coordinated applications for enterprise-wide management and automation of technology, finance, production and materials management, HR tasks, etc. ERP system

**NOTE**

The concept of MRP was first developed by Joseph Orlicky in 1964 during his tenure at IBM with the aim of computerised supply planning.

helps integrate all the aspects of an operation into a single database, application and user interface. It aids in increasing efficiency through automation. It enables managers streamline and manage quite complex processes. ERP helps improve business intelligence. It also enables the managers to access the higher quality data and, thereby, improves the reporting and planning activities. It increases the overall efficiency of a supply chain management system.

- **RFID:** Radio Frequency Identification (RFID) was introduced in the early 2000s. In the RFID process, a microchip is used to send information related to the product type, its source and the serial number code about a specific product. This data increases accuracy, allows real-time tracking of the inventory and helps ensure product availability at the right time.
- **EDI:** In e-commerce, Electronic Data Interchange (EDI) ensures the safety of personal information while making online transactions by enabling structured transmission of data between two or more computers connected through a network. The EDI transmission is better than paper-based document transmissions as it minimises errors, reduces data-handling costs and maintenance costs of paper documents, speeds up the transaction process, etc.
- **Backflushing:** Backflushing is an approach for post-production issuing commonly used in the Just-in-Time environment. Here, the system automatically issues goods once the operations have been confirmed. Technological advances, such as the Internet of Things, Big Data Analytics, alternative energy sources, artificial intelligence and advanced robotics, have all affected the way materials are handled in the supply chain.

Therefore, apart from the above modern trends in use in materials management, Lew Manci, Vice President-Engineering at Crown Equipment Corp., contends that the following technological trends may have the biggest impact on the future of warehouse management and materials management:

- **Big data analytics:** Big data may be defined as the data that exceeds the processing capacity of the traditional database systems. Lately, this definition has been expanded to include efforts to capture that data which is not the part of the existing database, consolidate it with the existing data, run an analysis and model it. As such, big data analytics is a very powerful tool in materials management. However, most organisations have been slow to tap the full potential of this tool. A reason for this may be that collecting and analysing the data from different sources is considered as a difficult and complicated task by most of the managers. Other challenges to big data analytics in materials management are safety, integrity and reliability of the data and the difficulty of incorporating it into the existing systems of the organisation as it requires specially trained personnel. It is imperative that organisations try to overcome these challenges. In the future, those organisations will be successful that are able to integrate big data analytics into their systems and, thereby, improve their efficiency. It is possible to make vast improvements by using big data analytics to monitor the utilisation of equipment and efficiency of operators. Big data analytics also helps make improvements in material handling by collecting the supply chain data across organisations. It, thus, becomes possible to generate baseline metrics that can be used as a reference

for operations and identify the best practices through the consolidation of metrics from similar organisations utilising similar types of facilities. This maximises the overall efficiency and helps reduce delivery times.

- **The Internet of Things:** The Internet of Things or IoT refers to a system of the related computing devices, machines, objects, etc., that are connected not only to the user, but also each other over the Internet. This is possible as processors, sensors and communication hardware are already installed in them, which enable them to gather, send and act on data that they gain from their environment. Thus, the IoT represents machine-to-machine interaction and coordination, although humans interact with it. In terms of materials management, IoT can be used to monitor various processes, increase operational efficiency, improve productivity, improve decision making, etc. IoT senses the presence and automatically regulates the lighting, temperature and other related things based on the preferences of users. In a warehouse, the IoT can bring together various systems and equipment with ordering details, warehouse control, transportation, etc. This connectivity can provide the real-time information which can lead to an improved workflow, greater operational efficiency, and better reliability and predictability. The data captured across devices can also help in predictive analytics.
- **Mobile technology:** Mobile technology refers to the use of portable hand-held or wearable devices for communication and information, such as smartphones and tablets. Just as quickly as mobile technology has gained access to consumers, it has also made its way into businesses. Material handling has also started to incorporate mobile technology into their system for quick and convenient access to data on orders, troubleshooting, tracking, etc., whenever and wherever needed. There is a disbelief that mobile technology will quickly replace fixed mounted terminals as the main platform for presenting data.
- **Tech-savvy workforce:** The new generation workforce in organisations today is at ease and competence by using technology at their workplace. It is, therefore, necessary to accommodate technology in materials management techniques and material handling so as to make the process more efficient and friendly to the tech-savvy workforce. One example of this could be the presentation of data in a graphical manner.

Another example is the use of graphical formats for displaying product identity and location instead of the text-based formats for increasing efficiency.

- **Advanced robotics:** Advanced robotics and driverless vehicles are examples of disruptive technologies that enable the automation of manual tasks. Earlier, robotics has been employed in material-handling equipment. However, advanced robotics comes with enhanced abilities and algorithms that help perceive the environment better. It can also be used to make informed decisions according to environmental changes.
- **Autonomous vehicles:** Autonomous vehicles are considered as a step-up from driverless vehicles as the former has the ability to make decisions on their own as a result of changes in the environment. Unlike driverless vehicles, that require human intervention in case of obstacles, autonomous vehicles can overcome the obstacles on their own. But this technology is still

in nascent stages and a lot of work still needs to be done in terms of sensor abilities and intelligence.

- **Alternative sources of energy:** Materials management is bound to improve with the development of alternative forms of energy and new techniques for controlling, monitoring and regulating performance and the use of energy. Using these alternative sources of energy, which are often cheaper and more efficient, helps improve productivity and reduce costs in the supply chain.
- **Sustainability:** Sustainable practices in the business allow the improved use of resources and reduced wastage. These also help increase operational efficiencies and decrease costs. All these factors result in more efficient materials management.



SELF ASSESSMENT QUESTIONS

13. _____ may be defined as data that exceeds the processing capacity of traditional database systems.
14. Electronic Data Interchange (EDI) ensures safety of personal information while making online transactions by enabling structured transmission of data between two or more computers connected through a network. (True/False)

1.8 SUMMARY



Materials management includes managing raw materials, components, spare parts, supplies, work-in-process/finished goods and services. The basic role of materials management is to ensure procurement of materials at the right time, right quantity, right quality, right price and from the right source (called the 5 Rs of materials management). The primary objectives of materials management are obtaining low prices, material selection, high inventory turnover, low-cost acquisition and possession, continuity of supply, maintain consistency in quality, standardisation, good supplier relations, development of personnel, and maintain records. The secondary objectives of materials management are new material-handling developments, make or buy decisions, co-operation with other departments, forecasting. Materials management is important to minimise the costs, to monitor procurement and quality control measures, to forecast, etc. Materials management has two interfaces, i.e., internal interface and external interface.

Standardisation refers to the qualities of uniformity and interchangeability of various materials, components and spare parts used in the production process. In materials management, standardisation is important to reduce costs of materials, components and spare parts, to reduce wastage, to minimise inventory, etc. Simplification is defined as the practice of making the production process simpler. The aim of simplification is to eliminate waste by removing unnecessary varieties, types and sizes of products. The International Standards Organization (ISO) is a non-governmental organisation established in Geneva, Switzerland in the year 1947. ISO is comprised of 164 national standards bodies worldwide. Most of the national standards bodies are a part of their government's structure, but some are established through government-industry partnerships.

The classification of materials is important to facilitate both inventory management and inventory control. In materials management, materials are classified on the basis of their nature, condition and usability. Codification of materials is needed to prevent ambiguity, save effort and time, ease of location and classification, automation, etc. Some popular systems of codification are arbitrary system, numerical system, mnemonic system, decimal system, Brisch system and Kodak system.

Some of the important modern trends in materials management are Material Requirements Planning (MRP), Enterprise Resource Planning (ERP), Radio Frequency Identification (RFID), Electronic Data Interchange (EDI), and Backflushing. Apart from these, the technology trends that may have the biggest impact on the future of materials management are Big Data Analytics, the Internet of Things, mobile technology, tech-savvy workforce, advanced robotics, autonomous vehicles, alternative sources of energy and sustainable practices.

1.9 KEY WORDS



- **Business intelligence:** A set of technologies, applications and practices that are used for collecting, integrating, and analysing the business information in order to support better business decision-making
- **Disruptive technologies:** A set of technologies that create a new market and value network by displacing the existing technologies and changing the way a business operates
- **Demand forecasting:** A technique of predicting inventory requirements through the study of external variables, such as consumer demand
- **Inventory control:** A process of managing, controlling and optimising the inventory currently held by an organisation
- **Operational efficiency:** An organisation's capability to deliver goods, services or support to its customers in a cost-effective manner without compromising on quality is referred to as its operational efficiency

1.10 CASE STUDY: BUSINESS PROCESS AND MATERIALS MANAGEMENT AT LAMPRELL ENERGY SERVICES



Lamprell Energy Services started an initiative to review and upgrade business processes within their Contracts and Purchasing Departments. Chris Hand, a Dubai-based business and technology solutions provider, was appointed as a Senior Quantity Surveyor. He was given the responsibility of leading the project. He was appointed to give assistance in the evaluation process, and identify the appropriate technological tools and systems that would reposition Lamprell as an industry leader. Chris Hand suggested Lamprell to use the Matrix Management System for the materials procurement process. He gave a demonstration of the Matrix system to the senior Lamprell management. He also reviewed procedures and made discussions with the key personnel in order to establish how the Matrix management system would impeccably incorporate with the existing systems, as well as bespoke software, that was under development. The decision took four days to proceed and the initial version of the software was installed immediately.

A fixed schedule was executed on the Matrix, but with the keenness of the Lamprell staff and the support of management, the first purchase order was produced in thirty-two days. Chris Hand was quite positive about the project. He said, "The implementation of Matrix has been a great success. Every aspect went smoothly with minimum business disruption and the system integrated seamlessly into our existing processes. We have been able to establish some sound commercial improvements very quickly." Steve Lamprell, the organisation's President, was also convinced with the use of the Matrix system. He said, "At Lamprell, we pride ourselves in being at the forefront of our industry and intend to be there for a long time to come. I believe that the acquisition of Matrix is consistent with that vision and provides us with an essential competitive edge. It has been developed by people who not only understand the processes involved, but who also demonstrate a distinct practical knowledge of how things need to be done."

The organisation also conducted market research. With the research, the organisation identified the need for a feature-rich, cost-effective materials management system, which would also provide a quick Return on Investment. The decision to go on with Matrix was taken following an extensive investigation of the best systems available worldwide. ProcuremaX (one of the applications in the MatriX suite of products) was used to manage and control the materials procurement process. Other MatriX systems were also used to assist in most areas of the organisation's business and operational processes. EstimaX was used for estimating the material, QuantimaX was used to take off material from the process, ControlmaX was used to control project material, and StockmaX was used for inventory and stock management. The implementation of these systems at Lamprell Energy Services in 2003, and its associated benefits and Return on Investment were being realised in various areas of the business. The managing director of Absolute, Peter Jamieson, explained the reasons for selecting Matrix by saying, "I believe that an investment in Matrix not only provides all the customary benefits associated with automating processes such as reduction in costs, improved efficiency, global availability of information and enhanced management control, Matrix also includes a myriad of user-friendly industrial-strength features, making it 'the' choice for materials management professional".

The use of the Matrix Management System provides a list of benefits. Some of the benefits are listed as follows:

- It utilises the latest Web technology.
- It allows the information available in the global upfront when demanded.
- It automates the procurement process.
- It is a business-driven system and not a technology-led system.
- The system combines functionality with practicality.
- It enhances management control.
- It eliminates the use of outdated and restrictive practices.
- It improves efficiency.
- It streamlines end-to-end purchasing and materials management.
- It is a Microsoft-recommended solution for the material procurement process.

The Matrix System is designed and developed by Pinnacle Business Solutions which is a business software house. Paul Kirwan, a Microsoft managing consultant of the Middle East & North Africa, used the Matrix system in the Middle Eastern version of the Microsoft 'Industry Solutions Catalogue'. The system was developed with the help of professionals from the fields of materials management, information technology and financial management. The system utilises the latest technological advances, including the Internet and e-mail facilities.

Source: <http://www.absolute-it.com/aboutus/casestudies/CSPage.aspx?PageID=39>

QUESTIONS

- List the benefits associated with the Matrix system.
(Hint: The system utilises the latest Web technology, etc.)
- What are the benefits of conducting market research?
(Hint: The organisation identified the need for a feature-rich, cost-effective materials management system, etc.)

1.11 SHORT ANSWER QUESTIONS



- _____ comprises 164 national standards bodies worldwide.
- Usage value is the _____ multiplied by the individual value of the material.
- In the _____ process, a microchip is used to send information related to the product type, its source, and the serial number code about a specific product.
- _____ refers to the classification of materials based on how often the materials are purchased.
- In the _____ system, the number of categories is restricted to 100 and is based only on the source of procurement.
- _____ is a system that enables an organisation to use a centralised system of cohesive and coordinated applications for enterprise-wide management and automation.
- The aim of simplification is to eliminate waste by removing unnecessary varieties, types and sizes of products. (True/False)
- Materials that are sourced from local suppliers are purchased, paid for and received the same way as materials that are imported from overseas suppliers. (True/False)
- The Brisch system assigns a code of ten digits to the items. (True/False)
- Using alternative sources of energy which are often cheaper and more efficient helps to improve productivity and reduce costs in the supply chain. (True/False)
- According to _____, *materials management is the grouping of management functions supporting the complete cycle of material flow, from the purchase and internal control of production materials to the planning and control*

of work in process to the warehousing, shipping, and distribution of the finished product.

- a. Thomas F. Wallace & John R. Dougherty
 - b. International Federation of Purchasing and Materials Management
 - c. Chris Hand
 - d. Joseph Orlicky
12. Which of the following is not the primary objective of materials management?
- a. Obtaining low prices
 - b. Material selection
 - c. Forecasting
 - d. Good supplier relations
13. Which of the following is not a secondary objective of materials management?
- a. New material-handling developments
 - b. Make or buy decisions
 - c. Co-operation with other departments
 - d. Maintenance of records
14. Which of the following is a challenge to materials management?
- a. Receipt of materials before they are needed, which can lead to higher inventory-carrying costs, and increase the risk of deterioration in quality and obsolescence
 - b. Delay in the supply of materials which can lead to a delay in the productivity of the finished product
 - c. Introduction of incorrect materials at the design and development phase of a product
 - d. All of these
15. _____ is an approach for the post-production issuing commonly used in the Just-in-Time environment.
- a. EDI
 - b. MRP
 - c. Back Flushing
 - d. RFID
16. The evolution of materials management can be classified into three distinct periods. Identify which of the following periods is not considered as a part of the evolution of materials management.
- a. Early part of the twentieth century
 - b. Middle part of the twentieth century
 - c. Phase after the Second World War
 - d. Later part of the twentieth century
17. Which of the following is not a benefit of standardisation?
- a. Uniformity
 - b. Interchangeability
 - c. Increased variety
 - d. Mass production

18. ISO works through certification groups known as .
 - a. Registrars
 - b. Accountants
 - c. Auditors
 - d. Workers
19. Which of the following is currently the most commonly used ISO standard?
 - a. ISO 9001:2015
 - b. ISO 14001
 - c. ISO 13485A
 - d. ISO/TS 16949
20. Which of the following statements is incorrect for materials that need special handling?
 - a. They are placed into separate categories from those that require normal handling.
 - b. They require special transport, handling and warehousing procedures.
 - c. They are mostly purchased with materials that require normal handling.
 - d. They might require special licenses and approvals.
21. What do the first two digits in a code indicate?
 - a. The general classification
 - b. The size and characteristics
 - c. Small variations
 - d. The generic classification
22. In _____ system of codification, it may happen that the codes of two related items may be apart by several thousand digits.
 - a. Numerical
 - b. Arbitrary
 - c. Decimal
 - d. Kodak
23. There is a _____ contact of materials management with the customers in the organisations where products are featured by relatively simple assemblies.
 - a. Indirect
 - b. Direct
 - c. Short-term
 - d. Long-term
24. _____ is a widely used computer-based inventory management system for determining the dependent demand inventory needed to produce the finished goods.
 - a. MRP
 - b. ERP
 - c. EDI
 - d. RFID
25. The _____ refers to a system of related computing devices, machines, objects, etc., connected not only to the user, but also themselves over the Internet.
 - a. Big Data analytics
 - b. Internet of Things
 - c. Mobile technology
 - d. Advanced robotics

1.12 HIGHER ORDER THINKING SKILLS (HOTS)

1. Identify the correct option that best represents the purpose of the materials management system.
 - A. Managing materials in the production process
 - B. Purchasing materials in such a way that it supports the needs of production
 - C. Carry on the production process in such a manner that it supports the purchasing of materials
 - a. A and B
 - b. B and C
 - c. A, B and C
 - d. A and C
2. Identify which of the following represents the major activity of materials management.
 - A. Manufacturing planning and control
 - B. Physical distribution
 - a. Both A and B
 - b. Neither A nor B
 - c. A only
 - d. B only
3. Identify the first step in manufacturing, planning and control.
 - a. Achieving the level of forecast
 - b. Maintaining the required level of inventory
 - c. Maintaining the panned backlog
 - d. Production planning
4. Name the scientific technique which is used for planning the ordering and usage of materials at different production levels and for monitoring the inventory levels during the transactions.
 - a. EDI
 - b. MRP
 - c. ERP
 - d. RFID
5. Which of the following is not considered in the 5 Rs of buying?
 - a. Right quality
 - b. Right quantity
 - c. Right price
 - d. None of these

1.13 ANSWER KEY**A. SELF ASSESSMENT QUESTIONS**

Topic	Q. No.	Answer
Concept of Materials management	1.	True
	2.	5 Rs
Internal and External Interfaces of Materials Management	3.	False
	4.	annual supplier
Standardisation and Simplification	5.	uniformity; interchangeability
	6.	Bureau of Indian Standards (BIS)
International Standards Organization (ISO)	7.	non-governmental
	8.	True
Classification of Materials	9.	Safety inventory
	10.	False
Codification of Materials	11.	Mnemonic system
	12.	False
Modern Trends in Materials Management	13.	Big data
	14.	True

B. SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	International Standards Organization (ISO)
2.	usage rate
3.	Radio Frequency Identification (RFID)
4.	Frequency of Purchase
5.	Kodak
6.	Enterprise Resource Planning (ERP)
7.	True
8.	False
9.	False
10.	True

Q. No.	Answer
11.	a. Thomas F. Wallace & John R. Dougherty
12.	c. Forecasting
13.	d. Maintenance of records
14.	d. All of these
15.	c. Backflushing
16.	b. Middle part of the twentieth century
17.	c. Increased variety
18.	a. Registrars
19.	a. ISO 9001:2015
20.	c. They are mostly purchased with materials that require normal handling.
21.	a. The general classification
22.	b. Arbitrary
23.	b. Direct
24.	a. MRP
25.	b. Internet of Things

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answers
1.	a. A and B
2.	a. Both A and B
3.	d. Production planning
4.	b. MRP
5.	d. None of these

1.14 SUGGESTED BOOKS AND E-REFERENCES



SUGGESTED BOOKS

- Chapman, S., Arnold, TK., Gatewood, AK., Clive L. (2017). *Introduction to Materials Management, 8th Edition*. Pearson.
- Gopalakrishnan, P. & Haleem, Abid. (2015). *Handbook of Materials Management*. PHI Learning Pvt. Ltd.
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E-REFERENCES

- Materials management: it's Definition, Objectives and Organization. (2020). Retrieved 3 January 2020, from <http://www.yourarticlelibrary.com/material-management/material-management-its-definition-objectives-and-organization/27934>
- Materials Management Definition | Operations & Supply Chain Dictionary | MBA Skool-Study.Learn.Share. (2020). Retrieved 3 January 2020, from <https://www.mbaskool.com/business-concepts/operations-logistics-supply-chain-terms/15429-materials-management.html>
- Materials Management: Planning & Process | Study.com. (2020). Retrieved 3 January 2020, from <https://study.com/academy/lesson/materials-management-planning-process.html>

MIT

MATERIAL HANDLING

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Explain the objectives of material handling
- ▶ Discuss the principles of material handling
- ▶ Describe the cost factor in materials management
- ▶ Elucidate the methods of material handling along with its evaluation
- ▶ List various equipments for material handling



INTRODUCTION



Read

Pre-read Connect

In the previous chapter, you have learnt about the concept of materials management. Further, you studied the internal and external interfaces of materials management. You have gained knowledge about standardisation and simplification. You have attained information related to ISO. Finally, you have learnt about the classification and codification of materials along with the modern trends in materials management.

Materials management deals with the handling of right materials in the right amount, in the right condition, at the right place, in the right position, in the right sequence and for the right cost by the right method. The process of material handling is defined by **Material Handling Industry of America (MHIA)** as *the movement, storage, control and protection of materials, goods, and products throughout the process of manufacturing, distribution, consumption and disposal. The focus is on the methods, mechanical equipment, systems and related controls used to achieve these functions.* According to Stock & Lambert, 2001, production flow is made possible through material handling as it drives the static elements of the production process, such as materials, products, equipment, layout and human resources. Effective management of material handling allows an organisation to enhance its operational performance (Chopra & Meindl, 2001).

Efficiency in the material handling processes and system of an organisation allows it to reduce inventory, shorten delivery times, increase customer satisfaction, and reduce material handling costs overall. Material handling equipment assists personnel in managing the flow of materials efficiently. Industrial trucks are used to flow materials over variable paths with no restrictions on the area covered by the movement. It is an expensive equipment due to the involvement of high operating costs. Proper management of material handling is important to reduce costs, increase operational efficiency and minimise accidents.

In this chapter, you will learn about the objectives of material handling along with its principles. Further, you will study the various cost considerations and methods of material handling along with the evaluation. Finally, you will learn about the different equipments that are used while handling materials.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- List the objectives of material handling
- State the principles of material handling
- Discuss different methods of material handling
- Justify the evaluation of material handling

2.1 OBJECTIVES OF MATERIAL HANDLING

Important Concept

International Materials Management Society has defined Material Handling as '*an art and science involving the movements, packaging and storing of substances in any form*'.

The basic function of material handling is the movement of materials. The factory system that emerged during the industrial revolution shifted the handling of materials from simple physical handling to mechanical handling. The emergence of various technologies has completely changed the face of material handling to what it is today.

The objectives of material handling are as shown in Figure 1:

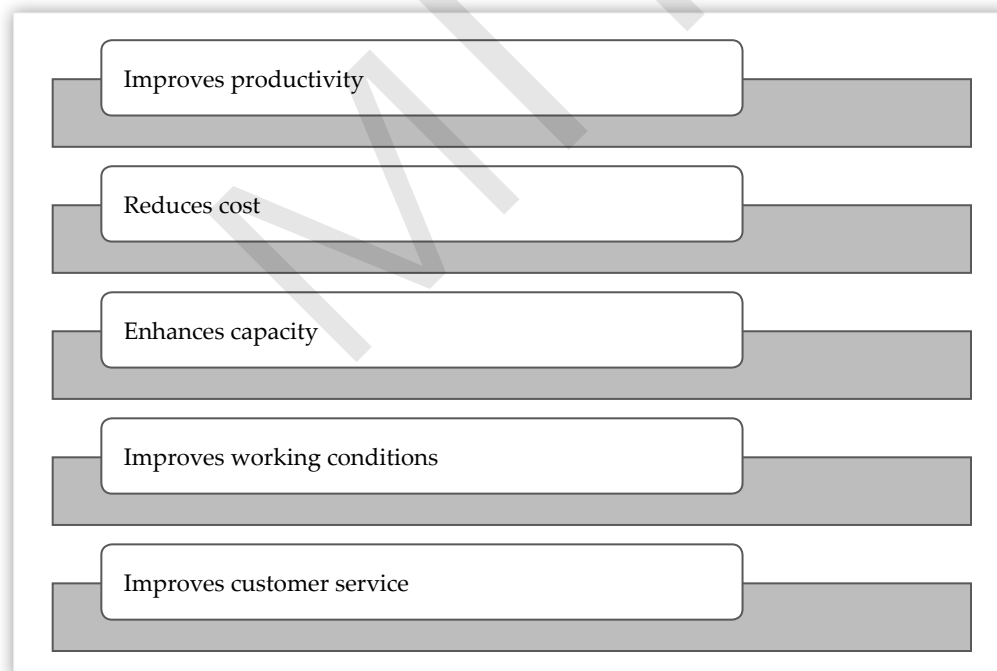


FIGURE 1: Objectives of Material handling

As depicted in Figure 1, the objectives of material handling are discussed as follows:

- **Improves productivity:** An efficient material handling system helps in increasing productivity per man-hour. It also helps in reducing the machine downtime in order to increase the efficiency of the machine.

- **Reduces cost:** Reducing and optimising material handling procedures help achieve a reduced total cost of production. These can be done in the following manner:
 - Reducing the number of material handling labourers
 - Assigning simple material handling tasks to unskilled staff
 - Minimising indirect labour expenses on activities related to storage, quality control, repair, etc.
 - Preventing damage to materials during handling
 - Optimising space utilisation
 - Reducing packaging expenses
 - Maintaining the minimum level of inventory
 - Reducing storage between processes
- **Enhances capacity:** An efficient material handling system helps achieve an increase in capacity through better utilisation of space. This can be done through the steps given as follows:
 - Using stacks or containers that allow the stacking of materials upon each other in order to utilise the space efficiently.
 - Examining the flow of materials between operations while taking into account the flow paths, volumes, timings, etc., in order to identify ways by which travel time and space requirements can be reduced.
 - Ensuring regular supply and allocation of materials results in better utilisation of equipment and prevents equipment from just sitting idle.
 - Using material handling equipment, such as cranes and conveyors, that allows faster loading or unloading of materials.
- **Improves working conditions:** Improvement of the working conditions in an organisation is one of the major objectives of material handling management. This can be done in the following ways:
 - Improving the safety of the workforce, materials and equipment helps in preventing loss of money and enhancing the morale of employees.
 - Using proper handling equipment during the course of production allows staff to perform heavy jobs faster, easier and at a steady rate.
 - Ensuring reduction in the manual handling of materials minimises the risk of errors in operations.
- **Improves customer service:** Better material handling ensures timely deliveries to the end user by preventing disruptions to the production schedule. Thus, it helps improve customer service.



NOTE

Material handling tasks are the causes of a large number of musculoskeletal disorders among workers. Musculoskeletal disorders are injuries affecting the musculoskeletal system of the body, i.e., muscles, tendons, ligaments, discs and nerves.



**SELF
ASSESSMENT
QUESTIONS**

1. An efficient material handling system helps achieve an increase in _____ through better utilisation of space.

2. The factory system that emerged during the industrial revolution shifted the handling of materials from simple physical handling to mechanical handling. (True/False)

2.2 PRINCIPLES OF MATERIAL HANDLING

The principles of material handling act as a guide during the designing of a material handling system. When a material handling system is aligned with these principles, it means that all equipment and processes work together as a unified and coordinated system. This results in reduced inventory, shorter delivery times, better customer service, and reduced handling costs. However, these principles should not be used as a substitute for value judgement and experience. The College-Industry Council on Material Handling Education (CIC-MHE) recognises the 10 principles of material handling. These are displayed in Figure 2:

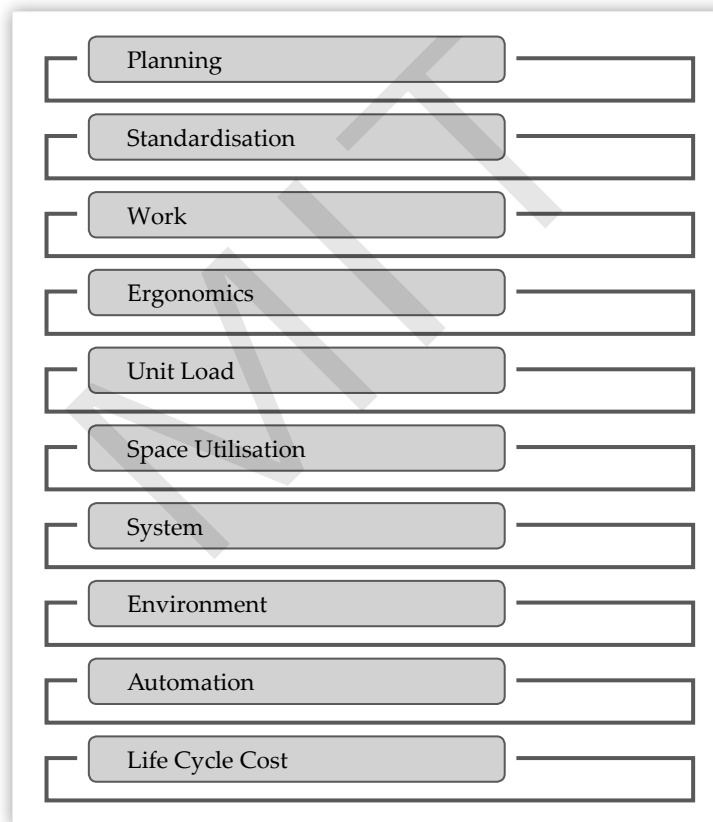


FIGURE 2: Principles of Material Handling

The principles of material handling are:

- **Planning:** Planning helps outline the requirements, desired performance goals and functional requirements of the intended material handling system. A material handling plan defines the materials to be handled, its movement and the method and technologies to be used for the smooth flow. Planning is to be done at the start of the design phase, taking into account the objectives of the organisation.

- **Standardisation:** Standardisation means less variety and customisation in methods and technologies that are employed in the material handling processes.
- **Work:** It is calculated by multiplying the materials flow in terms of volume, weight or count per unit of time with the distance moved by the materials.
- **Ergonomics:** It refers to the science that tries to adapt work and the working conditions as per the suitability of workers.
- **Unit load:** Unit loads comprise many individual items. These can be stored, managed and moved with the help of pallets, containers and totes as a single entity at one time. These should be preferred as they use less effort than the required effort to move various individual items.
- **Space utilisation:** In material handling, space is considered as three-dimensional and, therefore, referred to as a cubic space. It is important to keep in mind the following points in order to allow the maximum space utilisation:
 - Organise work areas and keep them clutter-free
 - Maximise density in storage areas without affecting safety, flexibility and accessibility
 - Utilise overhead space
- **System:** The movement and storage of materials should be coordinated during various processes, such as receiving materials, inspection, storage, allocation, production, assembly, packaging, shipping and returns.
- **Environment:** At the time of designing the system, energy usage and potential environmental impact need to be taken into account. Reusable packing, returnable containers, recycling packing materials and alternative sources of energy should be given preference. Safe work practices also need to be defined for handling hazardous materials.
- **Automation:** Automation refers to the use of electromechanical devices, electronics and computer-based systems that can be operated with the help of programmed instructions. Investing in automated material handling technologies should be given preference over manual ones, whenever possible, as they help increase operational efficiency, accuracy, responsiveness and reliability.
- **Life cycle cost:** Instead of looking only at the initial capital investment upfront, an analysis of life cycle costs needs to be undertaken for all equipment concentrating on the areas, such as installation and set-up, training, system operation, consumables, maintenance and repair, reuse value and disposal.



**SELF
ASSESSMENT
QUESTIONS**

3. _____ refers to the science that tries to adapt work and the working conditions as per the suitability of workers.
4. Instead of performing an analysis of life cycle costs for all equipment, one should focus on the initial capital investment upfront. (True/False)

2.3 MATERIAL HANDLING COST

Material handling costs in any organisation typically include the following:

- Handling of materials by the staff
- Handling of materials in a warehouse, department or plant
- Handling of materials in the supply chain

Therefore, material handling cost can be calculated as:

Material handling cost = Cost of handling + cost of transportation + cost of storage + cost of packaging + cost of space + cost of handling equipment including operation, maintenance, depreciation and disposal

The primary concern of material handling consists of the elements given below:

- Picking up the load
- Moving the load
- Laying down the load

Apart from the above obvious costs, material handling has a lot of hidden costs that are constantly being added up in various areas. The top areas that accumulate hidden costs in material handling are depicted in Figure 3:

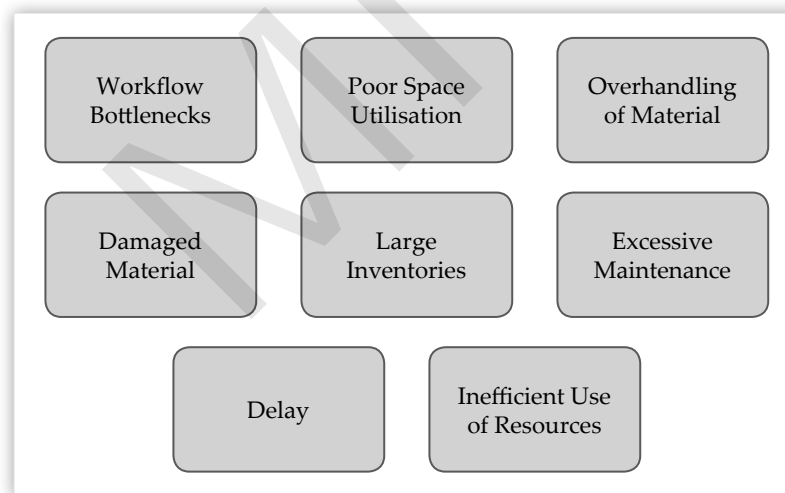


FIGURE 3: Areas that Accumulate Hidden Material Handling Costs

These areas are in detail as follows:

- **Workflow bottlenecks:** Poor materials management, such as availability of the insufficient amount of raw materials before the start of the production process can cause bottlenecks that, in turn, results in keeping the whole line of machines idle for some time. This can cost a lot of money and time and negatively affect productivity.
- **Poor space utilisation:** Space usage needs to be evaluated to determine if the available space is being utilised effectively and safely. Underuse and overuse

of space is both not recommended because underutilisation will increase the storage costs, whereas overutilisation can lead to traffic bottlenecks. It is better to use various flexible steel construction options available, such as taller racks and ceiling racks, to utilise overhead space efficiently.

- **Overhandling of materials:** Each time a material is moved, sorted, set aside or prepared for shipment, it uses employee time and costs money. Therefore, it is important to use techniques that minimise the number of times a material is handled to help in decreasing material handling costs.
- **Damaged material:** A damaged material has a high hidden cost in material handling. Loss of product, equipment wear, breakage, torn packaging, etc., are some examples of damaged materials. To prevent damage, storage space should be such that the shelf life of a material can be tracked along with moisture or temperature levels wherever applicable. Conveyor systems may also help decrease the risk of damage during the movement of materials.
- **Large inventories:** Large inventories lock-in the capital and use large amounts of storage space.
- **Excessive maintenance:** Maintenance costs can add up while taking corrective measures and when the equipment is kept idle during the course of maintenance.
- **Delay:** Delays in material handling or lying idle of transportation facilities over a specified time adds to the expenses incurred in material handling.
- **Inefficient use of resources:** Too much or too less employment of resources can incur a cost for an organisation. For example, if there is a large number of labour deployed for an activity, the idle time will increase. On the other hand, too small number of labour can put the activity on halt. Similarly, equipment, such as lift trucks, are useful but are bulky and expensive to maintain. Therefore, these should only be chosen when they are mandatory to use.



STUDY HINT

Inefficient operations can cost companies up to 30% of their revenue.



SELF ASSESSMENT QUESTIONS

5. Underutilisation of space will increase the storage costs, whereas overutilisation can lead to traffic bottlenecks. (True/False)
6. Material handling should follow the _____ possible route.



ACTIVITY 1

Visit a nearby manufacturing facility and try to learn about the costs of any one material handling equipment that they use.

2.4 METHODS OF MATERIAL HANDLING

Industrial workers handle different materials using different methods. There are various shapes and sizes of material handling systems used to handle the material, and workers should select the type of system that is the most suitable for the task. There are also certain safety principles for material handling that workers should keep in mind.

Material handling systems can also be categorised into four groups given as follows:

- **Equipment-oriented systems:** On the basis of the type of equipment to be used, material handling systems can be classified as follows:
 - Overhead systems, such as monorails or overhead cranes
 - Conveyor systems, such as conveyor belts
 - Industrial truck systems, such as pallet truck, forklift, platform trucks and tractor-trailers
 - Underground systems
- **Material-oriented systems:** Depending upon the type of materials being handled, material handling systems can be classified as follows:
 - Unit handling systems
 - Bulk handling systems
 - Liquid handling systems
- **Method-oriented systems:** On the basis of the techniques of material handling and production, the material handling systems can be classified as:
 - Manual systems
 - Automated/mechanized systems
 - Job-shop handling systems
 - Mass production handling systems
- **Function-oriented systems:** On the basis of functions performed by the material handling equipment, material handling systems can be classified as under:
 - **Transportation systems:** For horizontal motion
 - **Conveying systems:** For horizontal, vertical or combined motions
 - **Transferring systems:** For horizontal, inclined or declined motions through the air
 - **Elevating systems:** For motion over vertical or steeply inclined tracks
 - **Self-loading systems:** For intermittent motion with machines that pick up, move and lay down loads



**SELF
ASSESSMENT
QUESTIONS**

7. Which of the following is not an equipment-oriented system?
 - a. Overhead system
 - b. Conveyor system
 - c. Industrial truck system
 - d. Elevating system
8. Transportation systems help in the horizontal, vertical and inclined motions of materials. (True/False)

2.5 EVALUATION OF MATERIAL HANDLING

Material handling is a process that does not add value to a product directly, but it adds value in a significant element, i.e., cost. Typically, the material handling costs range from 20% to 35% of the total cost of production. While it was earlier believed that most of this cost was a necessary evil, a systems approach is now being applied to achieve a reduction in material handling costs. Apart from costs, material handling also uses a lot of production time before, during and after the production process. This time can also be decreased by the proper selection, operation, maintenance and layout of material handling devices. Material handling must, therefore, be evaluated at the time of selecting equipment, constructing the factory building, designing new plants and altering the existing plants.

Most organisations are challenged by the problem to increase productivity, efficiency, accuracy and consistency, while, at the same time, controlling labour and other costs. Therefore, they need an evaluation of their current equipment and handling systems to maintain the balance. Evaluation or audit of existing material handling systems includes:

- Determining which parts need replacement, modifications or service
- Providing suggestions on maintenance, modifications, upgrades, etc.
- Recommending an approach to bring the system to the desired functionality
- Estimating costs to implement upgrades, modifications, replacements or repairs

Audits are, thus, used by managers to estimate the maintenance objectives and costs, plan for the purchase of critical spare parts, determine the adjustments required to reduce downtime, determine costs and schedule for replacement and/or maintenance of equipment. The costs include costs on investment, labour, and estimated service hours per year, operating costs, etc. There are other factors that need to be considered during an assessment. These are given as follows:

- Equipment utilisation
- Unit load-carrying ability
- Loading and unloading characteristics
- Size requirements
- Energy sources
- Operating conditions and other technical aspects

The efficacy of any material handling system can be correctly quantified as the ratio of operating time to loading time. In terms of cost, the effectiveness can be measured by the expenses incurred per unit weight handled.

Some other criteria for evaluating the performance of material handling systems are as follows:

- **Equipment utilisation ratio:** Equipment utilisation ratio is an important gauge for assessing the material handling system. This ratio can also be

compared to a benchmark. Calculation of the Material Handling Labour (MHL) ratio helps in determining the total effort needed to move materials from one place to another. The formula to calculate this ratio is:

MHL = Personnel assigned to material handling/Total operating workforce

- Calculating the Direct Labour Handling Loss (DLHL) ratio allows to determine if the handling system is able to deliver materials with the maximum efficiency or not. This ratio is calculated as follows:

DLHL = Material handling time lost by direct labour/Total direct labour time

- The movement's operations ratio helps determine whether the movement of workers is more than the requirement due to poor routing or not. This ratio is calculated as:

Movement operations ratio = Total number of moves/Total number of productive operations

One should always bear in mind that the effectiveness of a material handling system depends on the following factors:

- How efficiently are the material handling methods being used to handle a unit weight through a unit distance?
- How efficient are the layout and routing for handling the materials?
- How efficiently are the material handling facilities being utilised?
- How speedily are the materials being handled?

Therefore, evaluation helps determine the efficiency of a material handling system. Careful selection and evaluation of the material handling equipment help an organisation improve its overall system through work-study techniques. After an assessment, customisation of the layout and equipment can be done to suit the specific requirements. For example, when a big volume of materials needs to be transported from a limited number of sources to a limited number of destinations, it is better to use fixed path equipment, such as rollers, belt conveyors and overhead conveyors, but when flexibility is important, it is better to use varied path equipment. Assessing the material handling system allows enhancement in the ratio of operating time to loading time by introducing improvements, such as palletising, removing duplicative movements, and replacing ineffective or obsolete equipment.



**SELF
ASSESSMENT
QUESTIONS**

9. Material handling is a significant element to the total cost of production as it adds value to a product. (True/False)
10. Calculating the _____ ratio allows to determine if the handling system is able to deliver materials with maximum efficiency.

2.6 MATERIAL HANDLING EQUIPMENT

The five major types of material handling equipment are shown in Figure 4:

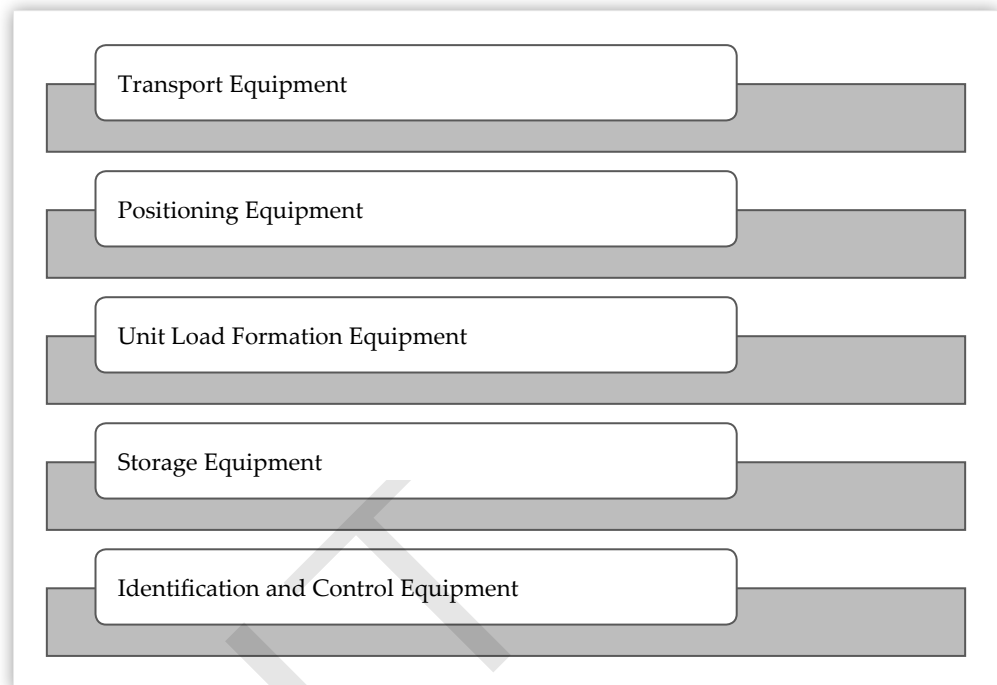


FIGURE 4: Types of Material Handling Equipment

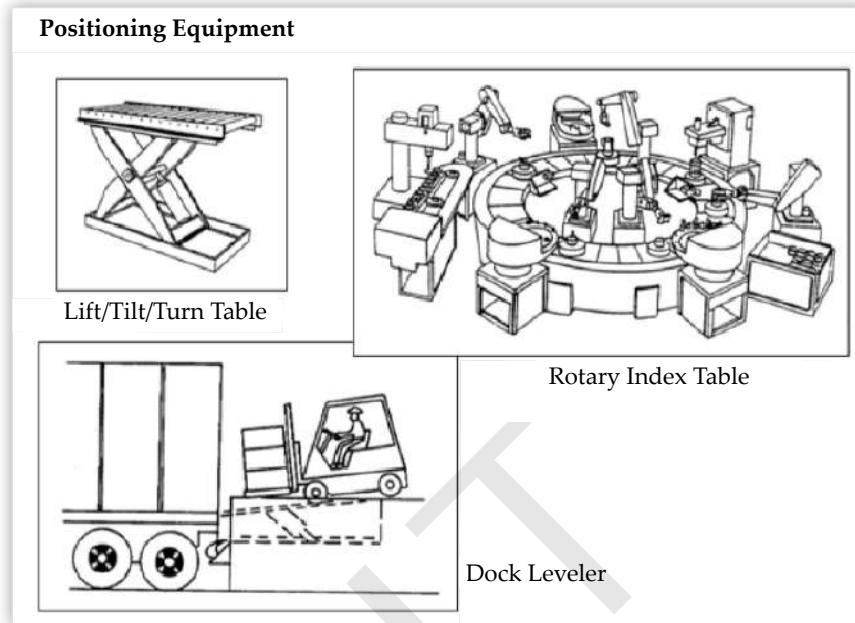
Let us discuss these equipment as follows:

- **Transport equipment:** Transport equipment is used for the movement of materials from one facility to another. The movement might take place in between the workplaces or from the loading deck to the storage area. Conveyors, cranes, industrial trucks, etc., are used for transporting materials. Sometimes, no material handling equipment is needed to transport materials.



Source: <https://www.lencrowforklifts.com.au/news/different-types-of-material-handling-equipment-used-in-warehouse/>

- **Positioning equipment:** Positioning equipment is used for handling materials at a single workplace so that it can be used for subsequent handling, machining, transporting or storing efficiently. Hoists, manipulators, balancers, etc., are used as positioning equipment. Sometimes, the materials can easily be positioned manually.



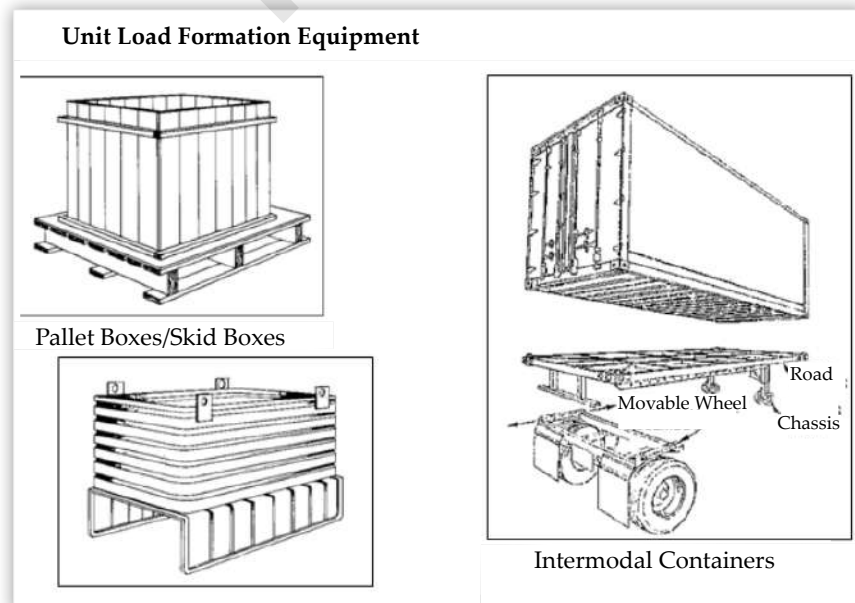
Source: <https://slideplayer.com/slide/4655448/>

- **Unit load formation equipment:** Unit load formation equipment is used to form a unit load from a number of individual materials so that they can be handled as a single load during transportation and storage. If individual materials are self-restraining, then they can form a unit load themselves without using any equipment. Pallets, cartons, bags, etc., are used as unit load formation equipment.



Quick TIP

The material handling method should be chosen on the basis of the type and volume of materials being handled and also the facility. For example, conveyors are suitable when the load is steady and uniform, and the route is free of traffic interference. A crane frees up floor space and helps make use of overhead space to move materials.



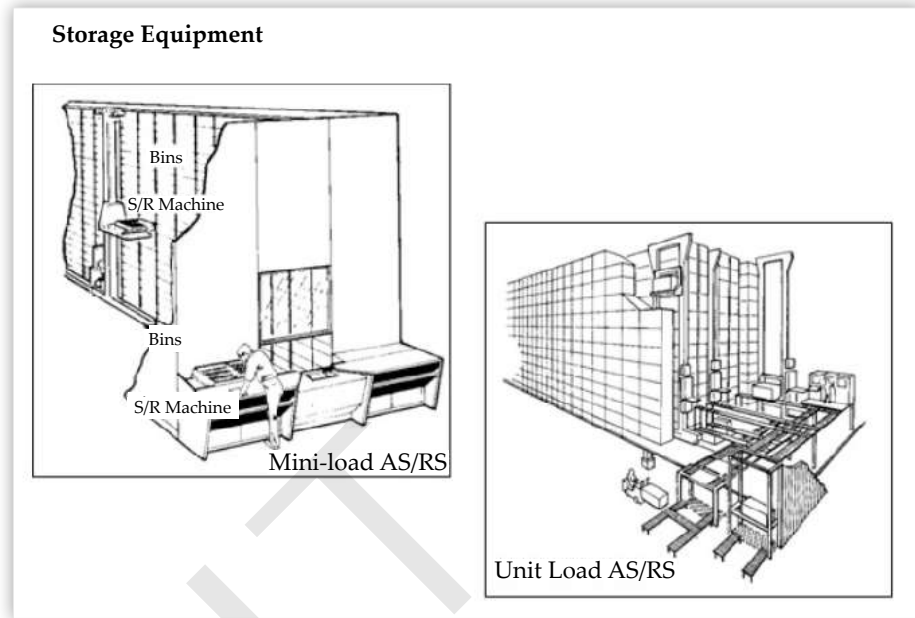
Source: <https://slideplayer.com/slide/4655448/>



NOTE

Storage and handling equipment include equipment used for storage that is not automated. Automated storage and handling equipment are included in the engineered systems category.

- **Storage equipment:** Storage equipment is used to store materials for a specific period of time. S/R machines of AS/RS or storage carousels may be used to store and transport materials from one facility to another. Bins, racks, etc., are used as storage equipment. There is no need to use storage equipment if materials are stacked directly on the floor.



Source: <https://slideplayer.com/slide/4655448/>

- **Identification and control equipment:** Identification and control equipment are used to gather and communicate the related information in order to coordinate the materials flow within a facility or outside a facility. Sometimes, the use of specialised equipment is not required to identify and control materials. Bar codes, RFID tags, Machine Vision, EDI, etc., can be used as identification and control equipment.



SELF ASSESSMENT QUESTIONS

11. _____ equipment is used for handling materials at a single workplace so that it can be used for subsequent handling, machining, transport or storage efficiently.
12. If individual materials are self-restraining, then they can form a unit load themselves without using any equipment. (True/False)



ACTIVITY 2

Read about forklift systems on the Internet and prepare a list of safety norms that should be considered while working with forklifts.

2.7 SUMMARY



The process of material handling is defined by **Material Handling Industry of America (MHIA)** as *the movement, storage, control and protection of materials, goods,*

and products throughout the process of manufacturing, distribution, consumption and disposal. The focus is on the methods, mechanical equipment, systems and related controls used to achieve these functions. Efficiency in the material handling processes and system of an organisation allows it to reduce inventory, shorten delivery times, increase customer satisfaction and reduce material handling costs overall. The objectives of material handling are decreasing production and operations costs, enhancing capacity and improving working conditions. The principles of material handling are the best practices that act as a guide during the designing of a material handling system. These are planning, standardisation, work, ergonomics, unit load, space utilisation, system, environment, automation and life cycle cost. Material handling costs in any organisation typically include handling of an item by the staff, handling in warehouse, department or plant and handling of materials in the supply chain. It can be measured by adding the cost of transportation, cost of handling materials, cost of storage, cost of packaging, cost of space, cost of equipment (operation, maintenance, depreciation, disposal costs). It can have a lot of hidden costs including workflow bottlenecks, poor space utilisation, over-handling of materials, damaged materials, large inventories, excessive maintenance, delays, inefficient equipment and inefficient use of equipment or labour. The five major types of material handling methods are movement, quantity, time, space, and control. Material handling systems can be categorised into four groups, i.e., Equipment-oriented systems, Material-oriented systems, Method-oriented systems and Function-oriented systems. Material handling must be evaluated at the time of selecting equipment, constructing factory building, designing new plants and altering the existing plants. Evaluation or audit of the existing material handling systems includes determining which parts need replacement, adjustments or service, suggestions on maintenance, modifications, upgrades, recommendation of an approach to bring the system to the desired functionality and estimation of costs to implement upgrades, modifications, replacements or repairs. The five major types of material handling equipment are transport equipment, positioning equipment, unit load formation equipment, storage equipment, identification and control equipment.

2.8 KEY WORDS



- **Critical spare parts:** Spare parts whose unavailability can greatly reduce or even shut down production
- **Downtime:** Time during which a machine or equipment is unavailable or out of action due to reasons, such as technical failures, repairs, adjustments and shortage of materials or labour
- **Job Shops:** Systems can manufacture a wide variety of products with small lot sizes in order to achieve maximum flexibility across processes
- **Pallet:** A flat wooden or metal platform that is used to stack items so that the items can be lifted and moved using a forklift truck
- **Unit load:** A storage and transport unit arranged with modular support so as to ensure efficient picking and handling

2.9 CASE STUDY: BEALLS INC. AND THE TRIFACTOR SOLUTION



Bealls Inc. is a family-owned enterprise that retails general merchandise and dry goods. The headquarters of this enterprise are in Bradenton, Florida. Bealls, Inc. is responsible for distributing items to over 560 Beall's Department Stores, Bealls Outlet Stores and Burke's Outlet Stores located across the Sun Belt from Florida to California.

To keep up with the fast-paced growth of Bealls Inc., it needed to merge its five regional distribution centres into one 3,00,000-square-foot location in Bradenton, Florida. The merger of the distribution centres would mean that Bealls Inc. could increase its cost efficiency and allow it to directly ship items to the departmental stores.

Bealls Inc. made a contract with TriFactor to help it design a solution to meet its requirements and specifications. TriFactor is a professional engineering company that offers material handling integrated solutions, equipment, set up and services to its clients who are mainly the distributors of finished goods. TriFactor provides solutions to its customers that allow them to lower their distribution costs, increase their distribution capacity and quality.

After being in contract with Bealls Inc., TriFactor analysed the existing processes and volumes to help it plan and design specifications based on the best practices. It also studied the estimated future growth and volumes to accommodate them. For future growth, TriFactor pioneered a solution customised for Bealls needs. There was a huge variety in case size being handled in the distribution centre, ranging from 9 inch x 9 inch x 2 inch to 42 inch x 32 inch x 36 inch sizes. This diversity in size and weight added another element of complexity to the problem for which TriFactor has to provide a solution.

As a solution to Bealls problems, TriFactor developed an entirely automated material handling system was tailor-made to satisfy all the needs and specifications. TriFactor put into place a merge and sortation system along with multi-level pick modules and shelving. The use of multi-level pick modules helps Bealls in increasing the order requirements in less time and with accuracy.

With the implementation of TriFactor's solution, Bealls Inc. saw a decrease in delivery and transportation costs. Moreover, it achieved a reduction in costs with the redistribution of direct labour. Another important advantage of the solution was vastly improved accuracy of shipments to the stores as a result of which Bealls saw both higher savings and improved customer satisfaction.

Source: <http://www.trifactor.com/Material-Handling-Case-Studies/Bealls-Case-Study>

QUESTIONS

1. Why was Bealls Inc. looking for a material handling solution?
(**Hint:** To increase its cost efficiency and allow it to directly ship items to the departmental stores)
2. What was TriFactor's solution for Beall's, Inc.?
(**Hint:** TriFactor developed an entirely automated material handling system which was tailor-made to satisfy all needs and specifications.)

2.10 SHORT ANSWER QUESTIONS



1. _____ can be stored, managed and moved with the help of pallets, containers and totes as a single entity at one time.
2. Material handling must be _____ at the time of selecting equipment, constructing the factory building, designing new plants and altering the existing plants.
3. _____ are small manufacturing systems. These systems manufacture a wide variety of products with small lot sizes in order to achieve the maximum flexibility across processes.
4. _____ are suitable when the load is steady and uniform and the route is free of traffic interference.
5. _____ are used to flow materials over variable paths with no restrictions on the area covered by the movement.
6. _____ ratio is an important gauge for assessing the material handling system.
7. Each time the materials is moved, sorted, set aside, or prepared for shipment, it uses employee time and costs money. (True/False)
8. Maintenance costs can add up while taking corrective measures and when the equipment is kept idle during the course of maintenance. (True/False)
9. The efficacy of any material handling system can be correctly quantified as the ratio of operating time to loading time. (True/False)
10. Storage and handling equipment include equipment used for storage that is automated. (True/False)
11. Which of the following does not achieve the material handling objective of reducing costs?
 - a. Reducing the number of material handling labour
 - b. Assigning simple material handling tasks to unskilled staff
 - c. Minimising indirect labour expenses on activities related to storage, quality control, repair, etc.
 - d. Maintaining the maximum level of inventory
12. Which of the following are used as a unit load formation equipment?
 - a. Hoists
 - b. Manipulators
 - c. Balancers
 - d. Pallets
13. _____ refers to the use of electromechanical devices, electronics and computer-based systems that can be operated with the help of programmed instructions.

a. Planning	b. Standardisation
c. Automation	d. Ergonomics

14. Which of the following can be used as the identification and control equipment?
 - a. Bar codes
 - b. RFID tags
 - c. Machine vision
 - d. All of these
15. Which of the following is included in the material handling costs in any organisation?
 - a. Handling of materials by the staff
 - b. Handling of materials in a warehouse, department or plant
 - c. Handling of materials in the supply chain
 - d. All of these
16. Poor materials management, such as the availability of an insufficient amount of raw materials before the start of the production process, can cause _____.
 - a. Workflow bottlenecks
 - b. Poor space utilisation
 - c. Overhandling of materials
 - d. Large Inventory
17. Unit handling systems, bulk handling systems and liquid handling systems are the types of which material handling system?
 - a. Equipment-oriented
 - b. Materials-oriented
 - c. Method-oriented
 - d. Function-oriented
18. Which type of material handling systems is best suited for the movement over vertical or steeply inclined tracks?
 - a. Transportation Systems
 - b. Conveying Systems
 - c. Elevating Systems
 - d. Transferring Systems
19. Typically, the material handling costs range from _____ of the total cost of production
 - a. 10 to 15%
 - b. 20 to 35%
 - c. 30 to 40%
 - d. 40 to 50%

20. Evaluation or audit of the existing material handling systems includes:
- Determining which parts need replacement, adjustments or service
 - Providing suggestions on maintenance, modifications, upgrades, etc.
 - Estimating costs to implement upgrades, modifications, replacements or repairs
 - All of these
21. Which of the following are not estimated with the help of audits?
- Estimate maintenance objectives and costs
 - Plan for the purchase of critical spare parts
 - Plan for overhandling of materials
 - Determine costs and schedule for replacement and/or maintenance of equipment
22. _____ helps determine whether movements of workers are more than required due to poor routing or not.
- Material Handling Labour Ratio
 - Movement Operation Ratio
 - Direct Labour Handling Loss Ratio
 - None of these
23. Material Handling Labour (MHL) ratio is calculated as:
- $MHL = \text{Personnel assigned to material handling} \times \text{Total operating workforce}$
 - $MHL = \text{Total operating workforce} / \text{Personnel assigned to material handling}$
 - $MHL = \text{Personnel assigned to material handling} / \text{Total operating workforce}$
 - $MHL = \text{Total number of moves} / \text{Total number of productive operations}$
24. _____ is the ratio of material handling time lost by direct labour to total direct labour time.
- Material Handling Labour (MHL) ratio
 - Direct Labour Handling Loss (DLHL) ratio
 - Movement Operation Ratio
 - None of these
25. Large inventories lock-in _____ and use large amounts of storage space.
- Cost
 - Capital
 - Storage
 - Productivity

2.11 HIGHER ORDER THINKING SKILLS (HOTS)



1. Match the following:

List I	List II
A. Transportation Systems	i. For intermittent motion with machines that pick up, move and lay down loads
B. Conveying Systems	ii. For horizontal motion
C. Transferring Systems	iii. For horizontal, vertical or combined motions
D. Self-loading Systems	iv. For horizontal, inclined or declined motions through air

- a. A-i, B-ii, C-iii, D-iv b. A-iv, B-iii, C-i, D-ii
 c. A-ii, B-iii, C-iv, D-i d. A-iii, B-i, C-ii, D-iv
2. Calculate the material handling cost if the cost of handling is ₹ 5,000, the cost of transportation is ₹ 2,000, the cost of packaging is ₹ 500 and the cost of storage is ₹ 1,000.
- a. ₹ 8,500 b. ₹ 7,500
 c. ₹ 6,000 d. ₹ 5,000
3. Calculate the Movement Operation Ratio if the 30 productive operations take place in 100 moves.
- a. 3:1 b. 3.33:1
 c. 3:1.33 d. 1:3.33
4. Calculate the DLHL ratio if 60 minutes are allotted to the direct labour for the entire production process out of which 15 minutes are lost by direct labour for handling materials.
- a. 1:4 b. 4:1
 c. 1:6 d. 6:1
5. Calculate MHL if the total working force in an organisation is 200, but only 25 personnel are dealing with the work of handling materials for the smooth flow of production.
- a. 8:1 b. 4:1
 c. 1:4 d. 1:8

2.12 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Objectives of Material Handling	1.	capacity
	2.	True
Principles of Material Handling	3.	Ergonomics

Topic	Q. No.	Answer
	4.	False
Material Handling Cost	5.	True
	6.	shortest
Methods of Material Handling	7.	d. Elevating system
	8.	False
Evaluation of Material Handling	9.	False
	10.	Direct Labour Handling Loss
Material Handling Equipment	11.	Positioning
	12.	True

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	Unit loads
2.	evaluated
3.	Job-Shops
4.	Conveyors
5.	Industrial trucks
6.	Equipment Utilisation
7.	True
8.	True
9.	True
10.	False
11.	d. Maintaining the maximum level of inventory
12.	d. Pallets
13.	c. Automation
14.	d. All of these
15.	d. All of these
16.	a. Workflow bottlenecks
17.	b. Materials-oriented
18.	c. Elevating systems
19.	b. 20 to 35%
20.	d. All of these
21.	c. Plan for overhandling of materials
22.	b. Movement operation Ratio
23.	c. $MHL = \frac{\text{Personnel assigned to material handling}}{\text{Total operating workforce}}$
24.	b. Direct Labour Handling Loss (DLHL) ratio
25.	b. Capital

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	c. A-ii, B-iii, C-iv, D-i
2.	a. ₹ 8,500
3.	b. 3.33:1
4.	a. 1:4
5.	d. 1:8

2.13 SUGGESTED BOOKS AND E-REFERENCES**SUGGESTED BOOKS**

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QUALITY CONTROL IN MATERIALS MANAGEMENT

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶▶ Discuss the importance of quality in materials management
- ▶▶ Describe various tools of quality control
- ▶▶ Explain the quality costs
- ▶▶ Discuss the questionnaire for a sample inspection
- ▶▶ Explain quality standards



INTRODUCTION

Read

Pre-read Connect

In the previous chapter, you have studied the concept of material handling. You have also studied the objectives and principles of material handling. Material handling costs, methods of material handling, evaluation of material handling and material handling equipment have also been discussed in the previous chapter.

Important Concept

According to **Joseph Juran**,
Quality does not happen by accident; it must be planned.

The definition of quality, according to **J. M. Juran**, the father of quality, has two aspects from the viewpoint of the customer. Quality is a greater number of features that meet customer needs and fewer number of defects. *Quality is a key factor that helps consumers make a distinction when it comes to any goods or services.* Quality plays a vital role in materials management because materials management is a service function and it is important to ensure the supply of proper quality materials for producing the right standard products in an organisation. Ensuring quality in materials management reduces materials wastage, which, in turn, helps in controlling manufacturing costs.

Juran states that *quality control is the regulatory process through which we measure actual quality performance, compare it with standards, and act on the difference.*

Quality control is crucial to develop goods and services that meet or surpass the expectations of customers. It also helps an organisation in waste reduction and ensures high levels of productivity. A good quality control system, based on acknowledged standards provided by the International Standards Organization (ISO), helps an organisation successfully reap various marketing and operational benefits. Therefore, it is important for all organisations to make efforts to consistently improve their product or service quality. For customers, standards have become synonymous with quality. Therefore, they are more inclined to buy their product or service from a manufacturer or a service provider that is certified. Hence, quality control is quintessential in materials management to foster higher productivity at minimum cost and wastage.

In this chapter, you will gain insights into the role and importance of quality in materials management. You will study about various tools of quality control. In the end, you will understand the concept of quality costs and quality standards.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the widespread adoption of quality control in materials management
- Outline the technical aspects of quality control tools
- Examine the benefits of a questionnaire for sample inspection
- Appreciate how quality control is helping businesses in achieving minimum wastage and higher productivity

3.1 IMPORTANCE OF QUALITY IN MATERIALS MANAGEMENT

Important Concept

According to **Tom Peters**, almost all quality improvements come via simplification of design, manufacturing, layout, processes, and procedures.

Quality can be defined as that attribute of a good or service which allows it to satisfy the needs and expectations of the user. The importance of quality in materials management can be understood through the points shown in Figure 1:

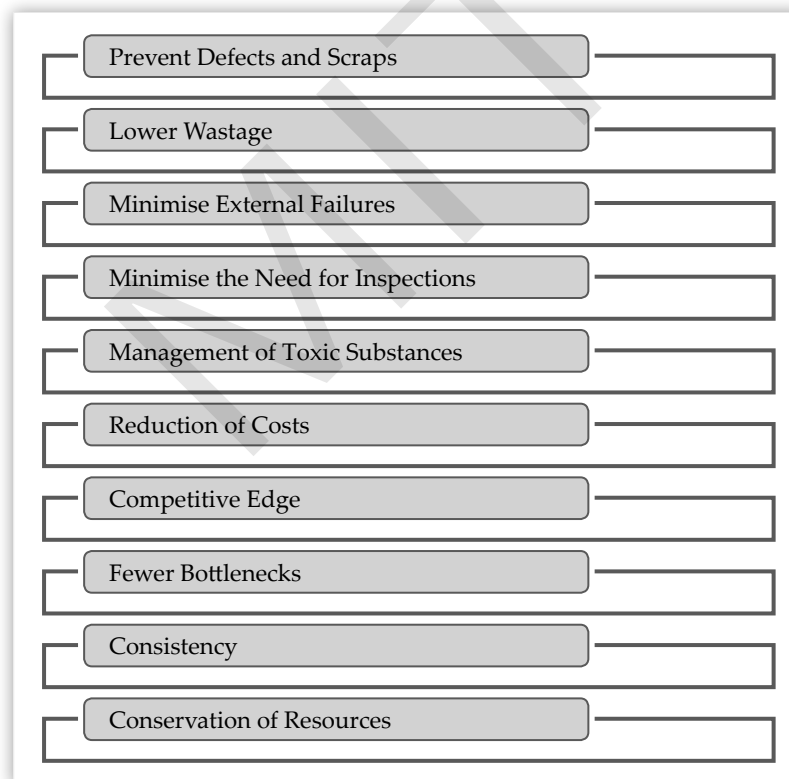


FIGURE 1: Importance of Quality in Materials Management

The importance of quality in materials management as depicted in Figure 1 is given as follows:

- **Prevent defects and scrap:** Defects in raw materials or components lead to a flawed and inefficient production line which causes higher defect rates in the goods produced. Moreover, raw materials of lower quality or those that do not

meet specifications may require extra processing steps or refining. This adds to the work already needed to be done by the staff and also increases overall production costs. Therefore, it is important for the materials management team to make sure the materials meet the required specifications.

- **Lower wastage:** Quality control in materials management helps organisations ensure the maximum utilisation of the available resources in order to avoid large quantities of waste products because of defects or flaws in the product during manufacturing.
- **Minimise external failures:** Quality control is important in materials management to prevent external failures. These are failures that occur once a product leaves a manufacturing facility, for example, breaking or wearing out of a product before the expiry of warranty. These failures can hurt the brand image of the company.
- **Minimise the need for inspections:** Organisations that do not focus on quality while handling materials during manufacturing often find themselves having to employ manual inspections to ensure the quality of the end product. These inspections result in a loss of labour hours and increased operating costs. Quality controls need to function properly during materials management to eliminate the need for these inspections.
- **Management of toxic substances:** A lot of manufacturing companies need hazardous substances for various purposes. Most governments have guidelines for transport and handling of these hazardous substances, to protect employees and other stakeholders from exposure to their harmful side effects. Quality control is needed for proper handling of these substances, compliance with guidelines and avoiding penalties or fines.
- **Reduction of costs:** In manufacturing, even slight alterations in materials or workforce can result in huge differences in the finished goods and, thus, customer satisfaction. Proper quality control and assessment of quality during the production helps reduce these losses drastically by preventing errors that cause the recall, repair or rebuilding of products.
- **Competitive edge:** Organisations that focus on quality control throughout their production processes improve their final products significantly. Generally, better products are preferred by consumers and, thus, provide a competitive edge to the organisation.
- **Fewer bottlenecks:** Effective quality control allows for better compliance with regulatory guidelines and standards with multiple checkpoints throughout the production process. This means fewer bottlenecks and chances of defects and, thus, a lower risk of financial losses.
- **Consistency:** Quality control is imperative to foster consistency during the production process by removing redundant processes and scrapped materials. It also provides more stability to pricing as it prevents significant fluctuations in manufacturing costs.
- **Conservation of resources:** Preventing errors during production is a major step towards conserving resources. Lower error rate due to good quality control translates to not only lower upfront costs of materials, but also

enhances the company's image. It also results in higher throughput and bigger profits.

It is difficult for any organisation to achieve and maintain an acceptable level of quality in its products and services. It requires various steps given as follows:

- Since quality is an obscure concept, quality standards must be pre-determined to enable measurement of quality.
- Deviation from the pre-determined standards must be recorded and minimised.
- An acceptable level of quality must be obtained at a minimum cost.

The objective of quality control is to bring the product up to the established standards by minimising deviations from established and present standards.

Quality control is used by an organisation to ensure that it is able to achieve its quality objectives, and correct any deviations if they arise. Quality control applies sample inspection, assessment and corrective measures to a production process to identify if any action is needed on the process to ensure that the desired level of quality is achieved.

Quality control is a set of procedures to ensure that goods produced or services provided abide by a pre-determined set of quality standards or meet the expectations of the customer. An efficient quality control system should include remedial measures to ensure that negative deviations that affect the quality of products or services do not happen in the future. Quality control covers not only the quality of products or services, but also the workforce and operations because the desired quality in products and services can only be achieved with effective control on the quality of workforce and operations. Thus, quality control helps establish the best practices for producing quality products within prices that the customer finds reasonable.

The objectives of quality control are given as follows:

- To determine the quality standards in products and services that are desired by consumers
- To identify flaws or deviations from standards in both the materials and the production process
- To assess the production process and recommend improvements in operations
- To identify the level of deviation in the quality of a product during the manufacturing process and take steps to minimise it



**SELF
ASSESSMENT
QUESTIONS**

1. _____ can be defined as that attribute of a good or service which allows it to satisfy the needs and expectations of the user.
2. Raw materials of _____ quality or those that do not meet specifications may require extra processing steps or refining.

3.2 VARIOUS TOOLS OF QUALITY CONTROL

The Seven Basic Tools of Quality (or the 7 QC Tools) for quality control were first pointed out by Kaoru Ishikawa, a professor of engineering at Tokyo University, during the time Japan was going through a major quality revolution. These simple graphical and statistical tools need only basic training in statistics to apply them to resolve the complex quality-related issues. These tools are shown in Figure 2:

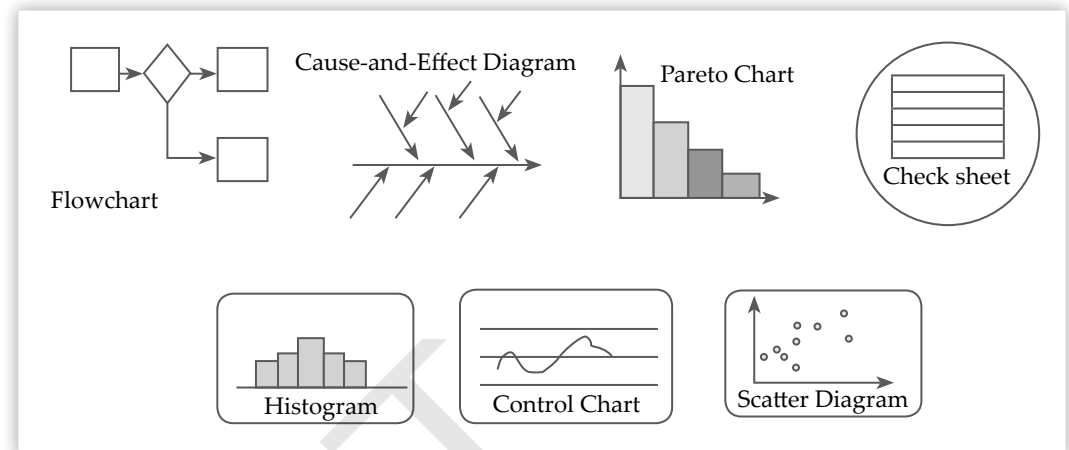


FIGURE 2: Seven Basic Tools of Quality

Source: <https://www.theexcellencecenter.org/single-post/2018/02/25/SEVEN-Basic-Quality-Tools>

These tools are discussed in detail as follows:

- **Flowchart:** A flowchart is used to display inputs, activities and outputs of one or more processes within a system as a diagram, thus allowing you to visually understand how the processes function. They display the logical sequence of steps to be performed so that the objective is achieved. Flowcharts enable you to see correlations and interdependencies between the activities in your project. They are also useful for showing decision-making processes and to assess where problems might arise in the process.
- **Cause-and-effect diagram:** Also known as fishbone diagrams, these were introduced by Kaoru Ishikawa. Cause-and-effect diagrams help determine factors causing an effect/problem. Thus, these diagrams allow identification of all root causes leading to a problem. The problem of quality is placed at the fishbone head and used as a starting point to map the source of the problem to the sub-factors causing the problem. This results in a diagram with branches and sub-branches of underlying factors that looks similar to a fishbone. Using the information from a cause-and-effect diagram, project teams can apply corrective actions to remove the underlying factors of the problem. In manufacturing environments, the causes are generally classified into the following major categories:
 - Material
 - Personnel
 - Methods

NOTE

Most organisations today set aside a budget for a quality department which involves testing and then reporting and analysing the results.

- Equipment
 - Measurements
 - Environment
- **Pareto chart:** A Pareto chart, named after Vilfredo Pareto, helps determine the major sources liable for most of the effects of a problem. It is based on the 80-20 rule given by Pareto, which contends that in any process, 80% of problems are caused by 20% of a few major factors (called the Vital Few), while the remaining 20% of problems are caused by 80% of many minor factors (or the Trivial Many). Pareto diagrams are represented as vertical bar charts where individual factors are shown on the horizontal axis in the descending order of their impact and the cumulative is shown by a line graph. Pareto charts help display the causes of problems in order of relative importance to be able to concentrate on causes that will have the greatest impact when solved.
 - **Check sheet:** Check sheets or tally sheets act as a checklist during the collection of data. These help organise data and list the key checkpoints or events in a tabular/metrics form. Check sheets continue to update or mark the status on their incidence which enables to recognise the progress, detect patterns and underlying factors for defects.
 - **Histograms:** Histograms are a type of bar chart introduced by Karl Pearson, used to describe the central tendency, dispersion and shape of a statistical distribution. These help identify the factors that repeat at a higher frequency and need immediate attention.
 - **Control chart:** Control charts, originally developed by William A. Stewart, are used to determine if an industrial process is stable and within control, and able to meet the accepted specification limits. A control chart allows recording of data and detecting the occurrence of an unusual event, for example, a significantly high or low observation as compared to the usual process performance. Control charts are typically used to map and identify the duplication of activities or repetitive activities that are needed during producing batches. Also, these charts monitor cost, schedule variances and scope changes, etc., to establish whether the project management processes are in control or not. In control charts, time is in the X-axis against which the data is plotted. These have a central or mean line, an upper control limit line and a lower control limit line, determined from historical data. Comparison against these helps identify whether the process is stable (affected by common causes of variation) or unstable (affected by special causes of variation). These charts distinguish between two types of process variations. Common cause variations are inherent to the process and will be present at all times, while special cause variations appear from the external sources and suggest that the process is not within the statistical control.

There are various types of control charts designed for different situations of quality control. Although each of these charts has its own area of application, advantages and limitations, they have a few common characteristics. Some of the most commonly control charts are:

- **X and R charts:** These charts are used for variables.

- **P-charts:** These are control charts for fraction defective.
- **C-charts:** These are control charts for number of defects per unit.
- **Scatter diagrams:** Scatter diagrams plot the dependent variable on the Y-axis, against the corresponding independent variable on the X-axis as dots on their common intersection points. Connecting these dots helps recognise any existing correlation between the variables. The relationship between the variables may be directly proportional or positive correlation, inversely proportional or negative correlation, or no correlation. Scatter plots help establish a correlation between problems and causes.

Statistical Process Control

Statistical Process Control (SPC) is a quality control approach that applies statistical tools to monitor and control a process, detect issues in internal systems and find measures to correct the identified issues. SPC is used to identify a quality problem during the production process. It inspects a random sample of output from a process and determines whether the process is producing products with specified characteristics. This will enable the organisation to ascertain whether a process is functioning properly or not.

Developed by Walter Shewhart, the SPC concept was originally intended for the manufacturing industry, but, nowadays, it is extensively used for analysing, controlling and improving any repeatable process across industries. The SPC methods extend the use of descriptive statistics to monitor the product/process quality. SPC makes sure the process runs efficiently and produces a sufficient number of products that conform to specifications, and lowers wastage in terms of rework and scrap.

As you are well aware, there are normal or random causes of variation in every production process. The SPC is used to determine the amount of normal variation in a process. The process is then monitored to ensure that it stays within control.

The most common SPC tool is a control chart, also called a process chart or a quality control chart. A control chart is a graph of data plotted over time, which demonstrates whether a sample of data is within the normal range of variation or not. The normal range of variation is defined by control limits. When a plot of data demonstrates that one or more samples are outside the control limits, it means that the process is out of control.

SPC concentrates on constant improvement and enhanced design of processes. SPC should be performed in two stages – the first stage, which is the initial establishment of the process, and the second stage which is the regular use of the process in production. Data for SPC is captured in the way of measurements of dimensions, characteristics of the product, or process instrumentation readings. Various types of control charts or run charts are then used to record and track the data. The types of chart used depends on the type of data being collected. SPC focusses on the early detection and prevention of quality issues, instead of correcting them once they have occurred. Therefore, SPC helps minimise waste and also ensure minimum time to produce the product.



EXHIBIT

SIX SIGMA

In the early and mid-1980s, Motorola discovered that the traditional way of measuring quality in terms of defects in thousands of opportunities was not helping them realise the desired bottom-line results. Thus, its engineers devised a new methodology to measure defects per million opportunities. Motorola gave a name to this new methodology as Six Sigma. It developed an entire standard around Six Sigma. The resulting \$16 billion savings caused everyone—from GE to Allied Signal (now Honeywell)—to take notice. Other companies followed suit and the results delivered in the form of improved processes and fewer defects established Six Sigma as a hallmark quality management philosophy.

Six Sigma is a data-driven approach to quality management, which focusses on setting high-quality standards, collecting and evaluating information, and reducing defects in products and processes. According to the **UK Department for Trade and Industry**, *Six Sigma is a data-driven method for achieving near-perfect quality. Six Sigma analysis can focus on any element of production or service, and has a strong emphasis on statistical analysis in design, manufacturing and customer-oriented activities.*

Developed by Motorola Inc in 1986, Six Sigma is a quality-control approach to minimise errors or defects in a process using data-driven analysis. Six Sigma stresses on simultaneously improving cycle-time and limiting manufacturing errors/defects to no more than 3.4 occurrences per million events. Thus, Six Sigma can be described as a system that allows you to work faster with a lower number of mistakes. It promotes qualitative measurements of success. Any process generating less than 3.4 defects per 1 million chances is believed to be efficient. It is based on the mathematical fact that it would take a six-standard deviation occurrence from the mean for an error to arise.

Six Sigma has recently emerged as a more widespread business-management approach that concentrates on satisfying customer requirements, increasing customer retention and statistical improvements in products and services.

Six Sigma methodology differs from other quality control tools with respect to the following features:

- Focus on achieving quantifiable results
- Significant requirement of top leadership commitment
- Decision making is done on the basis of statistical and verifiable data

Six Sigma enables organisations to make their products and processes virtually defect-free or near-perfect. This enables them to deliver what their customers want right the first time itself.

Figure 3 illustrates the key benefits of Six Sigma:

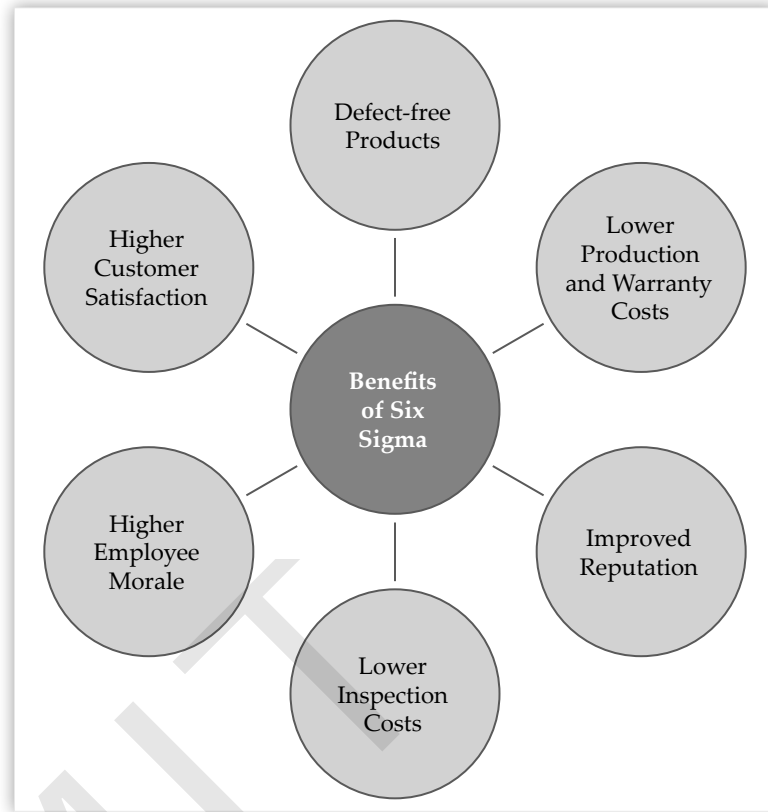


FIGURE 3: Benefits of Six Sigma



**SELF
ASSESSMENT
QUESTIONS**

3. The Seven Basic Tools of Quality (or the 7 QC Tools) for quality control were first pointed out by _____.
4. _____ display(s) the logical sequence of steps to be performed in a process.

3.3 QUALITY COSTS

Quality costs are defined as the costs related to the identification, prevention and resolution of issues associated with quality. Quality costs are not the costs of merely upgrading the value of a product perceived by consumers to a higher level. Rather, it involves producing and delivering a product that fulfils consumer expectations. For example, at times, a consumer may not spend a big amount on their purchase, and, therefore, do not expect a luxury experience. But they will still want the basic functions to perform well. In such a case, the quality will be properly functioning instead of a luxury experience.

Quality costs may occur anywhere in the production process such as product design issues originating in the engineering department as well as the purchase of inferior raw materials by procurement. Quality costs can form a major portion of the total costs incurred by an organisation, therefore, the elimination of quality issues does not only hugely improve profitability, but also customer retention.

To lower the production costs, manufacturing companies started paying attention to the **costs of quality**. This concept was proposed by **Juran** who divided costs of quality into prevention costs (for preventing poor quality), appraisal costs (for evaluating the quality of products or services), internal failure costs (for remediating product issues from internal failure) and external failure costs (for remediating product issues from external failure). Therefore, quality costs can be categorised into four groups as shown in Figure 4:

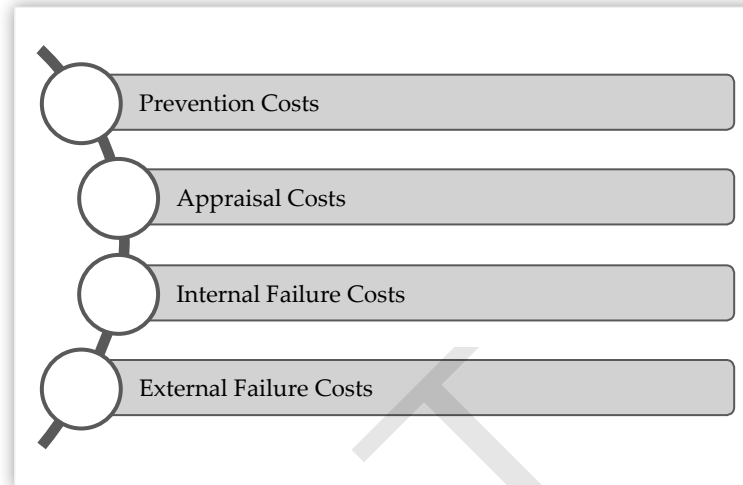


FIGURE 4: Types of Quality Costs

Let us study these types in detail.

- **Prevention costs:** Prevention costs are those costs that are incurred to prevent a quality problem from occurring. Amongst all quality costs, this is the least expensive. Therefore, it is hugely recommended. Prevention costs can include the following:
 - Proper employee training in assembling products
 - Statistical process control for identifying processes from where defective goods are arising
 - Good product design
 - Vendor certification

A focus on prevention allows a reduction in avoidable scrap costs because the scrap is not created in the first place.
- **Appraisal costs:** Appraisal costs are arising in the detection of defective inventory before it is shipped to customers. These costs are necessary as defective inventory needs to be prevented from being sold to consumers. It is cheaper to incur appraisal costs than to lose customers who become dissatisfied with being sold low-quality or faulty items. Losing customers include losing marketing costs incurred to attract the customer and all profits the seller would have gained if the customer would have stayed with them. The cheapest way to perform an appraisal is to have production workers examine both the inputs and the outputs to and from their workstations, which spots problems faster than other types of inspection.

Some appraisal cost examples are:

- Examination of delivered materials on receipt
 - Inspection of work-in-process materials
 - Testing of finished goods
 - Any materials used while conducting inspections
 - Destruction of goods on failing inspection
 - Supervision of the inspection team
 - Maintenance of test equipment and software
 - Depreciation costs of test equipment and software
- **Internal failure costs:** When a defective good is produced, it materialises in the form of scrapped or reworked goods. Scrapping or reworking of faulty goods is a part of internal failure costs. Some internal failure cost examples are:
- Activities for assessment of failure
 - Costs for reworking on goods
 - Costs of scrapped goods minus scrap sales
 - Loss in throughput
- **External failure costs:** External failure costs are incurred when a defective product, reaches the consumer. It includes not only the cost of the defective product but also far more extensive costs, such as the cost of product returns, warranty claims, field service and potential legal expenses if the consumer files a lawsuit. External failure costs also include the cost of loss of future sales, which is not easily unquantifiable. Some examples of external failure costs are:
- Product recall costs
 - Product return costs
 - Warranty claim costs
 - Legal expenses associated with lawsuits
 - Loss of unhappy consumers and future sales



NOTE

External failures result in substantial losses for a business. It is estimated that these can be between 10% and 30% of the sales turnover.



**SELF
ASSESSMENT
QUESTIONS**

5. _____ are the least expensive amongst all quality costs.
6. Costs for reworking on goods are an example of _____ costs.
7. Cost of product returns is an example of appraisal costs. (True/False)



ACTIVITY 1

Research on the Internet and find examples where external failures have resulted in substantial losses for market leaders.

3.4 QUESTIONNAIRE FOR SAMPLE INSPECTION



NOTE

Random sampling is an inspection method wherein products are chosen at random. This method is generally occurs at the manufacturing site before the products are to be transported. In random sampling, the quality of a batch is measured with a specified degree of statistical certainty without having to test every single unit. The organisation decides whether to accept or reject the entire lot based on the results that show how many of the predetermined number of samples pass or fail the testing. The main advantage of random sample is that a sample represents the target population and eliminates sampling bias.

According to ISO, an inspection is a process of measuring, examining or testing the features of a product or process and comparing the results with the given requirements to be able to verify whether each tested feature conforms to the requirements. Acceptance sampling is an approach to statistical quality control which is also known as 'Sampling Inspection Plan'. This technique is generally applied after products have been manufactured or are in the final phase of manufacturing. Therefore, it is an examination of the quality of the goods that have already been manufactured.

Whilst inspections are most commonly done on finished goods, they can also be conducted on raw materials, components or semi-finished goods. Quality inspections are generally conducted by specialised personnel and do not directly impact the manufacturing process. Because inspections are time-consuming, they are only done for a random sample.

A questionnaire for sample inspection is shown in Table 1:

TABLE 1: Questionnaire for Sample Inspection

1. Supplier Information		
1.1	Supplier name:	
1.2	Corporate address:	
1.3	Address of manufacturing premises:	
1.4	Types of manufacturing operations performed:	
2. General Information		
2.1	What types of materials do you package, manufacture or handle at the premises?	
2.2	Do you follow current Good Manufacturing Practices (cGMP) at the premises?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.3	Please list any additional quality accreditations (e.g., ISO 9001):	
3. Personnel		
3.1	Do you have written job descriptions for all personnel?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.2	Do you have a written training policy or procedure?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.3	Do you maintain training records for all staff?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.4	Do you have a system or process to readily identify the level of compliance with training requirements?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.5	Describe the training program:	
3.6	Please describe how the competency of staff is evaluated:	
4. Premises, Utilities and Equipment		
4.1	Were the premises designed for their present use?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.2	Are there separate areas for:	
	Receipt of bulk manufacturing components and materials?	<input type="checkbox"/> Yes <input type="checkbox"/> No

	Preparation and control of labelling materials?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Manufacturing?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Quarantined finished goods? (This may be controlled by an inventory system that does not require separation)	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Approved finished goods? (This may be controlled by an inventory system that doesn't require separation)	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Rest and eating?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
4.3	Do your areas for manufacturing, testing and storage have:		
	Written cleaning or house-keeping procedures?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Environmental controls and monitoring program (e.g., temperature, humidity, microbial)?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	A pest control program?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Security/access control measures?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
4.4	Is all equipment qualified?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
4.5	Do you monitor the conformance of all utilities to their quality standards?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
4.6	Is there a maintenance/preventative maintenance program for all equipment?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
4.7	Do you have written maintenance and calibration procedures for critical equipment?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
4.8	Is any manufacturing equipment software-controlled?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
5.	Bulk Manufacturing Components and Materials		
5.1	Are incoming bulk manufacturing materials inspected, sampled and tested according to written procedures?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
5.2	Do you routinely test incoming manufacturing materials to verify conformance with the supplier certification or quality claims?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
5.3	Do you have an established supplier qualification program?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
6.	Manufacturing Operation Practices		
6.1	Is each line identified with product identifier or code and batch number?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
6.2	Are there procedures describing:		
	The verification of the correctness of the manufacturing process at the start and throughout manufacturing operations?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Proper control to ensure correct manufacturing raw materials and components are used?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Proper control to ensure correct packaging components are used?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	Controls and processes to manufacture with quarantine materials?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No

6.3	Are there procedures for in-process control describing:		
	The point of sampling?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	The frequency of sampling?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	The number of samples taken?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	The specification(s) to be checked?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	The limit of acceptability for each specification?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
6.4	Please describe your process validation practices briefly:		
7.	Quality Control		
7.1	Is the Quality Control (QC) function independent of production?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.3	Are there written plans and procedures for sampling?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.4	Which sampling plans/systems do you use for:		
	Raw materials?		
	Finished goods?		
7.5	Do you retain a sample of each batch?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.6	Are there formal written procedures for all tests performed?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.7	Do you use validated analytical methods?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.8	Is there a written procedure to establish and manage analytical reference standards?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.9	Do you perform trend analysis on analytical results?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
7.10	Do you have a written procedure for documenting and investigating out-of-specification results?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
8.	Quality Assurance		
8.1	Is the Quality Assurance (QA) function independent of production?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
8.2	Who is responsible for evaluation and approval of:		
	Specifications for components, in-process and finished goods specifications?		
	Critical manufacturing process parameters?		
8.3	Are deviations and non-conformances investigated, assessed and filed?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
8.4	Do you conduct monitoring and periodic reviews of quality?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	If yes, what is the frequency?		
8.5	Does the QA function conduct internal audits?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No

8.6	Do you have a written complaint-handling procedure?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
8.7	Do you have a written product recall procedure?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
8.8	Do you have a written change control policy or procedure?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
	How do you evaluate quality risks before implementing changes?		
8.9	Do you supply a certificate of analysis with each batch?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No
8.10	Do you supply certification of conformance for each batch?	<input type="checkbox"/>	<input type="checkbox"/>
		Yes	No

Questionnaire Completed By:

Title:

Signature & Date:

Source: Adapted from: https://web.ornl.gov/adm/contracts/library/articles_forms/ITER-QAQC-Questionnaire-Supplier-ext-venx-apr10.pdf



**SELF
ASSESSMENT
QUESTIONS**

8. Inspections are most commonly done on raw materials. (True/False)
9. _____ sampling is an approach to statistical quality control which is also known as the sampling Inspection plan'.

3.5 QUALITY STANDARDS

Quality can be a challenging concept at first because what one perceives to be quality may not be qualified for another. Therefore, quality standards are required to regulate a standardised concept of quality in various sectors. Quality standards are documents that provide information about specifications, guidelines and features that materials, products, services and processes need to satisfy to ensure that their quality consistently meets expectations, they are fit for their function and they are able to fulfil the needs of end users. Quality standards are devised to ensure that organisations meet the minimum requirements of any industry. Standards are a key element of quality management systems. Standards allow organisations to fulfil stakeholder expectations because they provide the organisation with understanding of the stakeholder vision and bridge the communication gap between businesses and consumers.

Whilst quality standards are primarily concerned with safety and meeting stakeholder expectations, meeting quality standards enables businesses to obtain improved profits and contain losses. Businesses that surpass quality standards rise over their competitors and improve the possibilities for profit and retaining customers. The main objectives of quality standards are:

- Meet the quality expectations of customers
- Ensure that products, services and processes are safe
- Compliance with regulations
- Satisfy environmental goals

- Safeguard products and services against any unfavourable conditions
- Make sure that internal processes are defined and controlled

ISO has clearly defined standards to allow businesses to easily understand as to what their consumers consider quality and improve the overall vision of the business's objectives and apply them to the product or service they provide. ISO standards have been developed to cover almost all trade from manufactured goods, technology, food safety to agriculture and healthcare. International standards developed by ISO are the most widely-acknowledged set of quality standards globally. Following are the major international standards:

- **ISO 9000: Quality Certification:** A foundational step to develop a quality system in an organisation can be ISO 9000 certification. ISO 9000 is a set of international standards published by the International Standards Organization (ISO) on quality management and assurance. They can be applied to any organisation with the aim to maintain an efficient Quality Management System (QMS). They provide the following benefits to organisations:

- Customer satisfaction
- Regulatory compliance
- Continuous improvement

ISO 9000 was first released in 1987 by the ISO. Since then, the standards were significantly revised in 2000 and 2008. Today, the ISO 9000 family consists of four standards, which are explained as follows:

- **ISO 9001:2015: Quality management systems – Requirements:** This standard specifies requirements for QMS in the following conditions:
 - An organisation wants to prove that it is capable to consistently offer products and services that meet customers' requirements and conform to statutory and regulatory requirements.
 - An organisation wants to enhance customer satisfaction through the efficient application of a QMS, which includes processes for continuous improvement, meets customers' requirements and conforms to regulatory standards.

The requirements are generic and apply across industries.

- **ISO 9000:2015: Quality management systems – Fundamentals and vocabulary (definitions):** This standard provides the basic concepts, principles and definitions for quality management so that organisations can effectively and efficiently implement a QMS. This standard is applicable to any organisation that seeks to:
 - Achieve sustained success through the implementation of a QMS
 - Win confidence from customers on its ability to consistently offer quality products and services
 - Provide assurance to suppliers that product and service requirements will be met

- Improve communication through the use of common vocabulary or definitions in quality management
- Assess whether the organisation conforms to the ISO 9001 requirements
- Provide training, assessment, or consultancy in quality management
- Develop related standards
- **ISO 9004:2009: Quality management systems – Managing for the sustained success of organisation (continuous improvement):** This standard guides the management of an organisation to achieve sustained success in a complex and dynamic environment. The sustained success can be achieved by:
 - Proving the ability to satisfy customer’s needs over a long period and in a balanced manner
 - Raising awareness about the organisation’s environment
 - Managing risks and opportunities effectively
 - Learning from experience
 - Applying innovative methods
 - Continuous improvement
- **ISO 19011:2011: Guidelines for auditing management systems:** This standard guides organisations on auditing management systems by providing principles of:
 - Auditing
 - Managing an audit program
 - Conducting management system audits
 - Evaluating individuals involved in audits



NOTE

ISO 9001 has issued 1.1 million certificates across 178 countries and economies!

Together, the ISO 9001:2015 and ISO 9000:2015 standards are founded on seven quality management principles, which can be applied to any industry for organisational improvement.

Standards may either be specific, concerning only a particular type of product, or broad such as those for wide-ranging management procedures.

Using standards may be voluntary, although customers or stakeholders may often expect compliance. Moreover, regulatory bodies may mandate compliance to standards.



**SELF
ASSESSMENT
QUESTIONS**

10. _____ are documents that provide information about specifications, guidelines and features that must be satisfied to ensure the products’ quality and consistently meet the expectations.
11. Standards are always specific, concerning only a particular type of products. (True/False)

3.6 SUMMARY



Quality is vital to materials management as it is extremely important to ensure supply of proper quality materials for producing the right standard products. It prevents defects and scrap, lowers wastage, minimises external failures, minimises the need for inspection, helps manage toxic substances, reduce costs, reduce bottlenecks, provide competitive edge, consistency and conserve resources. Quality control is a set of procedures to ensure that products abide by to a pre-determined set of quality standards or meet the expectations of the customer.

The seven basic tools of quality are simple graphical and statistical tools that need only basic training in statistics to apply them to solve the complex quality-related issues. These are flow-charts, cause-and-effect diagrams, Pareto diagrams, check-sheets and histograms. Statistical Process Control (SPC) is a quality control approach that applies statistical tools to monitor and control a process, detect issues in internal systems and find measures to correct the identified issues. Six Sigma is a quality-control approach to minimise errors or defects in a process using a data-driven analysis.

Quality costs are defined as the costs related to the identification, prevention and the resolution of issues associated with quality. Quality costs can be categorised into four groups, prevention costs, appraisal costs, internal failure costs and external failure costs.

According to ISO, an inspection is a process of measuring, examining or testing the features of a product or process and comparing the results with given requirements to be able to verify whether each tested feature conforms to the requirements. Acceptance sampling is an examination of the quality of the goods that have already been manufactured. Quality standards are documents that provide information about specifications, guidelines and features that materials, products, services and processes need to satisfy to ensure that their quality consistently meets expectations, they are fit for their function and they are able to fulfil the needs of end users.

3.7 KEY WORDS



- **Environmental Management System (EMS):** A management system that an organisation uses to minimise its environmental impacts and enhance its operational efficiency
- **Management system:** A set of processes, practices, guidelines and procedures employed by an organisation so that it can achieve its goals and objectives
- **Run chart:** A graph that is used to display data collected over time to identify if the central tendency of a process is fluctuating
- **Scrap:** Waste materials whose monetary value is recoverable through recycling of its basic materials content

3.8 CASE STUDY: BEN & JERRY'S QUALITY CONTROL MANAGEMENT



Ben & Jerry's founded by Ben Cohen and Jerry Greenfield in 1978 is a well-loved ice-cream brand worldwide. The company is based in Vermont and is a fully owned subsidiary of Unilever. Ben & Jerry's makes a wide range of top-notch, premium and novelty ice creams. The company is dedicated to using only high-grade ingredients such as milk and cream from family farmers who do not use the synthetic hormones, cage-free eggs, and Greyston Bakery brownies from Yonkers, New York. Today, the company has over 500 employees and about 700 Ben & Jerry's Scoop Shops globally. Its manufacturing operations are located at facilities in Waterbury and St. Albans in Vermont and a few production lines at the Unilever plant in Henderson, Nevada. Phish Food, Cherry Garcia and Chunky Monkey are some popular flavours offered by Ben & Jerry's that are supplied in supermarkets, stores, Scoop Shops, restaurants. etc., in more than 35 countries. Ben & Jerry's is committed to maintaining the most rigorous standards of quality in its products to ensure its customers experience full flavour every time they relish its ice cream. The company's attention to detail is visible in every step of its supply chain. Its vendors and distributors to production operations must each conform to the company's three-part mission statement that stresses on quality, financial return and responsibility towards the community. Ben & Jerry's ensures quality procedures for the key performance indicators (KPIs) in its manufacturing operations that allow consistency and uniformity in quality for every pint of ice cream made.

For a long time, Ben & Jerry's had been using a paper-based system to track quantitative data, which was becoming tedious for both operators and data administrators. In the current system, operators would take individual readings and plot the average of those readings on a paper chart. Quality assurance staff then did manual calculations to determine trends and generate reports. This was a time-consuming and inflexible system. Moreover, it was expensive because of man-hours required for computation and analysis. Therefore, Ben & Jerry's needed a fast and dependable means to collect and assess important quality data of its premium and novelty ice cream products.

Ben & Jerry's chose to implement the InfinityQS ProFicient enterprise quality hub to modernise and restructure its quality control practices. ProFicient is driven by a Statistical Process Control (SPC) analysis engine to allow for data collection to be effortlessly automated. Its real-time monitoring and analysis utilities allow the quality department of the organisation to obtain 'Manufacturing Intelligence' by tracking irregularities across each production line.

The run capabilities of each line being different, Ben & Jerry's generated run charts within ProFicient based on Six Sigma data obtained on the plant floor to identify variations pertaining to each individual line. The four main product characteristics, weight, volume, air addition and amounts of add ons, are measured, monitored and controlled while the pints come off the production lines. This enables quality departments to work with the manufacturing team to respond in real time and make adjustments as products or processes approach specification limits. Quality teams are also able to compare data obtained from visual cut-ups (a process during production where a pint is cut into four equal parts to ensure the right quantities

of add-ons occur in each serving) against run capability data in ProFicient to determine the source of any variability in add-on distribution and volume as identified during the cut-ups. Ben & Jerry's soon saw the following benefits:

- Manufacturing intelligence detected the potential for improvement in run capabilities and raw materials use
- Lower variation in raw materials generated cost savings
- The power to tighten specification limits leads to even higher quality products
- Advance reporting abilities generated time savings and improved efficiency

Thus, with the implementation of ProFicient solution, Ben & Jerry's began using Manufacturing Intelligence to identify cases where run capability could be enhanced and raw materials usage could be optimised. The ability to adjust and refine processes with more accurate specification limits results in lower variation in raw material, higher cost savings, and a better-quality product for the consumer because high-quality ingredients are invariably more expensive. Moreover, with ProFicient's advanced reporting suite, Ben & Jerry's was able to save a considerable amount of time by doing away with manual calculations and slow report creation. With ProFicient, reports could run in seconds against the eight to 10 hours that quality assurance personnel spent earlier on calculating data. Paper usage was significantly reduced by operators and they could devote more time to enhancing manufacturing processes and efficiency.

Source: <https://www.infinityqs.com/resources/case-studies/ben-jerry-s>

QUESTIONS

1. Why was Ben & Jerry's looking for a fast and dependable means to collect and assess important quality data?

(Hint: Ben & Jerry's was using a paper-based system to track quantitative data, which was becoming tedious, time-consuming and expensive.)

2. What were the benefits Ben & Jerry's had with the implementation of ProFicient solution?

(Hint: Improvement in run capabilities and raw materials use, lower variation in raw materials, tighten specification limits, time saving and improved efficiency.)

3.9 SHORT ANSWER QUESTIONS



1. _____ are a type of bar chart used to describe the central tendency, dispersion and shape of a statistical distribution.
2. Inspections are time-consuming, and, therefore, only done on a random _____.
3. _____ variations appear from external sources and suggest that the process is not within statistical control.

4. ISO 14000 family of ISO standards is associated with _____ management systems.
5. _____ are defined as the costs related to the identification, prevention, and resolution of issues associated with quality.
6. International standards developed by _____ are the most widely acknowledged set of quality standards globally.
7. Histograms are represented as vertical bar charts where individual factors are shown on the horizontal axis in the descending order of their impact and the cumulative is shown by a line graph. (True/False)
8. Check-sheets help organise data and list the key checkpoints or events in a tabular/metrics form. (True/False)
9. SPC focusses on the early detection and prevention of quality issues, instead of correcting them once they have occurred. (True/False)
10. Scatter diagrams plot the dependent variable on the Y-axis against the independent variable on X-axis as dots on their common intersection points. (True/False)
11. The simple graphical and statistical tools used to solve complex quality-related issues are:
 - a. 5 QC Tools
 - b. 6 QC Tools
 - c. 7 QC Tools
 - d. 8 QC Tools
12. Cause-and-effect diagrams are also known as:
 - a. Fishbone diagrams
 - b. Scatter diagrams
 - c. Control charts
 - d. Flow charts
13. Which 7 QC tool is used to determine if an industrial process is stable and within control, and able to meet the accepted specification limits?
 - a. Scatter diagrams
 - b. Control charts
 - c. Flow charts
 - d. Histograms
14. Which of these is not an example of appraisal costs?
 - a. Inspection of work-in-process materials
 - b. Training of employees in assembling products
 - c. Any materials used while conducting inspections
 - d. Destruction of goods on failing inspection

15. Which of these is not an example of internal failure cost?
 - a. Activities for assessment of failure
 - b. Costs of scrapped goods minus scrap sales
 - c. Loss in throughput
 - d. Testing of finished goods
16. _____ are costs arising in the detection of defective inventory before it is shipped to customers.
 - a. Internal failure costs
 - b. External failure costs
 - c. Prevention costs
 - d. Appraisal costs
17. _____ costs are incurred when a defective product reaches the consumer.
 - a. Internal failure
 - b. External failure
 - c. Prevention
 - d. Appraisal
18. External failure costs do not include which of the following?
 - a. Warranty claims
 - b. Field service
 - c. Depreciation costs of test equipment
 - d. Potential legal expenses
19. Which of these is the main objective of quality standards?
 - a. Meet the quality expectations of customers
 - b. Ensure that products, services and processes are safe
 - c. Compliance with regulations
 - d. All of these
20. Which of the 7 QC tools is based on the 80-20 rule?
 - a. Control charts
 - b. Pareto diagrams
 - c. Flow charts
 - d. Histograms
21. _____ stresses on simultaneously improving cycle-time and limiting manufacturing errors/defects to no more than 3.4 occurrences per million events.
 - a. Statistical process control
 - b. Six Sigma

- c. Inspection
 - d. Prevention
22. _____ is the process of examining the features of a product or process and comparing the results with the given requirements to verify whether each tested feature conforms to the requirements.
- a. Testing
 - b. Inspection
 - c. Evaluation
 - d. Appraisal
23. Standards ensure that product/process:
- a. Involves meeting of quality consistently with expectations
 - b. Is fit for their function
 - c. Is able to fulfil the needs of end users
 - d. All of these
24. _____ family of ISO standards is associated for auditing management systems.
- a. ISO 14000
 - b. ISO 13485
 - c. ISO 19011
 - d. ISO/TS 16949
25. Preventing errors during production is a major step towards:
- a. Waste of resources
 - b. Higher upfront costs
 - c. Maximising external failures
 - d. None of these

3.10 HIGHER ORDER THINKING SKILLS (HOTS)



1. Which quality tool analyses the input to a process to identify the causes of errors?
 - a. Pareto diagram
 - b. Flow chart
 - c. Scatter chart
 - d. Fishbone diagram
2. The process of randomly inspecting a certain number of items from a lot to decide whether to accept or reject the lot is called:
 - a. Statistical process control
 - b. Descriptive statistics

- c. Quality assurance
 - d. Acceptance sampling
3. When is the statistical process control performed?
 - a. Before the production process
 - b. During the production process
 - c. After the production process
 - d. Before and after the production process
 4. Which quality management chart ranks defects in the order of frequency of occurrence and is based on the principle that 80% of defects are caused by 20% of causes?
 - a. Pareto diagram
 - b. Control chart
 - c. Histogram
 - d. Cause-and-effect diagram
 5. Who defines quality in an organisation?
 - a. Top management
 - b. Middle management
 - c. Employees
 - d. Customers

3.11 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Importance of Quality in Materials Management	1.	Quality
	2.	lower
Various Tools of Quality Control	3.	Kaoru Ishikawa
	4.	Flow-charts
Quality Costs	5.	Prevention costs
	6.	internal failure
Questionnaire for Sample Inspection	7.	False
	8.	False
Quality Standards	9.	Acceptance
	10.	Quality standards
	11.	False

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	Histograms
2.	sample
3.	Special cause
4.	environmental
5.	Quality costs
6.	ISO
7.	False
8.	True
9.	True
10.	True
11.	c. 7 QC Tools
12.	a. Fishbone diagrams
13.	b. Control charts
14.	b. Training of employees in assembling products
15.	d. Testing of finished goods
16.	d. Appraisal costs
17.	b. External failure
18.	c. Depreciation costs of test equipment
19.	d. All of these
20.	b. Pareto diagrams
21.	b. Six Sigma
22.	b. Inspection
23.	d. All of these
24.	c. ISO 19011
25.	d. None of these

C. | HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	a. Fishbone diagram
2.	d. Acceptance sampling
3.	b. During a production process
4.	a. Pareto diagram
5.	d. Customers

3.12 SUGGESTED BOOKS AND E-REFERENCES



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MIT

SUPPLIER QUALITY MANAGEMENT

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Describe the supplier quality management
- ▶ Discuss the role of the purchasing manager in managing supplier quality
- ▶ Explain Total Quality Management (TQM)
- ▶ Describe the TQM approach to managing supplier quality
- ▶ Discuss the Six Sigma approach to supplier quality



INTRODUCTION

Read

Pre-read Connect

In the previous chapter, you have learnt the importance of quality in materials management along with various tools of quality control. You have also studied the quality costs. Further, you have attained knowledge about quality standards and questionnaires for sample inspection.

Supplier quality management, according to Carr and Pearson (1999), is a set of activities performed by the management of an organisation to enhance organisational performance. Some of these activities are evaluating and tracking the cost of supplier quality using supplier scorecards to monitor their performance, perform audits and set up efficient two-way communication with suppliers with the goal of achieving customer satisfaction. Forker (1999) contends that the supplier quality has a powerful and direct impact on the operational performance of an organisation, in line with the common belief that the quality performance, i.e., the output of any business can only be as good as the input, i.e., quality performance of its suppliers. A number of studies have shown that management of supplier quality helps improve organisational performance throughout the supply chain by lowering operational expenses, shortening process cycles, enhancing quality performance and improving customer satisfaction.

Total Quality Management (TQM) is a methodology that aims to improve quality and performance, and enhance customer satisfaction. Black & Porter (1996) state that the core elements of a TQM strategy include support from top management, personnel management, process management, customer relationships, supplier relationships, quality data, product design, and benchmarking.

The Six-Sigma improvement approach has been increasingly adopted by several organisations in the last few decades. Six Sigma is the well-defined application of the tools and techniques of quality management employed on a project basis to realise planned business goals.

In this chapter, you will learn about the role of a purchasing manager in managing supplier quality. The chapter will also shed light on the TQM approach. Six Sigma approach will also be discussed at the end of the chapter.



NOTE

In the chapter, the terms 'vendor' and 'supplier' have been used interchangeably.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Elucidate the supplier quality management
- Justify the role of purchasing manager in managing supplier quality
- Write a short note on Total Quality Management (TQM)
- State the importance of the TQM approach in managing supplier quality
- Justify the significance of the Six Sigma approach to supplier quality

4.1 PURCHASING MANAGER'S ROLE IN MANAGING SUPPLIER QUALITY

Important Concept

In the words of **J.R.D. Tata**, *productivity and efficiency can be achieved only step by step with sustained hard work, relentless attention to details and insistence on the highest standards of quality and performance.*

Supplier quality is defined as a supplier's ability to deliver goods or services that will meet the expectations of the consumer. Supplier Quality Management is a collaborative approach that is used by an organisation to effectively manage supplier quality. Each and every organisation is concerned about receiving high-quality services and materials from the suppliers keeping in mind the pre-established requirements. Therefore, organisations use supplier quality management systems for monitoring supply chains, and auditing services and materials at periodic intervals. The implementation of supplier quality management enables businesses to lower down the materials costs, improve the quality of materials, minimise delays at the supplier's end, and minimise errors in quantities ordered and received. The purchasing function of any organisation can only be efficient in providing the best possible service to customers if the supplier's performance levels are optimum.

A purchasing manager leads a team in charge of procuring goods and services for resale or as required by their organisation. They are responsible for finding the best available quality at the lowest possible price. Purchasing managers are also responsible for conducting market research in order to identify price trends, forecast availability of materials, identifying new suppliers, assessing vendors, negotiating contracts, and evaluating product and supplier quality. They also head the preparation of requisitions and purchase orders, and the maintenance of purchase records. The role of a purchasing manager also depends on the type of industry they are working in. In a manufacturing environment, purchasing managers are responsible for the purchase of raw materials or components. In a wholesale or retail environment, they head the purchase of finished goods. A purchasing manager needs to possess good financial management skills, negotiation skills, communication skills and the ability for market research, marketing and decision making.

It is important for every purchasing manager to make sure that its suppliers deliver the best quality materials, goods or services to the organisation while conforming to pre-determined requirements. Supplier quality management enables purchasing managers to monitor supply chains and inspect/audit materials, goods and services at regular intervals. Supplier quality management begins at the initial stages of



STUDY HINT

There is a difference between a purchasing manager and a supply chain manager. A purchasing manager is responsible for inbound flow of materials while a supply chain manager is also concerned with the outbound flow.

designing a product and choosing the supplier for purchasing and procurement of materials. The process continues throughout the life cycle of the product. On the basis of the relationship with a particular supplier, sometimes the process goes on until the relationship stays between an organisation and the supplier. Supplier quality management involves using inputs, such as employee work, raw materials and customer requirements, and transforming them successfully into outputs that are considered valuable by the customer. Supplier quality management also includes the following:

- The costs of transactions, communication, resolution of issues and switching suppliers.
- The reliability of supplier delivery and the supplier's internal policies.

An effective supplier quality management process has the following advantages:

- Long-term and partnership-oriented arrangements with a smaller number of suppliers. This has the benefit of improving consistency in vital process inputs and reducing the need for constant monitoring of suppliers who have a good track record.
- A good supplier-buyer relationship is built on trust that is the key to sharing the expertise and resources.
- It lowers the risk of incomplete orders with defects and late deliveries.
- It helps gain support from the top management of both the parties. The basic criteria and strategies for selecting a supplier are:
 - Past experience and performance with the purchased material
 - Meeting regulatory requirements to maintain the relative level of sophistication in the quality system
 - Competence to satisfy existing and potential capacity needs within the desired delivery schedule
 - Accessibility to technical support for designing and optimising processes
 - Total cost of working with the supplier, such as material costs, communication modes and inventory needs
 - Supplier's past record for improving the performance of the organisation
 - Financial stability of the organisation
 - Accessing the total cost of production

To determine whether a potential supplier matches the selected criteria, the following tools and techniques can be used:

- Acquiring a publicly available financial report
- Asking for a formal quote
- Visiting the supplier's site
- Requesting a certificate of quality system registration
- Consulting the other customers of the supplier

- Reviewing databases for the product line and supplier
- Assessing the samples provided by the supplier through methods, such as lab testing

While it is not easy to implement and consistently enforce supplier quality, it is important for a purchasing manager to use supplier quality management to control overall costs, improve outcomes, and increase customer satisfaction and retention. The ten key ways that help a purchasing manager improve the supplier quality are illustrated in Figure 1:

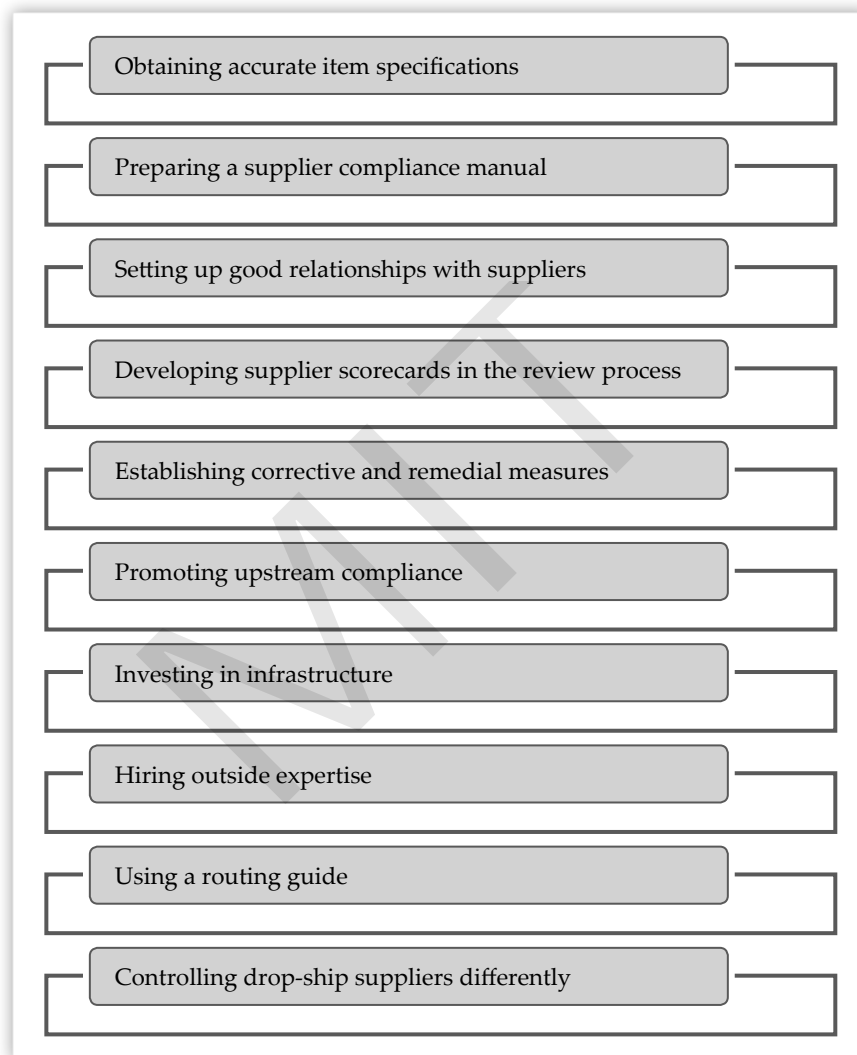


FIGURE 1: Ways to Improve a Supplier's Quality

These ways are explained as follows:

- **Obtaining accurate item specifications:** It is important to have a concrete document that accurately depicts the specifications of each item, such as correct measurements and colour. This step ensures that you will receive the correct item and is, thus, vital in ensuring customers' expectations will be met.

- **Preparing a supplier compliance manual:** Having a supplier compliance manual helps ensure that the items are delivered by the supplier in a proper condition and on the agreed schedule. A supplier compliance manual should also include packaging and shipping specifications, shipping instructions, labelling, invoicing, paperwork requirements, logistics specifications, statistical sampling requirements, etc. A supplier compliance manual also specifies how each step in the product fulfilment relationship will be managed.
- **Setting up good relationships with suppliers:** It is important to establish clear, two-way communication with all the suppliers, concentrating on the ones that provide the majority of items. It is important to establish a contact point to help in addressing any issues and doubts of the suppliers and vice versa. Mutual site visits are also helpful in creating an understanding between the two parties.
- **Developing supplier scorecards in the review process:** It is a good idea to use vendor scorecards to assess and evaluate their performance. A scorecard helps rank the vendors on the basis of their performance. Evaluation in a scorecard is done on the basis of performance standards which includes delivery on the agreed-upon schedule, product design, reasonability in pricing, and accuracy in packaging and paperwork. The manager decides the level of monitoring required and the criteria for examining sample product shipments from vendors on the basis of these rankings. The vendors at the top of the ranking list will need less scrutiny than the vendors at the end.
- **Establishing corrective and remedial measures:** The process and time for suppliers to make the necessary adjustments and corrections if the specifications are not fulfilled should be defined in advance. A penalty, in case the supplier fails to resolve the issues in the stipulated time, should also be agreed upon at the time of having a contract.
- **Promoting upstream compliance:** It is better to push the quality control program to the facilities of the supplier instead of pushing it to the organisation's warehouse. For example, it is better to see if you can be a part of inspections and approvals of items before they are shipped over to you. It is also in your best interest to have your suppliers complete as many value-added services as possible at their site, rather than you end up doing the same at your warehouse.
- **Investing in infrastructure:** Effective implementation of a supplier quality control program requires dedicated resources assigned to the program, such as information technology, computer systems, inspection equipment, personnel, and travel expenses. For this, support from top management is needed, not only to secure finances, but also to receive a continued commitment towards the objectives of supplier compliance.
- **Hiring outside expertise:** Hiring experts accustomed to supplier quality control programs is usually a good idea if you lack the required expertise within the organisation. Hiring industry experts in various areas, such as

developing a supplier compliance program, product sampling and quality testing will often benefit the organisation.

- **Using a routing guide:** Inbound freight costs are one of the biggest operational expenses for retail environments. Using a routing guide with a pre-determined list of carriers helps lower down costs.
- **Controlling drop-ship suppliers differently:** It is important to have some sort of control over suppliers who drop-ship to your customers to ensure that the product reaches the customer even though you do not physically handle the order yourself. Suppliers who drop-ship need to be managed and controlled using a different method. Drop-ship performance and order status can be tracked using software systems available for this purpose.

It is also important to measure supplier performance for continuous improvement. In any organisation, supplier performance will be measured differently across different functions. It is suggested to identify a list of supplier metrics and Key Performance Indicators (KPIs) that should be measured across the departments. Standardising the calculation and reporting of metrics create a consistent way for assessing suppliers and vastly improve the process of identifying areas for improvement.

Some examples of metrics that can be considered for supplier assessment are as follows:

- **Cost of quality:** This metric measures the cost of producing a quality product or service.
- **Products in compliance percentage:** This metric measures compliance as the percentage of products conforming to government and internal regulations.
- **Success of new product introduction:** This metric measures the percentage of new products that satisfy volume, quality and time targets.
- **Percentage of received defective products:** This metric measures the percentage of products that have defects in terms of volume, quality and time.
- **Percentage of returned products:** This metric measures the percentage of complaints, rejects or returns over a given period of time.
- **Complete and on-time delivery:** This metric measures the percentage of products delivered complete and on time without rescheduling or errors.
- **Overall equipment effectiveness:** Overall Equipment Effectiveness (OEE) measures productivity and efficiency in terms of availability, performance and quality.

Supplier quality audit is an important tool used by managers to measure the existing supplies and to map the potential opportunities for building strong relationships with the suppliers. Supplier quality audits are vital to ensure that the products delivered by suppliers satisfy predetermined quality specifications. While conducting audits, it is wise to classify suppliers by risk and prioritise audits

Important Concept

Drop shipping is a retail fulfillment model in which a retailer purchases products individually from a supplier and ship directly to the customer. Instead of purchasing a large number of products, the retailer goes into a partnership with drop shipping supplier and list their merchandise for sale.



NOTE

A Key Performance Indicator (KPI) refers to a measurable value that reflects how effectively an organisation/ individual is achieving key business objectives.

of high-risk suppliers. High-risk suppliers are responsible for providing materials or services that are vital to the availability and quality of your product or service.

Figure 2 depicts how an auditing process is conducted:

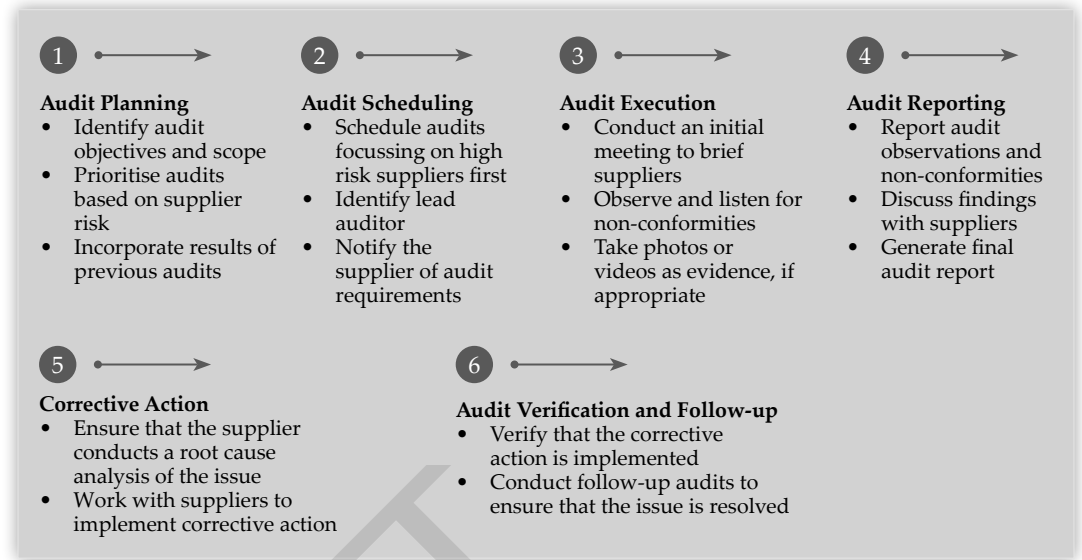


FIGURE 2: Process of Conducting a Supplier Quality Audit

Source: https://www.metricstream.com/insights/bestPractices_supqlymgmt.htm



SELF ASSESSMENT QUESTIONS

- _____ is defined as a supplier’s ability to deliver goods or services that will meet the expectations of the customer.
- A purchasing manager is responsible for both inbound and outbound flow of materials. (True/False)
- A publicly available financial report can help determine whether a potential supplier matches the selected criteria. (True/False)



ACTIVITY 1

Suppose you are working as the head of inventory department of the Kraft Heinz Company. Assess supplier performance by preparing a supplier scorecard.

4.2 TQM APPROACH TO MANAGE SUPPLIER QUALITY

Total Quality Management (TQM) is defined as a management system for long-standing success through customer satisfaction. The TQM approach involves all members of an organisation in the process of continual improvement in processes, products, services and the organisational culture. TQM applies various strategies to effectively incorporate quality discipline in organisational activities and culture.

There are 8 principles of TQM. These principles are displayed in Figure 3:

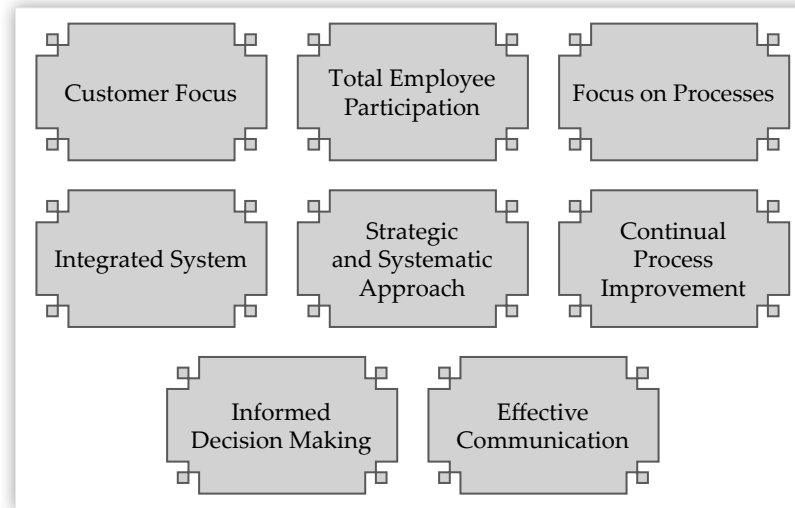


FIGURE 3: The Eight Principles of Total Quality Management



Quick TIP

Smaller processes add up to bigger processes, all of which combine into the business processes needed for establishing and implementing the strategy.

Important Concept

The Malcolm Baldrige National Quality Award (MBNQA) is an award established by the U.S. Congress in 1987 to raise awareness of quality management and recognize U.S. companies that have implemented successful quality management systems. The criteria for performance excellence are:

- Leadership
- Strategy
- Customers
- Measurement, analysis, and knowledge management
- Workforce
- Operations
- Results

- **Customer focus:** The level of quality is determined by the customer. It is the customer who ultimately decides whether the efforts of an organisation put into improving the quality of the offered product are worthwhile or not. Therefore, the primary focus of TQM is the customer.
- **Total employee participation:** It is important for all employees to get involved in the process of achieving common objectives. Improved workplace culture and empowerment through methods, such as self-managed work teams and support from top management are important for gaining total employee participation.
- **Focus on processes:** A core element of TQM is focussed on process thinking. A process here means a sequence of steps that uses inputs from suppliers and converts them into outputs that are delivered to customers. TQM involves establishing the steps needed to complete the process and monitoring the performance according to the pre-determined measures on a regular basis so as to detect unforeseen variations.
- **Integrated system:** The horizontal processes, interconnecting various functions of different vertically structured departments of the organisation, are the focus of TQM. It is important to constantly monitor and communicate business performance. Therefore, everyone in the organisation should be familiar with the vision, goals and principles along with the quality program, objectives, and policies of the organisation. An integrated system may be patterned on the Baldrige Award criteria and/or include the ISO 9000 standards.
- **Strategic and systematic approach:** A strategic and systematic approach is the key to achieving an organisation's vision, policies and goals. Strategic planning or strategic management involves developing a strategic plan that incorporates quality as an integral element.
- **Continual process improvement:** Continual process improvement is a major element of TQM. Continual process improvement pushes an organisation

**NOTE**

For the success of an audit, it is important that both the parties, i.e., the suppliers and the client, view them as a means to enhance the quality and strengthen the relationship. The client should view an audit as a chance to become familiar with the supplier and offer constructive criticism, while suppliers should think of audits as an opportunity to get a fresh outlook on their internal processes to help identify variances, uncertainties, etc.

to use both rational and innovative thinking for discovering ways to gain a competitive edge and meet stakeholder's expectations better.

- **Informed decision making:** Determining the performance of an organisation requires actual facts and data based on performance measures. In the TQM approach, an organisation collects and evaluates data on a regular basis so as to improve decision making, obtain consensus and make forecasts based on the collected data.
- **Effective communication:** TQM emphasises effective communication because of the role it plays in maintaining and boosting the morale of the employees. Communication involves policies, approaches and timeliness.

Deming's 14 Points on Total Quality Management, developed by Dr. W. Edwards Deming, form a core concept on implementing TQM. These are a set of management practices that enable an organisation to improve its quality and productivity. These points are discussed as follows:

- Develop 'constancy of purpose' for improving products and services as this ensures business survival and also helps a business remain competitive. This point emphasises a long-term focus on quality through innovation, research and constant improvement in product design.
- Adopt a new philosophy that supports developing a culture of quality with a commitment from every individual in the organisation through leadership and support from top management, proper training of personnel, supervision, etc.
- Organisations fall into the habit of depending on inspections to achieve improvement in quality, forgetting that they can easily miss defects. They are expensive and do not lead to actual enhancement in quality. All they do is identify defects but not prevent them.
- Do not award business to a supplier on the basis of price alone and be willing to pay for quality. Instead of using multiple suppliers, focus on working with a single supplier for a single input. Businesses should encourage long-term relationships with suppliers. This helps create incentives for the supplier in order to meet the needs of the organisation. It also resulted in more consistency.
- Analyse and improve the way of handling business processes on a regular basis.
- Establish training on the job so that your staff is trained to deliver their best and have better productivity.
- Use leadership skills to create an environment where employees are encouraged to reach their potential.
- Drives out fear as it closes lines of communication. Without fear, employees will be easily able to report issues, own up to their mistakes, and you will be able to focus on resolving the issues rather than punishing those who make mistakes.
- Break down barriers between departments so that they can communicate with each other freely and work as a team towards the common objectives of the business.

- Set up the personalised goals for individuals, which will have a greater impact rather than using slogans, catch-phrases and generalised targets for the workforce.
- Do not emphasise numerical quotas for the workforce and numerical goals for management as these can encourage people to take shortcuts that can affect quality. Numbers should be used to evaluate the process instead.
- Remove flaws in the system or processes that deprive people of pride of workmanship and let go of the annual rating or merit system.
- Set up a dynamic program of continued education that helps in personal growth and self-improvement for every employee.
- Push every employee to work towards improving the quality of their outputs by making a change in the processes.



**SELF
ASSESSMENT
QUESTIONS**

4. An integrated system may be patterned on the _____ criteria.
5. The level of quality is determined by the _____.
6. Use _____ skills to create an environment where employees are encouraged to reach their potential.

4.3 SIX SIGMA APPROACH TO SUPPLIER QUALITY

Six Sigma insists that one should study the issues associated with customer satisfaction first, though field data suggests that complaints or technical issues are traceable to the supplier. This overlooks the responsibility of the organisation in these faults. Some responsibility lies with the existing processes that allow faulty parts to be assembled, and some with designs that are not robust against deviation in supplied components. Therefore, one needs to have a wider perspective on quality problems considering all relevant facts when making the decision to involve suppliers in quality improvement.

Most supplier companies are too small to merit full Six Sigma programs. Depending on the situation of the process, organisations use the following approaches for involving suppliers in the use of Six Sigma:

- **Supplier uses Six Sigma on the demand of customers:** This approach is common in environments where there is an advanced use of quality tools, such as the automotive industry, where customer companies simply mandate that suppliers use Six Sigma. The factors influencing this approach are:
 - The amount of influence and control exerted by the customer company.
 - The use of Six Sigma as a standard tool across the industry.
 - The main drawback of this approach is that consumers demand suppliers to use Six Sigma mandatorily, but they don't encourage them to realise the real potential of Six Sigma. The supplier may just end up treating Six Sigma as a certification system instead of a quality management system.

- **Conduct projects on the supplier's processes:** The approach of involving suppliers is to conduct projects on the supplier's processes. In this approach, the customer company attempts to solve a problem that lies inside the scope of the supplier. This approach has the advantage that it does not require training of the supplier's workforce. Moreover, it brings transparency to the supplier's processes. The only prerequisite for this approach to work is that the supplier needs to provide access, information and independence to the customer company to become involved in its processes. The limitation of this approach is that the supplier is not able to resolve similar issues in the future because they do not start their own Six Sigma programs and do not develop skills and knowledge.
- **Involve suppliers in training:** Sometimes, customer companies offer their suppliers the opportunity to participate in their Six Sigma training sessions.
- **Assist supplier in establishing Six Sigma:** This is the most proactive approach to supplier Six Sigma where the customer company assists in setting up the program for major suppliers. This consists of holding Six Sigma awareness sessions for their own procurement team, choosing suppliers based on business importance and willingness for Six Sigma, holding awareness sessions for supplier senior executives, etc.

The comparison among these four approaches can be understood with the help of Table 1:

TABLE 1: Comparison of Different Approaches to Supplier Involvement in Six Sigma

Basis of Comparison	Supplier's Use Six Sigma on the Demand of Customers	Conduct Projects on the Supplier's Processes	Involve Suppliers in Training	Assist Suppliers in Establishing Six Sigma
Likely Longevity at Supplier Organisation	Low	Low	Medium	High
Time to Results	Depends on supplier response	Depends on the experience	First results after 6 months	First results after 9 months
Speaking the Same 'Improvement Language'	No	Only for those involved in the projects	Training participants	Yes
Transparency of Supplier	Low	High	Medium	High
Impact on Quality and Cost	Depends	Medium	Low to Medium	High
Supplier Company Investment	High	Low	Low to Medium	High

Basis of Comparison	Supplier's Use Six Sigma on the Demand of Customers	Conduct Projects on the Supplier's Processes	Involve Suppliers in Training	Assist Suppliers in Establishing Six Sigma
Customer Company Investment	Low	Medium	Low	Medium

Source: <https://www.isixsigma.com/new-to-six-sigma/getting-started/how-company-can-involve-its-suppliers-six-sigma/>

The decision of using a particular Six Sigma approach is based on maintaining the right balance of investment and projected benefits.



SELF ASSESSMENT QUESTIONS

7. Sometimes, customer companies offer their suppliers the opportunity to participate in their Six Sigma training sessions. (True/False)
8. Most supplier companies are too small to merit full _____ programs.
9. In Six Sigma, some responsibility lies with the existing processes that allow faulty parts to be assembled, and some with designs that are not robust against deviation in supplied components. (True/False)



ACTIVITY 2

Search on the Internet for market leaders who have successfully implemented Six Sigma initiative into their organisations and find out how they have integrated their suppliers into the initiative. Discuss the same with your friends.

4.4 SUMMARY



Supplier quality is defined as a supplier's ability to deliver goods or services that will meet the expectations of the customer. Supplier Quality Management is the collaborative approach that is used by an organisation to effectively manage supplier quality with the goal of achieving customer satisfaction. A purchase manager leads a team in charge of procuring goods and services for resale or as required by their organisation. An effective supplier quality management process has the advantage of having long-term partnerships with a smaller number of suppliers, good supplier-buyer relationship that is built on trust, lower risk of incomplete, defective or late orders. The ten key ways that help a purchase manager improve the supplier quality are obtaining accurate item specifications, preparing a supplier compliance manual, setting up good relationships with suppliers, developing supplier scorecards, establishing correction and remedy measures, promoting upstream compliance, investing in infrastructure, hiring outside expertise, using a routing guide and controlling drop-ship suppliers differently. Supplier quality audits are vital to ensure that the products delivered by the suppliers satisfy predetermined quality specifications.

The TQM approach involves all members of an organisation in the process of continual improvement in processes, products, services and the organisational culture. TQM applies various strategies to effectively incorporate quality discipline in organisational activities and culture. The 8 principles of TQM are customer focus, total employee participation, focus on processes, integrated system, strategic and systematic approach, continual process improvement, informed decision making, and effective communication. Deming's 14 Points, developed by Dr. W. Edwards Deming, form a core concept on implementing TQM and are a set of management practices that help improve quality and productivity.

Six Sigma insists that one should study the issues associated with customer satisfaction first, though field data suggests that complaints or technical issues are traceable to the supplier. Depending on the situation of the process, organisations use various approaches for involving suppliers in the use of Six Sigma such as supplier uses Six Sigma on the demand of customers, conduct projects on the supplier's processes and so on.

4.5 KEY WORDS



- **Drop-ship:** A supply chain method in which the retailer offers goods for sale, but does not hold goods with themselves; instead he transfers the order to manufacturers, other retailers, etc., for fulfilment, shipment and delivery of the same directly to consumers
- **Key Performance Indicators:** Quantifiable values that indicate the success of an organisation towards achieving its key business goals
- **Routing guide:** A set of established routing instructions and guidelines followed while shipping products or materials to a particular location

4.6 CASE STUDY: SQM SUCCESS AT CEQUENT



Cequent Transportation Accessories, based in Plymouth, Michigan, produces a wide range of accessories for vehicles, such as SUVs, recreational vehicles and trailers. Cequent found that rejected Parts Per Million (PPM) of its overseas supplier were quite high and, as such, unacceptable. Not only did these fall short of Cequent standards, they also failed to meet their domestic supplier's expectations. As the importer of record, Cequent had the responsibility to safeguard against the risk of faulty parts that are entering into the market. To lower down the risks and ensure quality from its Chinese suppliers, Cequent deployed IQS, Inc.'s global infrastructure, to put into action a domestic quality and compliance program in China. The quality management system software, deployed by IQS, provides a practical insight into performance, cost of quality and metrics associated with risks, along with real-time visibility on supplier quality and customer satisfaction.

Overseas businesses can lack quality management and quality processes; therefore, it would not be as simple as Cequent just dictating a labour-end-state inspection to its Chinese suppliers. Traditional and culture barriers need to first be removed by presenting a step-by-step process all the way down to part characteristics. Apart from this, it is an importer's responsibility to offer monitoring and in-process

tests throughout the process to ensure that all aspects of the manufacturing process satisfy quality standards. Advanced Product Quality Planning (APQP) is a rigorous quality managing and monitoring process which has Failure Mode and Effect Analysis (FMEA) as a risk profile and control plan. Cequent's quality management software, IQS, Inc. provided a framework for FMEAs and the related control and inspection plans, as well as assimilate them with themselves and with the rest of the quality management system.

Before Cequent introduced a supplier quality management system with its Chinese suppliers, it confirmed that it can manufacture a unit in its U.S. labs. Consequently, it put suitable risk profiles, work instructions, control and inspection plans in place, and set up the supplier as an entity in its IQS global infrastructure. The quality framework in IQS equipped the supplier with a sequential, detailed process for proper quality execution, at the same time providing Cequent full visibility into the supplier's real-time inspection and compliance data, along with the power to make the required characteristic-level documentation changes. The last phase in this exercise was Cequent devising a plan, whereby quality experts would be able to spend time at the supplier's plant helping them learn and utilise the inspection process which enhanced the speed of adoption by the supplier. Data flow and communication also saw an overall improvement due to breaking down of cultural barriers.

With the successful implementation of the supplier quality management system, Cequent was able to use a quality program to its first Chinese supplier within 24 hours. Cequent obtained the quality assurance that the parts sent by the supplier have achieved the required quality specifications before being sent over, thus minimising warranty costs or recall issues in the future. Therefore, 97.5% of the products were passed through plants without needing any rework.

Cequent could apply the quality management system to its overseas suppliers to set performance expectations, monitor supplier performance, build supplier scorecards, apply a dock-to-stock program and have up-to-date data on non-conformances. This helped establish a robust quality management process for suppliers that could be easily implemented across Cequent's entire global supply chain.

The results of Cequent's supplier quality management in numbers are as follows:

- Within two years, Cequent saw:
 - Supplier container shipments increased from 1/month to 8/month
 - Supplier spend doubled because of enhanced supplier quality
- Within three years, Cequent saw:
 - Overall rejected supplier PPM came down to a monthly average below 300 from earlier 33,555
 - Internal rejected PPM came down to 172 from 1,102
 - Supplier non-conformance came down to 30 from 176

Source: <https://cerasis.com/supplier-quality-management-system/>

QUESTIONS

1. What is the prime responsibility of Cequent?
(**Hint:** To safeguard against the risk of faulty parts)
2. What is the result of successful implementation of a quality management system?
(**Hint:** Cequent was able to use a quality program to its first Chinese supplier within 24 hours.)

4.7 SHORT ANSWER QUESTIONS



1. Having a supplier _____ manual helps ensure that the items are delivered by the supplier in proper condition and on the agreed schedule.
2. A supplier _____ helps rank suppliers on the basis of their performance.
3. Using a _____ with a pre-determined list of carriers helps lower inbound freight costs.
4. A _____ process is expected to be free of errors 99.99966 per cent of the time, allowing no more than 3.4 defective features per million events.
5. _____ insists that one should study the issues associated with customer satisfaction first, though field data suggests that complaints or technical issues are traceable to the supplier.
6. The supplier may just end up treating Six Sigma as a _____ instead of a quality management system.
7. A penalty, in case the supplier fails to resolve the issues in the stipulated time, should also be agreed upon at the time of having a contract. (True/False)
8. Deming emphasises the use of slogans, catch-phrases and generalised targets for the workforce to improve productivity and efficiency. (True/False)
9. Deming states that it is a bad idea to emphasise numerical quotas for the workforce as these can encourage people to take shortcuts that can affect quality. (True/False)
10. Likely longevity at supplier organisation is high for the approach where the customer conducts projects on the supplier's processes. (True/False)
11. The implementation of supplier quality management enables businesses to _____.
 - a. Lower down the materials' costs
 - b. Improve quality of materials
 - c. Minimise delays at the supplier's end
 - d. All of these

12. Which of these is not a process in supplier quality management?
 - a. Monitoring the cost of supplier quality
 - b. Creating customer scorecards
 - c. Performing audits
 - d. Establishing efficient communication with the supplier
13. Which of the following is not the responsibility of the purchasing manager?
 - a. Market research to identify price trends
 - b. Identifying new suppliers
 - c. Logistics
 - d. Negotiating contracts
14. When does the supplier quality management take place?
 - a. The initial stages of designing a product
 - b. At the time of choosing the supplier for purchasing and procurement of materials
 - c. Throughout the product life cycle
 - d. All of these
15. Impact on quality and cost is _____ at the supplier organisation for the approach where the suppliers are assisted in establishing Six Sigma.
 - a. High
 - b. Medium
 - c. Low to medium
 - d. Depends
16. Which of the following is incorrect regarding an effective supplier quality management process?
 - a. It helps build short-term arrangements with a large number of suppliers.
 - b. It lowers the risk of incomplete orders with defects and late deliveries.
 - c. It helps gain support from top management of both parties.
 - d. A good supplier-buyer relationship is built on trust which is the key to sharing the expertise and resources.
17. Which of these is a common criterion for supplier selection?
 - a. Past experience and performance with the purchased material
 - b. Competence to satisfy the existing and potential capacity needs within the desired delivery schedule
 - c. Supplier's past record for improving the performance of the organisation
 - d. All of these

18. Which of the following supplier metrics measures compliance as the percentage of products conforming to government and internal regulations?
 - a. Products in compliance percentage
 - b. Percentage of received defective products
 - c. Percentage of returned products
 - d. Overall equipment effectiveness
19. Which of the following supplier metrics measures productivity and efficiency in terms of equipment availability, performance and quality?
 - a. Products in compliance percentage
 - b. Percentage of defective products received
 - c. Overall equipment effectiveness
 - d. Percentage of returned products
20. Which of the following is not true regarding supplier quality audits?
 - a. Most suppliers are sceptical of quality audits.
 - b. It is wise to classify suppliers by risk.
 - c. It is better to prioritise audits of low-risk suppliers.
 - d. It is good to incorporate the results of previous audits.
21. Which principle of TQM involves developing a strategic plan that incorporates quality as an integral element?
 - a. Customer focus
 - b. Focus on processes
 - c. Strategic and systematic approach
 - d. Continual process improvement
22. The TQM principle of _____ pushes an organisation to use both rational and innovative thinking to constantly discover ways to gain a competitive edge and meet stakeholder expectations better.
 - a. Customer focus
 - b. Continual process improvement
 - c. Informed decision making
 - d. Effective communication
23. Which of the following is an incorrect point in Deming's 14 Points on Total Quality Management?
 - a. Develop 'constancy of purpose'.
 - b. Adopt a new philosophy that supports developing a culture of quality.
 - c. Always depend on inspections to achieve improvement in quality
 - d. Drive out fear as it closes lines of communication.

24. The limitation of which approach is that the supplier is not able to resolve similar issues in the future because they do not start their own Six Sigma programs and do not develop skills and knowledge?
 - a. Supplier uses Six Sigma on the demand of customers
 - b. Conduct projects on the supplier's processes
 - c. Involve suppliers in training
 - d. Assist supplier in establishing Six Sigma
25. Which of the following is the most proactive approach to supplier in Six Sigma?
 - a. Customer demands the supplier use Six Sigma
 - b. Customer conducts projects on the supplier's processes
 - c. Customer involves the supplier in training
 - d. Customer assists the supplier in establishing Six Sigma

4.8 HIGHER ORDER THINKING SKILLS (HOTS)



1. A manufacturing unit wants to maintain a long-term relationship with suppliers and also wants to deliver quality products to its customers. Which of the following would be the first step to be considered by the firm?
 - a. Supplier quality management in the initial stage of designing a product
 - b. Performing supplier quality audit
 - c. Negotiating with the vendors
 - d. None of these
2. Which of the following criteria is to be opted by an organisation for examining sample product shipments from the vendors?
 - a. Scorecards
 - b. Supplier quality audit
 - c. Six Sigma
 - d. Any of these
3. Which of the following are the principles of Six Sigma?
 - a. 'Smaller is better' allows an upper specification limit, for example, maintaining a target of zero for defects or rejected parts.
 - b. 'Larger is better' allows a lower specification limit, for example, test scores where the target is 100 percent.
 - c. 'Nominal is best' considers the middle ground, for example, a customer service representative might resolve an issue by spending enough time on the phone, but if he spends too much time, then he might lose productivity.
 - d. All of these

4. Which Six Sigma methodology is used for improving the existing processes?
 - a. DMADV
 - b. DMAIC
 - c. DFSS
 - d. DIDO

4.9 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Purchase Manager's Role in Managing Supplier Quality	1.	Supplier quality
	2.	False
	3.	True
TQM Approach to Manage Supplier Quality	4.	Baldrige Award
	5.	customer
	6.	leadership
Six Sigma Approach to Supplier Quality	7.	True
	8.	Six Sigma
	9.	True

B. SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	compliance
2.	scorecard
3.	routing guide
4.	Six Sigma
5.	Six Sigma
6.	Certification system
7.	True
8.	False
9.	True
10.	False
11.	d. All of these
12.	b. Creating customer scorecards
13.	c. Logistics

Q. No.	Answer
14.	d. All of these
15.	a. High
16.	a. It helps build short-term arrangements with a large number of suppliers.
17.	d. All of these
18.	a. Products in compliance percentage
19.	c. Overall equipment effectiveness
20.	c. It is better to prioritise audits of low-risk suppliers.
21.	c. Strategic and systematic approach
22.	b. Continual process improvement
23.	c. Always depend on inspections to achieve improvement in quality
24.	b. Conduct projects on the supplier's processes
25.	d. Customer assists supplier in establishing Six Sigma

C. | HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	a. Supplier quality management in the initial stage of designing a product
2.	a. Scorecards
3.	d. All of these
4.	b. DMAIC

4.10 SUGGESTED BOOKS AND E-REFERENCES



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MIT

SUPPLIER DEVELOPMENT

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5.11 Suggested Books and e-References



CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Discuss the concept of supplier performance measurement
- ▶ Explain how to create a manageable supply base
- ▶ Discuss the concept of supplier development as a strategy for improvement
- ▶ Discuss how to overcome the barriers to supplier development



INTRODUCTION

Read

Pre-read Connect

In the previous chapter, you have studied about supplier quality management. You gained an insight into the role of the purchase manager in managing supplier quality. TQM and Six Sigma approach to manage supplier quality have been discussed as well. Supplier quality management plays a pivotal role in the long-run success of an organisation.

It is important for organisations to promote collaborative relationships with their suppliers and facilitate supplier development through the use of performance measurement systems, rationalisation of the supply base and supplier development. Supplier performance measurement may be defined as the process of reviewing the supplier's processes and practice performance. It is the process of measuring, evaluating and managing supplier performance to help reduce costs, minimise risks and push towards constant improvement.

Supplier performance management helps determine the possible issues or threats and their causes to help address them at the earliest. Beamon (1999) stresses on the establishment of the supplier performance measurement systems to monitor various suppliers and assess the health of the buyer-supplier relationship. Since the quality offered by a business is dependent on prices, quality, and timely delivery provided by their suppliers, the efficient management of supplier performance and its improvement are essential. Measurement and comparison of supplier performance enable organisations to eliminate suppliers that fail to meet performance requirements. Supplier selection is a critical process that can negatively impact a business if executed badly. It is important for organisations to categorise their supply bases in terms of their competencies and requirements. Supplier selection criteria must, therefore, be clearly defined keeping in mind the quality expectations of customers, program objectives and organisational policies.

In this chapter, you will study the concept of supplier performance measurement and how to create a manageable supply base. Using supplier development as a strategy for improvement is an important concept which will also be provided in the chapter. At last, overcoming barriers to supplier development will be discussed.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the role of supplier performance in materials management
- Outline technical aspects of supplier performance measures
- Examine the benefits of manageable supply base
- Appreciate how supplier development leads to foster cordial relationship between the buyer organisation and suppliers

5.1 SUPPLIER PERFORMANCE MEASUREMENT

Important Concept

More and more companies are reaching out to their suppliers and contractors to work jointly on issues of sustainability, environmental responsibility, ethics, and compliance.
~ Simon Mainwaring

Supplier performance measurement is a systematic process of reviewing the supplier's processes and practices with an aim to determine whether suppliers are performing their work as expected. Performance is generally measured on the basis of expectations from suppliers defined in the supply contract, statement of work and service-level agreement. For measuring supplier performance, buyer organisations can choose between various metrics developed based on quality expectations of customers, program objectives and organisational policies. These supplier performance metrics should be specific, quantifiable and realistic. Figure 1 shows some of these common metrics:

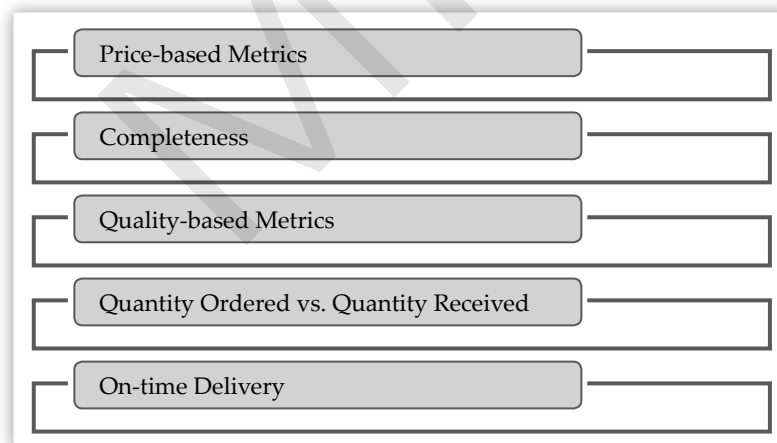


FIGURE 1: Common Metrics for Supplier Performance Measurement

Let us discuss these common metrics in detail.

- **Price-based metrics:** The supplier meeting the price requirements of a buyer organisation is one of the primary aspects of ensuring value. A buyer organisation generally prefers to select those suppliers that provide large quantities at lower prices at the same time fulfilling the quality commitment.
- **Completeness:** Supplier performance can be evaluated by reviewing whether the ordered service has been completed within the expected duration and

Important Concept

Supplier performance measures need to be SMART:

- Specific
- Measurable
- Achievable
- Realistic
- Time-based

with the expected outcome. This metric measures the supplier’s ability to fulfil the order as expected. It is calculated by mapping the time of order fulfilment as promised and shows the level at which a supplier is able to serve the buyer within the scheduled delivery time.

- **Quality-based metrics:** Quality, at the most basic level, is measured to determine whether the supplier has provided goods or services as per the specifications defined in the service level agreement. These specifications involve basic indicators, such as defects per part or rejected parts per order. A degree of sophistication can be added to this measurement by including various value-adding activities that the buyer would like to promote.
- **Quantity ordered vs. quantity received:** This metric is used to match the quantity ordered by the buyer organisation and the quantity received by the buyer organisation. This measurement is commonly carried out over a given period of time. For example, if the purchase order quantity in the current month is 1,00,000 units, and the quantity received is 99,900 units, the supplier performance is 99.99%.
- **On-time delivery:** Measuring the on-time performance of inbound deliveries can help track the performance of suppliers. While organisations may have different criteria to classify delivery as on time, in general, the metric measures the percentage of deliveries received at the promised arrival time. In addition, on-time delivery protects the buyer organisation against storage cost, warehousing cost, etc. Also, the buyer organisation will be able to make on-time delivery to end users, which lead to consumer satisfaction and repeat business for the organisation.



EXHIBIT

AN EXAMPLE OF SUPPLIER PERFORMANCE MEASUREMENT

Measurement Area	Goods	Services
Timeliness	On time delivery of goods or other information	Response time at or within a specified time period
Completeness	Delivery in full	Service completed within the expected duration/ with the expected outcome
Quality	Low defect rate or unplanned failure	Low re-work, errors or complaints rate
Productivity	Yield, output, process efficiency	Utilisation, process efficiency, learning curve
Regulatory Compliance	Working within legal standards, health and safety protocols or organisational guidelines	
Social Responsibility	Sustainability, diversity or community initiatives	
Innovation	Continuous improvement resulting in improved outcomes	

Source: <http://www.adr-international.com/insights/what-are-supplier-performance-measures>

**NOTE**

It is a good idea to invest in some sort of dedicated supplier management software to keep track of the performance of suppliers easily.

However, having standardised metrics for supplier performance across similar suppliers/categories or across a project has both benefits and demerits.

The benefits of standardised supplier performance metrics are as follows:

- It results in competition between suppliers and inculcates good practices.
- It enables evaluation of cost, performance against supplier price and external benchmarks.
- Standardised measures enable ease of reporting performance.

However, some suppliers may have specific development goals depending on their capabilities; thus, standardised measures may not be appropriate for them.

**EXHIBIT****HOW SUPPLIER PERFORMANCE MEASURES ARE CREATED**

Business Need	Example of Supplier Performance Measure	Example of SMART Metric
Enhanced Quality	Product reliability improvement	5% reduction in customer warranty claims within 12 months
Improved Service	Customer experience improvement	10% higher satisfaction rating from external customers or users
Decreased Cost	Specification change resulting in lower operating cost	5% price reduction in every contract year resulting from approved vendor-initiated reengineering activities

Source: <http://www.adr-international.com/insights/what-are-supplier-performance-measures>

**SELF
ASSESSMENT
QUESTIONS**

1. _____ is a systematic process of reviewing the supplier's processes and practices with an aim to determine whether suppliers are performing their work as expected.
2. For measuring supplier performance, buyer organisations can choose between various metrics developed based on quality expectations of customers, program objectives and organisational policies. (True/False)
3. Supplier performance can be evaluated by reviewing whether the ordered service has been completed within the expected duration and with the _____.

5.2 CREATING A MANAGEABLE SUPPLY BASE

A supply base is the actively managed part of a supply network of a buying organisation. In simple terms, supply base refers to the number of suppliers that exist in the system of a buyer organisation. Managing a supply base is a process wherein a buyer organisation makes a pool of suppliers after scrutiny and decides which suppliers to be dealt with in short term, which needs to be kept as second choice, which needs to be groomed for the future, and so on, based on information and coordination among them.

Managing a supply base begins with rationalisation, which is a strategic initiative to not only eliminate or reduce inactive or limited-use suppliers, but also build healthy long-term partnerships with a manageable number of capable and reliable suppliers. A buyer organisation can use various techniques to manage a supply base. Some of these techniques are shown in Figure 2:

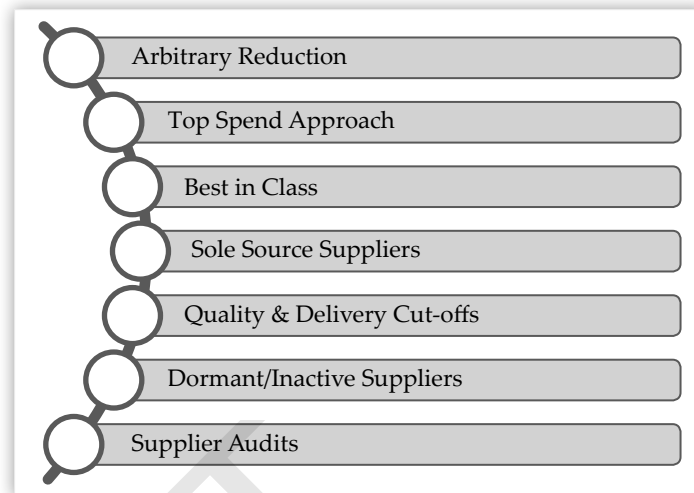


FIGURE 2: Approaches to Supply Base Optimisation

Let us now discuss these approaches in detail.

- **Arbitrary reduction:** In this approach, businesses cut down the number of suppliers to an arbitrary number as instructed by the top management of the buyer organisation. This is the quickest way to reduce the supplier base to a more manageable number. However, it comes with the disadvantage of eliminating good suppliers along with the inefficient ones.
- **Top spend approach:** For most businesses, 20% of the suppliers account for 80% of their spend dollars as these suppliers have a past record of reliability or ease of doing business. Some organisations can factor this in when trying to reduce the supplier base and eliminate the 80% suppliers who get the smaller share of their business. This approach comes with the drawback that some really capable suppliers might get eliminated just because they were receiving a smaller share of the business while suppliers may not necessarily be the best performers in more than one category even if they receive the bigger share of the business.
- **Best in class:** Some suppliers tower over others in one or more categories of items purchased by the buyer, such as machined parts, electronic components, cables, etc. Therefore, these suppliers are the obvious choice for buyer organisations to retain in the supply base. Even though a supplier is best in class in one category, they may do business with the buyer across two or more categories. In such cases, the buyer may keep these suppliers as a prime source in one category and back up source in other categories.
- **Sole source suppliers:** Some suppliers have unique expertise to produce highly critical items that other suppliers do not. These suppliers are, therefore, critical to business survival and need to be retained in the supply base. But

organisations should always endeavour to develop one or more back-up sources so as to eliminate or reduce dependence on sole sources because they are often prone to the inherent risk of price escalation in the absence of competition. Moreover, supply lines may be disrupted in case of damage at the supplier location due to unprecedented events, such as natural hazards, strikes and civil unrest.

- **Quality and delivery cut-offs:** Despite being simple and straightforward, this approach is highly effective. In this approach, specific upper limits for acceptable quality levels and on-time delivery are determined and conveyed to suppliers. Those suppliers that fall short of these criteria in the given period of time are then left out of the supplier base.
- **Dormant/inactive suppliers:** In this approach, the buyer organisation identifies and drops those suppliers that have not received a single purchase order from a long time, but somehow remain in the supplier base. The integrity of the supplier base is maintained by clearing it of dormant or duplicate suppliers and replacing them with active and reliable suppliers.
- **Supplier audits:** Supplier audits are a common method to gather accurate data about suppliers and their facilities. They can be conducted either onsite or offsite. Once a supplier audit has been performed using either of the two methods, information is recorded and used to compare different suppliers and pick the ones that perform better. Multiple audits conducted over duration on a single supplier can help track quality and improvement and make informed decisions on whether to retain them in the supplier base.

5.2.1 | SUPPLY BASE RATIONALISATION PROCESS

The supply base rationalisation process has four phases as shown in Figure 3:

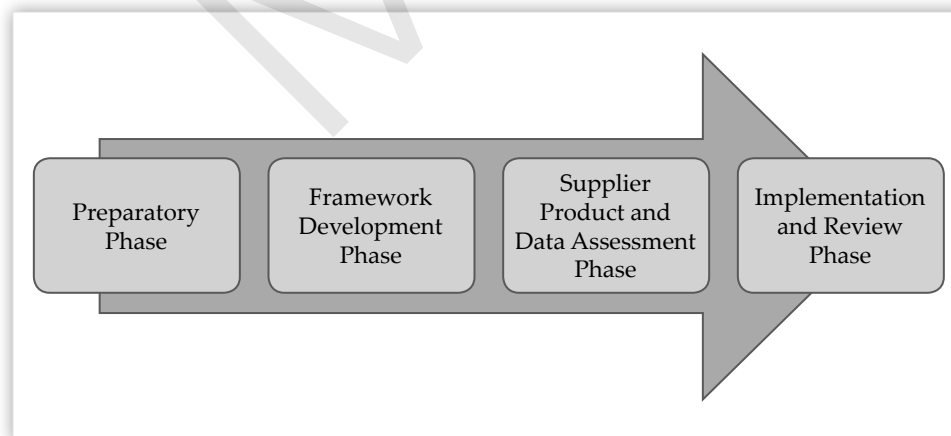


FIGURE 3: Phases in the Supply Base Rationalisation Process

Let us discuss these four phases in detail.

1. **Preparatory phase:** This is the first phase of the supply base rationalisation process. It involves the following steps:
 - i. Establishing a cross-functional team with the objective of collecting inputs and cooperation from the relevant stakeholders. It comprises

 **Quick TIP**

When reducing the supply base to a fewer number of suppliers, it is important for organisations to retain suppliers on the supply base who have the capacity and ability to handle larger volumes and satisfy the quality and lead-time requirements.

experts from technical, sourcing, purchasing and supplier relationship management teams.

- ii. Conducting spend analysis through a detailed analysis of historical data related to purchases, materials and suppliers.
- iii. Determining which supplier base reduction approach suits circumstances. This also involves product standardisation which aims to reduce needless variety in products.

The main barrier to this phase is the view of top management that reduces the number of suppliers to lower down competition among a company's suppliers instead of increasing it.

2. **Framework development phase:** This stage involves the following steps:

- i. Identifying supplier elimination criteria, such as prior purchases from a supplier over a given period, number of products allotted to a supplier, percentage of defects, number of returns, etc.
- ii. Identifying supplier selection criteria such as supplier performance, quality records, price, on-time delivery, compliance record, production facilities, etc.

3. **Supplier product and data assessment phase:** This is the third stage which involves the following steps:

- i. Identifying common suppliers across business units for further analysis
- ii. Performing a detailed supply risk assessment on the supplier's products to identify suppliers who are able to generate value and eliminate non-critical suppliers
- iii. Identifying and comparing contracts of suppliers of critical and essential products.

4. **Implementation and review phase:** The fourth phase involves the following steps:

- i. Consolidating suppliers for specific categories and service areas and executing supplier optimisation.
- ii. Reviewing the results and effectiveness of supply base rationalisation
- iii. Performing the review and re-evaluation of the supply base rationalisation process on a regular basis

However, there are various challenges in the rationalisation of supplier base as described below:

- Most organisations are constantly undergoing change and this makes the seemingly easy task of maintaining a manageable number of suppliers a little difficult. Major upheavals in the organisation, seismic shifts, acquisitions, mergers, and new product introductions, etc., create confusion in the on-going supply rationalisation efforts.
- Suppliers with borderline or lacklustre performance pose constant challenges to the supply chain.



NOTE

It is important for procurement to obtain inputs and ensure that other departments participate in the implementation and review phase of the rationalisation of the supply base.

- Decentralised procurement, internal politics and lack of communication between various departments are barriers to the consensus and cooperation needed to rationalise a supply base.
- Looking at too many suppliers all at once can overwhelm the management and may cause the organisation to give up on the process.



SELF ASSESSMENT QUESTIONS

4. The aim of _____ process is to create a manageable, risk-free and improved supply base, and build long-term healthy relationships with competent suppliers.
5. The supply base rationalisation process comprises _____ main phases.
6. It is not important for procurement to obtain inputs and ensure that other departments participate for the implementation and review phase. (True/False)



ACTIVITY 1

Research on the Internet and find out where disruptions at the sole source supplier's location have hurt the buyer company badly.

5.3 SUPPLIER DEVELOPMENT – A STRATEGY FOR IMPROVEMENT

Supplier development, according to Chartered Institute of Procurement & Supply (CIPS), is the practice of working with specific suppliers on a one-on-one basis to enhance their performance for the benefit of the buying company. It is strongly linked to supplier relationship management and partnering. Supplier development provides the buyer company with the advantage of better overall costs in the long-term as well as a trusted business partner. Following are some other objectives of supplier development:

- To achieve better supplier performance
- To achieve low costs
- To sort out quality issues
- To create new supply routes
- To improve business relationships between suppliers and the buyer company
- To develop a product or service not currently available in the marketplace
- To introduce competition for a high-priced product or service currently dominating the marketplace

Different organisations carry out supplier development for different reasons. Some common reasons are to improve total added value from the supplier in terms of product or service offering, business processes, deliveries and lead time. While the reasons for supplier development may vary, the process is usually a resource-intensive exercise and may involve a number of resources, such as a steering team

and a number of action teams, each having action plans for their assigned projects and formal reporting procedures against a time span. Supplier development activities may include supplier evaluation and feedback, supplier training, the sharing and transfer of employees from one firm to another, and other related activities (Wagner 2006).

The change management principles, clarity in vision, innovation and commitment from top management of both the organisations are pre-conditions for supplier development. According to CIPS, a pre-condition necessary for supplier development is that the buyer organisation must analyse, review and appreciate its objectives, strategy and business requirements. Apart from that, supplier development requires purchasing skills, contract management skills, project management skills along with good communication skills on part of a buyer organisation.

Selecting Suppliers for Development

The selection of suppliers is of utmost importance for supplier development in order to maintain congenial relationships between both the parties. Prioritisation of suppliers is essential because the process of supplier development is resource-intensive and, therefore, should only cover selected suppliers. CIPS contends that the selection of suppliers for development should be dependent on:

- Scale of value/improvement opportunity
- Cost, complexity and duration of value attainment
- Supplier co-operation

Prioritisation of suppliers that are well-suited for development can be done by:

- Identifying suppliers who supply critical and strategic products, goods and services, and ways to improve them, such as re-sourcing or re-tendering
- Measuring a supplier's performance against pre-determined criteria and determining the scope for development
- Identifying suppliers where real business benefits can be derived

Either the purchasing department or the quality department may be responsible for carrying out supplier development, depending on organisational structure. But, in each of the cases, it is important to have some development program in place, and acceptance from the suitable team members and managers should be taken for the process to be successful.

CIPS lists eight benefits that the implementation and execution of a well-designed supplier development program has, which ultimately result in overall improvement in supplier relationships. These are:

- Complete transparency between buying organisation and supplier
- Better collaboration between the two parties
- Efficient and reduced sourcing activities and lead times
- Enhanced quality, manufacturability and reliability for new designs

 **Quick TIP**

Long-lasting relationships with suppliers based on trust are critical to the success of any business. For this, it is important not to treat suppliers as vendors useful only for financial transactions, but as trusted partners.

- Improved supplier responsiveness
- Improved understanding of supplier diversity
- Increased customer satisfaction
- Greater visibility of the entire supply base to procurement, quality, and management departments



**SELF
ASSESSMENT
QUESTIONS**

7. Supplier development is strongly linked to supplier relationship management and partnering. (True/False)
8. Prioritisation of suppliers is essential because the process of supplier development is _____ and, therefore, should only cover selected suppliers.

5.4 OVERCOMING BARRIERS TO SUPPLIER DEVELOPMENT

It is very rare that suppliers commit resources to an individual buyer. Suppliers are usually concerned that their intellectual property may be exploited and their cost models will be left unprotected, leaving the supplier unprotected in any negotiations in the future. Most suppliers do not trust buyers which can become a major obstacle in the fulfilment of supplier development programs. Table 1 shows barriers to the supplier development process:

TABLE 1: Barriers to the Supplier Development Process

Supplier Side (Lascelles et al., 1990)	Supplier Side (Handfield et al., 2000)	Supplier-Buyer Interface (Handfield et al., 2000)
Communication and Feedback	Lack of Commitment	Trust
Supplier Complacency	Lack of Technical/Human Resources	Alignment of Organisational Cultures
Misguided Supplier Improvement Objectives		Ineffective Communication
Credibility of the Customer		
Misconceptions Regarding Purchasing Power		

Source: <https://pdfs.semanticscholar.org/3595/08141bde570d94410ed23a4a1ed60a3d54e2.pdf>

Some other barriers to the supplier development process are:

- Absence of acceptance for the process which normally requires significant involvement and co-operation from both the parties
- Lack of business expertise and technical expertise for the process
- Failure of the supplier to appreciate the business potential

Buyer organisations can overcome these barriers using a three-pronged approach as shown in Figure 4:

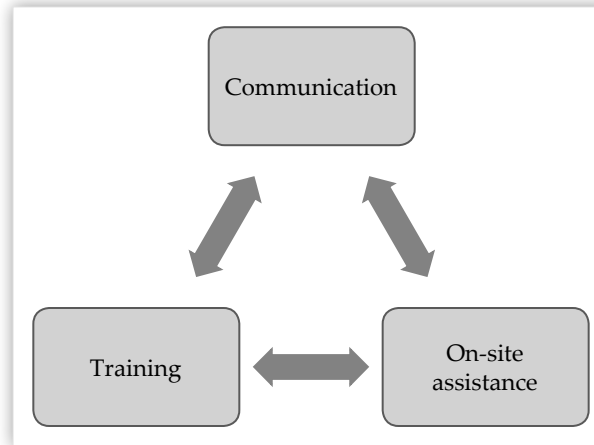


FIGURE 4: Three-pronged Approach to Overcome Barriers to Supply Development

Let us now discuss these in detail.



NOTE

The buyer organisation's relative strength will determine how easily the supplier will be convinced when the communication approach is used.

- **Communication:** Communicating the desire for change is a way through which buyer organisations can convince suppliers to participate in the change. It is better to do so through tailored communication to drive change. It is unlikely that generic emails will convince suppliers to invest in new technologies or push them towards any remarkable change. Customised communication sets clearer expectations including specific milestones and measurable deliverables to make them easier to follow. As trust is a key factor in driving supplier change, it is important that the channel of communication should be two-way. Buyer organisations need to communicate with suppliers by way of a program, sharing information and offering visibility into their product pipeline.
- **Training:** Training can be imparted in two modes namely online virtual learning and classroom-based learning. Online training sessions and webinars enable buyer organisations to communicate new standards or systems to suppliers. Such online sessions require significantly less buyer and supplier resources, but the impact of such sessions can be debatable. On the other hand, classroom-based learning is more direct and enables smooth communication between the buyer and the supplier, and helps in creating a development plan for the supplier. At times, buyer organisations hire third parties for providing training to their suppliers. These third parties have expertise and dedicated technology in imparting training.
- **On-site assistance:** Often, buyer organisations can provide on-site support to the suppliers selected for development. On-site support can help realise a new capability, for example, implementation of a new technology or a new management practice, much faster. It can also provide faster time-to-market compared to sourcing from a new supplier. On-site assistance allows a supplier to considerably decrease management consultancy costs, and they can pass these savings to the buyer organisation in turn. On-site personnel are also able to make sure that all developments are closely aligned to requirements, policies and standards of the buyer organisation.



**SELF
ASSESSMENT
QUESTIONS**

9. Trust is a key factor in driving supplier change; therefore, it is important that the channel of communication is _____-way.
10. _____-based learning is more direct and enables smooth communication between the buyer and the supplier, and helps in creating a development plan for the supplier.

5.5 SUMMARY



Supplier performance measurement is the review of the supplier's processes and practices. Common metrics for supplier performance measurement are price-based metrics, completeness, quality-based, quantity ordered vs. quantity received, on-time delivery, etc. Each measurement area is shaped by business needs, specific project requirements, stakeholder requirements and the needs of the organisation. Supplier performance measures should be specific, quantifiable and realistic.

There are three main categories of suppliers an organisation can work with, which are wholesalers and distributors, manufacturers and vendors and import sources. Supplier base rationalisation is the process where good suppliers are replaced by those that are better or the best to create a manageable, risk-free and improved supply base and build long-term healthy relationships with competent suppliers. Common approaches to supply base optimisation are arbitrary reduction, top spend approach, best in class, sole source suppliers, quality and delivery cut-offs, dormant/inactive suppliers, supplier audits, etc.

Supplier development involves the development of a new capability or competency in suppliers. The main reasons in support of supplier development are better supplier performance, lowering costs, sorting out serious quality issues, creating new supply routes, improving the supplier-buyer relationship, developing a currently unavailable product or service, introducing competition for a high-price product or service, etc. The barriers to supplier development are the unwillingness of suppliers to commit resources to an individual buyer, supplier's concern for their intellectual property and cost models, lack of trust, lack of acceptance, lack of expertise, failure of the supplier to appreciate the business potential, etc. Buyer organisations can overcome these barriers using a three-pronged approach comprising communication, training and on-site assistance.

5.6 KEY WORDS



- **Chartered Institute of Procurement & Supply (CIPS):** A global, non-profit organisation that promotes fair practices in purchasing and supply professions.
- **Social responsibility:** An ethical framework that suggests that every organisation has an obligation to act for the benefit of society at large
- **Statement of work:** A document providing detailed description of a project's work requirement, project-specific activities, deliverables and schedules to a supplier

- **Supplier relationship management:** A process of managing and working together with suppliers that an organisation purchases goods, materials and services from

5.7 CASE STUDY: COCA-COLA SUPPLIER DEVELOPMENT PROGRAM



Coca-Cola, Africa set up a robust supplier development program to promote supplier diversity. The aim of the program was to develop abilities and capacity of diverse suppliers to increase their competitiveness, and sustain growth in these communities. The program concentrated on training and development in order to enhance the efficiency of diverse suppliers so that they were able to satisfy the requirements of Coca-Cola and create conditions where they could strive for business opportunities and contracts in the global marketplace competitively.

The selected suppliers were certified diverse suppliers that offered supply chain solutions, had a good track record and delivered quality products and services at competitive pricing. The requirements Coca-Cola wanted from suppliers to take part in the program were:

- A robust business plan
- Financial solvency
- Positioning for growth

Coca-Cola reviewed the existing business practices, market strategy and financial position and developed an Individual Development Plan (IDP) for each supplier. The IDP outlined goals, reviewed product or services offered, and generated program action items, schedules, and recorded milestones and achievements. Extensive resource support including executive training, instructors for operational efficiency, and counselling by industry leaders was provided by Coca-Cola to identify and focus on areas for development.

Coca-Cola required from the suppliers that they take ownership of the development process and pledge the time and resources needed. Transparency and access to the development team was also a must so that Coca-Cola can analyse the business of the supplier and generate a plan for the next performance level.

The Supplier Development Program also focussed on increasing the capacity of the diverse suppliers to fulfill the requirements of the Coca-Cola and to foster an environment where they could pursue contracts competitively.

According to Coca-Cola Beverages South Africa (CCBSA) managing director, Velaphi Ratshefola, they spent ₹ 2.35 billion on the program in one year, encouraged the development of 567 black-owned suppliers, including 265 black female-owned suppliers. Thus, the whole program was clearly working towards helping to create an inclusive and growing economy. Moreover, it led to the creation of a stable environment where businesses can thrive. In the absence of a stable environment, businesses fail to thrive due to regular disturbances and disruptions. In all, Coca-Cola's initiative is not only important for social reasons, but also for business survival and success.

The efforts of the supplier development program resulted in reduced costs, lower risks, and improved operational efficiency. The program helped Coca-Cola leverage standard business processes and tools, reduce wastage in supply chain, increase predictability, and bring overall value to the company. The program also emphasised local sourcing and sustainable principles, which resulted in improved quality of drinks. It also promoted outsourcing of logistics activities and partnering with local suppliers. With the implementation of the supplier development program, Coca-Cola delivered growth each year, in the face of social unrest and tough macro environments in certain markets. The program looks forward in the future to strong innovation, optimisation of procurement, production and logistics activities, and greater appreciation of sustainability issues in collaboration with suppliers.

QUESTIONS

1. What requirements did Coca-Cola want from suppliers to take part in the program?
(Hint: A robust business plan, financial solvency and positioning for growth.)
2. How did Coca-Cola benefit from the supplier development program?
(Hint: Reduced costs, lower risks, and improved operational efficiency.)

5.8 SHORT ANSWER QUESTIONS



1. Buyer organisations can overcome barriers in supplier development by using a three-pronged approach comprising communication, training and _____.
2. _____ is the practice of working with specific suppliers on a one-on-one basis to enhance their performance for the benefit of the buying company.
3. _____ phase involves performing a detailed supply risk assessment on the supplier's products to identify suppliers who are able to generate value and eliminate non-critical suppliers.
4. In _____ approach, specific upper limits for acceptable quality levels and on-time delivery are determined and conveyed to suppliers.
5. Measuring the on-time performance of _____ deliveries can help track the performance of suppliers.
6. _____ suppliers have the unique expertise to produce highly critical items that other suppliers do not.
7. Consolidating suppliers for specific categories and service areas, and executing the supplier optimisation is done in the framework development phase. (True/False)
8. Multiple audits conducted over a time period on a single supplier can help track quality and improvement and make informed decisions on them. (True/False)

9. The top spend approach comes with the drawback that some really capable suppliers might get eliminated just because they were receiving a smaller share of the business. (True/False)
10. It is easy to sum up percentage figures, especially when varying volumes and goods values are involved. (True/False)
11. If the supplier quotes the price of \$100 in the first year and \$110 in the next, the recording change would be _____.
 - a. -1%
 - b. +1%
 - c. +10%
 - d. -10%
12. Say, a buyer can negotiate the price down to \$95 from the initial quoted price of \$100 per unit, and there are 1,000 units, it is a saving of:
 - a. \$500
 - b. \$950
 - c. \$1,000
 - d. \$5,000
13. If the ordered service has been completed within the expected duration and with the expected outcome, it is considered under which performance metric?
 - a. Price-based
 - b. Cost-based
 - c. Order completeness
 - d. Quantity ordered vs. quantity received
14. _____ metric measures whether the supplier has provided goods or services as per the specifications in terms of basic indicators, such as rejected parts per order.
 - a. Price-based
 - b. Cost-based
 - c. Quality-based
 - d. Quantity ordered vs. quantity received
15. If the purchase order quantity in the current month is 1,00,000 units, and the quantity received is 99,000 units, the supplier performance is:
 - a. 99%
 - b. 99.99%
 - c. 90%
 - d. 100%

16. If the inbound deliveries in the current month is 14, and the inbound deliveries checked in at security within 5 minutes of the promised arrival time in the current month is 12, then the supplier on-time delivery performance is:
- 85%
 - 85.7%
 - 90%
 - 99%
17. Which of the following is a metric for supplier performance measurement?
- Returns rate
 - Order fill rate
 - Lead-time variance
 - All of these
18. Which of the following is not a SMART supplier performance measure?
- Specific
 - Measurable
 - Achievable
 - Tentative
19. Which of the following is not a benefit of standardised supplier performance measures?
- Comparison between suppliers, foster ambition and cross-breeding of good practices
 - Provide specific development goals depending on individual supplier capabilities
 - Suppliers may perceive standardisation as just
 - Standardised measures enable ease of reporting
20. Supply base rationalisation does not involve which of the following?
- Good suppliers are replaced by those that are better or the best.
 - A manageable, risk-free and improved supply base is developed.
 - Long-term healthy relationships with competent suppliers are built.
 - Inactive or limited-use suppliers are given multiple chances.
21. _____ is the quickest way to reduce the supplier base to a more manageable number.
- Arbitrary reduction
 - Top spend approach
 - Best in class
 - Sole source suppliers

22. The second phase of the supply base rationalisation process is:
 - a. Preparatory phase
 - b. Implementation and review phase
 - c. Supplier product and data assessment phase
 - d. Framework development phase
23. Establishing a cross-functional team with the objective of collecting inputs and cooperation from the relevant stakeholders is a part of:
 - a. Preparatory phase
 - b. Framework development phase
 - c. Supplier product and data assessment phase
 - d. Implementation and review phase
24. One of the reasons for _____ is introducing competition for a high-price product or service currently dominating the marketplace.
 - a. Supply base rationalisation
 - b. Supplier development
 - c. Supplier performance measurement
 - d. None of these
25. The reasons for development can be:
 - a. Changes in staffing levels
 - b. Review and re-launch of a whole variety of critical products
 - c. The buyer organisation's desire to align with the supplier in a strategic partnership
 - d. All of these

5.9 HIGHER ORDER THINKING SKILLS (HOTS)



1. Which of the following is an example of a quality issue?
 - a. Delivery of monthly supply is late
 - b. Acceptable quality levels are not met
 - c. Cut-offs in delivery
 - d. All of these
2. 2% increase in customer satisfaction ratings is an example of:
 - a. Product reliability improvement
 - b. Specification change resulting in lower operating cost
 - c. Customer experience improvement
 - d. None of these

3. In order to facilitate supplier development, which of the following would be the first step taken by any firm?
 - a. Supplier training
 - b. Supplier evaluation and feedback
 - c. Transfer of employees from one firm to another
 - d. None of these
4. In order to assess the supplier cost performance, which of the following metrics measures the supplier's ability to fulfil the order as expected?
 - a. Completeness
 - b. Quality-based metrics
 - c. Price-based metrics
 - d. Cost-based metrics

5.10 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Supplier Performance Measurement	1.	Supplier performance measurement
	2.	True
	3.	expected outcome
Creating a Manageable Supply Base	4.	supplier base rationalisation
	5.	four
	6.	False
Supplier Development – A Strategy for Improvement	7.	True
	8.	resource-intensive
Overcoming Barriers to Supplier Development	9.	two
	10.	Classroom

B. SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	on-site assistance
2.	Supplier development
3.	Supplier product and data assessment
4.	quality & delivery cut-off
5.	inbound
6.	sole source suppliers
7.	False

Q. No.	Answer
8.	True
9.	True
10.	False
11.	c. +10%
12.	d. \$5,000
13.	c. Order completeness
14.	c. Quality-based
15.	a. 99%
16.	b. 85.7%
17.	d. All of these
18.	d. Tentative
19.	b. Providing specific development goals depending on individual supplier capabilities
20.	d. Inactive or limited-use suppliers are given multiple chances.
21.	a. Arbitrary reduction
22.	d. Framework development phase
23.	a. Preparatory phase
24.	b. Supplier development
25.	d. All of these

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	d. All of these
2.	c. Customer experience improvement
3.	b. Supplier evaluation and feedback
4.	a. Completeness

5.11 SUGGESTED BOOKS AND E-REFERENCES



SUGGESTED BOOKS

- Emmett, S., Crocker, B. (2009). *Excellence in Supplier Management: How to Better Manage Contracts with Suppliers and Add Value: Best Practices in Supplier Relationship Management and Supplier Development*. Cambridge: Cambridge Academic, the Studio
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PURCHASE MANAGEMENT

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- » Discuss the concepts, evolution, objectives, functions and the importance of purchase management
- » Explain the methods of purchases
- » Discuss centralised and decentralised purchasing
- » Discuss the concept of make-buy-lease decision
- » Elucidate the steps involved in the purchasing cycle



INTRODUCTION

Read Pre-read Connect

In the previous chapter, you studied the concept of supplier development. The chapter also gave an insight into the supplier performance measurement and manageable supply base creation. At last, the chapter discussed the supplier development concept as a strategy for improvement and how to overcome the barriers to supplier development.

Purchase management has evolved over the years and is considered as a critical activity in many organisations. Earlier, the process of purchasing involved a mere process of buying materials from a supplier after placing an order. But, today, it has expanded and has become a significant activity with a much broader scope of identifying suppliers, verifying their creditability and ensuring the delivery of quality products in the right quantity at the right price, and on time. Globalisation has prompted organisations to improve on their internal purchasing processes ranging from the supply management to selecting the vendors. The level of competition in the marketplace has increased and it has also brought the international markets under the scope of supply chain management along with the domestic markets. The process of purchasing has moved on from being a transactional activity to a strategy-oriented activity. Nowadays, organisations look forward to reduced costs to produce higher-value products. Purchase management is considered to be an important function for the organisation as the quality of end product relies on correct purchasing of input materials. Purchase management involves the systematic flow of materials and ensures smooth operations. The purchasing department is involved in buying raw materials, machinery, tools and services while keeping in mind the quality metrics required by the clients.

In this chapter, you will study the concept, evolution, objectives, functions and importance of purchase management. You will also gain an insight into the methods of purchases. Further, the chapter explains the meaning of centralised and decentralised purchasing, and make-buy-lease decisions. Finally, the steps of purchasing cycle and roles and responsibilities of a purchasing manager have been discussed in the chapter.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the role of purchases in materials management
- Outline the technical aspects of purchases method
- Examine the benefits of centralised and decentralised purchasing
- Appreciate how purchase management is helping businesses in achieving minimum wastage and higher productivity

6.1 CONCEPT OF PURCHASE MANAGEMENT

Important Concept

In the words of **Alford and Berry**, purchasing is the procuring of materials, supplying machine tools and services required for the equipment maintenance and operation of the manufacturing plant.

Purchase refers to the act of acquiring the necessary products or services for an organisation from an external source. It is a managerial activity that aims to provide different departments with the right material, at the right time, in the right quantity and from the right source, as and when required. According to **Westing, Fine and Zenz**, purchasing is a managerial activity that goes beyond the simple act of buying. It includes research and development for the proper selection of materials and sources, the follow-up to ensure timely delivery, inspection to ensure both the quantity and the quality, to control traffic, receiving, storekeeping and accounting operations related to purchases.

In order to ensure proper flow of materials in an organisation, management of purchases plays a pivotal role. Therefore, it is important to manage purchase functions accurately. Purchase management involves the process of transacting goods and services from the external agents for fulfilling the objectives of an organisation. It is the process of controlling the purchase of raw materials required for the production of the product, and managing stocks of inventory. Purchase management involves fulfilling the administrative process along with effective negotiating skills with the suppliers, creating purchase orders and suitable contracts, and tracking the goods with the receipt and payments.

Purchase management requires a good knowledge of handling various suppliers, directing the flow of goods and services, handling various data in terms of suppliers and contractors. Purchasing requires effective competency, the knowledge of supply chain management, transportation, logistics issues, business and tax laws, inventory management, invoicing procedures, etc. It is the process of having a mutual relationship with suppliers for obtaining the materials, goods and services for manufacturing products or for providing the required services.

The main functions of the purchasing department are as follows:

- To identify the requirements of goods and services
- To identify the reliable and trustworthy suppliers
- To negotiate the prices of the required goods and services

- To evaluate and compare the delivery terms
- To define the order quantities
- To invite quotations, request for bids and implement the supply contracts
- To coordinate delivery with the supply chain department
- To manage the budgets and payment process

The purchasing department helps in determining the quantity and quality of goods required. It also ensures the availability of goods at the right time and at a fair price for the organisation. It is the responsibility of the department to negotiate the favourable terms and conditions for the purchase of materials, machines, tools and the services in a manner that helps in maintaining the quality of the end product. The purchasing department is committed to maximising the saving and profits of the organisation.

According to **Walters**, *purchasing function means 'the procurement by purchase of the proper materials, machinery, equipment and supplies for stores used in the manufacture of a product adopted to marketing in the proper quality and quantity at the proper time and at the lowest price, consistent with the quality desired.'*



EXHIBIT

GOALS OF THE PURCHASING DEPARTMENT

The important goals for the purchasing department of an organisation are as follows:

- **Right price:** Purchasing department works at determining the prices which help in reducing the costs during the process of production.
- **Right quantity:** Purchasing department ensures the perfect quantity of materials and that there is no shortage of the materials or the required inputs for production. At the same time, it should also be considered that there is not an excess of purchase. The right quantity of materials ensures minimum inventory. Therefore, the right quantity results in the reduction in the cost.
- **Right quality:** The quality of the product should be as per the requirement of the client. The accepted standard of the product should be on a mutual agreement.
- **Right place:** Right place is defined by the requirements of the product for production in the process of value stream of the processes. The material availability at the right place is important for the process of production.
- **Right time:** It is important for the inputs to be available at the right time for the smooth process of production. It is necessary to adhere to the production schedule for taking care of the needs of the client.

6.1.1 | EVOLUTION OF PURCHASE MANAGEMENT

Table 1 shows the evolution of purchase management:

TABLE 1: Evolution of Purchase Management

Period	Milestone
The Early Years (1800s-1900)	<ul style="list-style-type: none"> • In 1832, a book on the economy of machinery and manufacturers by Charles Babbage published, which laid emphasis on the importance of the purchasing function. • During the early years of the 1850s, the greatest development of purchasing occurred. During this period, the growth of American railroads emerged as the major forces in the economy. • Major contributions to purchasing history included the early recognition of the purchasing process and its contribution to overall company profitability. • The late 1800s signalled the beginning of organising of purchasing as a separate corporate function requiring specialised expertise. Before that, this separation did not exist.
Growth of Purchasing Fundamentals (1900–1939)	<ul style="list-style-type: none"> • The second period of purchasing evolution started in the beginning of the 20th century and lasted till the start of World War II. • This era also saw the development of basic purchasing procedures and ideas. • The importance of purchasing increased during World War I as it played a major role in obtaining vital war materials. The main objective of purchasing during this period was on the procurement of raw material versus buying finished or semi-finished goods.
The War Years (1940–1946)	<ul style="list-style-type: none"> • A new period in purchasing history was introduced in World War II. • In 1933, about nine colleges started offering courses related to purchasing. This number increased to 49 colleges by 1945. • The National Association of Purchasing Agents witnessed an increase in its membership from 3,400 in 1934, to 5,500 in 1940, to 9,400 in the autumn of 1945. • A study conducted during this period revealed that 76 per cent of all purchase requisitions contained no specifications or stipulation of brand. This suggested that other departments within the firm recognised the role of the purchasing agent in determining sources of supply.
The Quiet Years (1947–Mid-1960s)	<ul style="list-style-type: none"> • Articles began appearing during this period describing the practices of various companies using staff members to collect, analyse and present data for purchasing decisions.

Period	Milestone
	<ul style="list-style-type: none"> • Ford Motor Company was one of the first private organisations to create a commodity research department to provide commodity-related information on a short and long-term basis. Ford also formed a purchase analysis department to give buyers assistance on product and price analysis. • The post war period witnessed the development of the value analysis (VA) technique, pioneered by General Electric in 1947. • During the post war years and throughout the 1960s, the stress was given on satisfying consumer demand and the needs of a growing industrial market. • Companies faced stable competition and had access to abundant material, which historically diminished the overall significance of purchasing. The elements that lead to an increase in the importance of purchasing did not exist during these quiet years of purchasing history.
<p>Materials Management Comes of Age (Mid-1960s– Late 1970s)</p>	<ul style="list-style-type: none"> • The mid-1960s saw a dramatic growth of the materials management concept. • The Vietnam War, for example, resulted in upward price and materials availability pressures. During the 1970s, firms experienced materials problems related to oil “shortages” and embargoes. • There was widespread agreement about the primary objective of the materials concept and the functions that might fall under the materials umbrella. These functions included materials planning and control, inventory planning and control, materials and procurement research, purchasing, incoming traffic, receiving, incoming quality control, stores, materials movement, and scrap and surplus disposal. • The behaviour of purchasing during this period was notable. Purchasing managers laid emphasis on multiple sourcing through competitive bid pricing and rarely viewed the supplier as a value-added partner. • Price competition was the major factor determining supply contracts. • The purchasing strategies and behaviours that evolved over the last half century were inadequate when the severe economic recession of the early 1980s and the emergence of foreign global competitors occurred.
<p>The Global Era (Late 1970s–1999)</p>	<ul style="list-style-type: none"> • Global companies increasingly captured world market share and emphasised different strategies, organisational structures and management techniques. • The spread and rate of technology changed during this period was unprecedented with product life cycles becoming shorter.

Period	Milestone
	<ul style="list-style-type: none"> • The ability to coordinate worldwide purchasing activity by using international data networks and the World Wide Web (via intranets) emerged. • This intensely competitive period witnessed the growth of supply chain management. Managers began to view supply chain management as a way to satisfy intense cost and other improvement pressures.
Integrated Supply Chain Management (The Twenty- First Century)	<ul style="list-style-type: none"> • Purchasing and supply chain management today reflects a growing emphasis concerning the importance of suppliers. • Supplier relationships are shifting from an adversarial approach to a more cooperative approach with selected suppliers. • Supplier development, supplier design involvement, the use of full-service suppliers, total cost supplier selection, long-term supplier relationships, strategic cost management, enterprise-wide systems (enterprise resource planning, or ERP) and integrated Internet linkages and shared databases are now seen as ways to create new value within the supply chain. • The history and evolution of purchasing and supply chain management provides an appreciation for the growth, development, and increased stature of the profession over the last 150 years.

6.1.2 OBJECTIVES OF PURCHASE MANAGEMENT

The main objectives of purchase management are as follows:

- **Reducing costs:** The main objective of the purchasing department is to bring down the costs by identifying the right suppliers and getting the materials at the right price and quality. The purchasing manager ensures the maximum savings by effectively selecting the vendors who can supply material within the budgets.
- **Ensuring regular supply and reduce risks:** The identification of suitable vendors for providing the goods and services helps in controlling and managing the risks involved in the supply chain management. The department ensures the right procedures and steps are followed while procuring materials for the organisation. The purchasing department ensures that suppliers should work diligently and not indulge in wrong or unlawful practices.
- **Fulfilling business requirements:** It is vital for the organisation to be involved with the right suppliers and vendors to ensure that they supply the suitable goods and materials required for the organisation. This helps in controlling the prices and also fulfils the organisation requirements for achieving its objectives.

- **Managing long-term relationships:** Purchase management involves outsourcing requirements to suppliers who are interested in doing business with the organisation. It looks at a mutual long-term relationship and sharing of benefits by working together. It is vital for the purchasing department to identify the people who would be interested in a long-term association with the organisation.
- **Improving quality:** Purchasing management establishes the right metrics for quality and standardised performance levels. The organisation monitors and tracks the quality of the products which should be produced according to the requirement of the client.
- **Encouraging innovation:** It is necessary for the purchasing department to work closely with the vendors and suppliers for providing goods and services which are innovative to give it a competitive advantage. The competitive advantage could be in terms of quality, feel, look, convenience, price, etc.
- **Leveraging technology:** It is necessary for the purchasing department to work with the latest technologies for the smooth working of its supply chain management. The latest technologies like Machine Learning, Natural Language Processing, Artificial Intelligence, and Robotic Process Automation, are very effective in improving efficiency and managing the problems of inventory control. The efficiency of the supply chain management has increased with the implementation of the latest technology solutions which gives the organisation a competitive edge.

6.1.3 | FUNCTIONS OF PURCHASE MANAGEMENT

The purchasing department is the backbone of many organisations. The purchasing department has a major responsibility for identifying the sources of supply of goods and materials with the right quality and at the right price. Many organisations have a dedicated department for procuring and purchasing of goods and services which is a part of everyday operations. The purchasing department has to go through a number of processes with making strategic policy decisions and analysing different alternative solutions for making purchases. It has to negotiate with the right kind of suppliers who can supply the proper material, machinery and equipment in the required quantity and quality at the right time and at the lowest price.

Purchasing today has become a specialised function with having a broad knowledge of the markets. It helps check the reliability and delivery performance of suppliers. Purchasing department needs to ensure that there is sufficient supply of the materials to maintain the smooth flow of the production or the marketing of goods. It needs to work within the budgets since it is using the organisation's funds for buying goods and services. There can be a risk at times when suppliers do not keep to their commitments. Hence, it is important to keep track and necessary checks on the supply to minimise risks. The purchasing department negotiates the price and terms of credits for the goods and to check whether the goods ordered are delivered according to the commitment of suppliers with the right quality and time. The functions undertaken by the purchasing department are as follows:

- To identify the requirements and purchase intends

- To select the reliable suppliers for the issue of bids and quotations
- To issue the tenders and seek quotations for getting the best quotes
- To evaluate, compare and analyse the quotations in a comparative statement
- To conform with the organisation's protocol with proper control and purchasing policy
- To negotiate contracts for satisfactory sources of supply of materials
- To check legalities of the agreements and contracts
- To develop and arrange for alternative sources of supply of materials
- To work on and implement the value analysis, cost analysis, etc.
- To issue Purchase Orders (PO)
- To follow up on the purchase orders for delivery on time
- To verify and pass suppliers' bills for making on-time payments
- To communicate and deal with suppliers and the supply chain on a regular basis
- To maintain the purchase records, orders and contracts
- To stay within the budgets and maintain expenditure statement
- To keep records and the data of the performance of vendors and suppliers
- To communicate with the different departments regarding the progress of their indents
- To maintain a level of coordination and cooperation with the other divisions and departments of the organisation
- To keep the top management and stakeholders informed of the indents; moreover, about the purchase which will affect the profits and the revenue of the organisation
- To possess sufficient knowledge regarding the prices and supply of materials and serve as an information centre

6.1.4 | IMPORTANCE OF PURCHASE MANAGEMENT

Purchasing has a major impact on the profits of the organisation with regard to saving money or increasing profits. The purchasing department has a major task of working on commitments by keeping costs as low as possible without compromising on quality. These are critical aspects of the organisation strategy to negotiate with suppliers for supplying goods and services with mutual advantage.

There are many business outcomes which are interlinked with purchase management that impacts the growth and profits of the organisation. The availability of the required stock of inventories, issues with contracts and agreements, cash flow, quality of products, and timely availability of goods are all part of an effective system and process of the purchasing department. Managing these processes effectively impacts organisational performance and marketing strategies. Keeping too much inventory stocks will bring down the profits of the organisation.

Hence, it is vital to acquire the right amount of inventory and materials that are needed.

A good purchasing plan improves confidence in stakeholders by bringing transparency and certainty in the purchasing process. Once the terms and conditions of purchases have been agreed upon, there is a lesser chance of disapproval. A purchasing plan provides a base for monitoring purchase activities. There are several benefits of purchase management which are as follows:

- **Lower overall costs of purchase:** Since an organisation may not be adequately equipped with market intelligence, the cost of purchase may go up. Therefore, with the advent of purchase planning and management, organisational resources need to be dedicated to conduct this research before a robust internal purchase plan can be devised. Therefore, effective purchase planning ensures cost and time saving.
- **Quality:** An organisation may find it difficult to maintain a sustained focus on quality of each product procured, as its main focus is on making profits from its core business. Therefore, with effective planning and market research, better value for money outcomes can be attained.
- **Relationship handling:** An outsourced purchase firm will put in the time and effort to find out the best vendors and ensure it maintains a good working relationship with them. The responsibility of managing the vendors, making payments to them, conducting market research regularly and compiling findings, etc., become the responsibility of the outsourcing firm.

A robust purchase plan helps organisations save money and time, achieve the objectives, comply with regulatory bodies, and provide guidance to purchase team.



**SELF
ASSESSMENT
QUESTIONS**

1. _____ is the process of having a mutual relationship with suppliers for obtaining materials, goods and services for manufacturing a product or for providing the required services.
2. Which of the following are the main functions of the purchasing department?
 - a. To invite quotations, request for bids and implement the supply contracts
 - b. To coordinate delivery with the supply chain department
 - c. To manage budgets and payment process
 - d. All of these
3. During the early years of the 1850s, the growth of _____ emerged as the major forces in the economy.
4. The latest technology, such as ERP solutions, is very effective in improving efficiency and managing the problems of inventory control. (True/False)

6.2 METHODS OF PURCHASES

There can be two different types of purchases, namely the individual purchase and the organisational purchase. Individual purchase involves various types of items or products that are either bought for personal consumption or family consumption. There are factors, such as social, cultural, personal and psychological, which affect the individual purchase behaviour. On the other hand, a purchase is said to be organisational if made in the name of the organisation or company, irrespective of size from medium-sized company to the multinational company. Organisations can be of any type, say retailer, industries, business, wholesaler, government or non-government organisations.

Table 1 shows the difference between decision-making of individual purchase and organisational purchase:

TABLE 1: Difference between Individual Purchase and Organisational Purchase Decision Making

Consumer Purchasing/Decision Making	Industrial Purchasing/Decision Making
Less Risky	More Risky
Emotional decision-making	Rational/Analytical decision-making
Personal purchasing is sometimes unplanned or on the spot or abrupt buying influenced by promotional activities	Scientific purchasing as whole organisation's profitability affects

Based upon the types of purchases, methods of purchases can be finalised. There are various methods of purchases depending upon the requirements and needs of the organisation or individual. An organisation can purchase materials in bulk. It is known as bulk purchase method. It is the most economical method of purchase and it is the safest option to attain large quantity of purchase for future. Another method of purchasing is zero stock buying, which is also known as hand-to-mouth purchasing. In this case, no purchases are made until the demand arises. This method is adopted to avoid capital blockage in stock or to minimise carrying cost, wastage of materials, etc.



SELF ASSESSMENT QUESTIONS

- _____ purchase involves various types of items or products that are either bought for personal consumption or family consumption.
- There are factors, such as social, cultural, personal and psychological, which affect the organisational purchase behaviour. (True/False)

6.3 CENTRALISED AND DECENTRALISED PURCHASING

If an organisation follows centralised purchasing, all the functions of purchasing are controlled by an individual department which manages and looks over the purchasing for the whole organisation. This involves purchasing in bulk volumes which leads to lower pricing and better terms for the organisation. The purchasing department is normally located at the headquarters of the organisation and it works with a large number of suppliers. The centralised purchasing organisation leads to better efficiency in managing the inventory, purchase of raw materials

with a decrease in the overhead cost and reduction of staffing costs. It is able to forge a better relationship with suppliers and the workforce is given adequate training for handling the purchases. The purchasing departments also help with mergers and acquisitions which increase the business of the organisation.

The advantages of centralised purchasing are as follows:

- It helps in purchasing in bulk quantities and reduces the cost to the organisation.
- It results in lesser overhead costs.
- It helps in developing good relations with suppliers, which can lead to lower prices.
- It allows the organisation to purchase in volume which leads to a discount on prices and better agreeable terms.
- It facilitates in reducing delivery charges when volume purchasing is done.
- It helps reduce transport cost because of the consolidated shipments.
- It enables to decrease inventory investment by centralising purchasing system.
- It assists in centralising record for all the purchases.
- It ensures standardisation of the work, which, in turn, helps in avoiding duplication of work.
- It helps maintain uniformity of policies for purchasing.
- It also helps the supplier understand the organisational structure.
- It helps in automating and integrating the work of the purchasing department.
- It provides leverage by better control of the inventory level which is maintained at the optimum level.

The disadvantages of a centralised purchasing organisation are as follows:

- Centralised purchasing can become very large and complex for handling the purchases efficiently.
- Centralised purchasing organisation can delay the delivery of important goods and materials.
- The delay is done as goods and materials are to be delivered from a central location.
- Centralised purchasing organisation has a number of branches which are spread across different locations or countries. Then they would not have the advantage of lower prices or discounts.
- Centralised purchasing involves investment in employees and technology required for effectively managing the process of purchasing which incurs a huge cost.
- Centralised purchasing organisation may involve employees who may not be effective or efficient.
- This can lead to the purchasing of poor quality and quantity of materials.

Let us now study decentralised purchasing.

The independent purchasing of materials by various departments of the organisation for fulfilling their requirements and needs is known as decentralised purchasing. In this form of purchasing organisational structure, there is no specific department of purchase. The departments and branches purchase their goods individually. The disadvantages of centralised purchasing can be controlled by the decentralised purchasing system. During an urgent requirement, it is easier to purchase materials through the decentralised purchasing organisation.

The advantages of decentralised purchasing organisation are as follows:

- The departments have ease of purchasing materials locally as and when required.
- The materials can be purchased in the right quantity and quality for the independent department easily.
- This form of purchasing does not require large investment initially.
- The orders can be placed quickly.
- The defective material replacement takes less time.
- The large organisations would greatly benefit from decentralised purchasing.

The disadvantages of decentralised purchasing organisation are as follows:

- The organisations do not get the advantage of bulk purchasing.
- The purchasing staff may not be well qualified for the work of purchasing.
- The organisation has less control over purchasing which may result in over- and under-purchasing of materials.
- Various departments may lack proper coordination and cooperation.
- The data is not organised properly in such type of an organisation.
- There is lack of uniformity in the standardised system of purchasing.



**SELF
ASSESSMENT
QUESTIONS**

7. The purchasing department is normally located at the _____ of the organisation and it works with a large number of suppliers.
8. The orders can be placed quickly in a centralised purchasing organisation. (True or False)

6.4 MAKE-OR-BUY DECISIONS

Make-or-buy analysis is a purchasing strategy or technique used by purchasing managers to decide if the item or service should be made or provided by a project organisation or it should be sourced from outside. The first step in the planning process is determining whether a particular resource needed for a project can be produced in-house or needs to be procured from outside. Following factors influence this decision:

- Skills available inside the organisation whether to make or to buy

- Cost differential, including direct and indirect costs, between make or buy
- Risks associated with making internally or buying from external sources
- Capacity of supplier(s) to deliver on time with the right quality
- Effect of schedule of the project

Therefore, whether the core capabilities of the organisation allow to produce the resource themselves or the value delivered by meeting the need externally or the risks associated with meeting the need within cost, quality and time constraints are various factors that affect the make or buy decision.

Make-or-buy decisions are the strategic decision-making step in a manufacturing organisation as these decisions decide what to buy and what to make. Organisations with inadequate technical capabilities or budget constraints prefer to either buy or outsource it from the third party. Make-or-buy analysis includes multiple parameters which are weighed to arrive at the decisions. Some of the crucial parameters are as follows:

- Items required are one time or frequently needed. Also, quality standards expected, urgency, extent of control required on the activity/item processing are taken into consideration.
- Availability of expertise, skills, resources and resource bandwidth to make an item in-house
- Cost and schedule of making an item in-house
- Availability and capability of vendors to deliver the item
- Cost and schedule if the item is procured from outside
- Risks involved in both the cases
- Advantages and disadvantages of both the alternatives
- Copyright, intellectual property right, confidentiality or legal constraints for the item or project under consideration

A cost-benefit analysis is conducted using these parameters to make a decision. Basically, make-or-buy analysis decides whether it is better to make or buy, i.e., whether to do the function internally or to outsource it to an agency. Such a decision is taken strategically as it can have a long-term impact on the organisation.



**SELF
ASSESSMENT
QUESTIONS**

9. The first step in the planning process is determining whether a particular resource needed for a project can be produced in-house or needs to be procured from outside. (True/False)

6.5 PURCHASING CYCLE

It is necessary for organisations to have an effective purchase management process. It is also important for organisations to understand the method of negotiating and purchasing of products and services. There are different steps involved in the

purchasing cycle for identifying the requirements or needs of the organisation. Once the needs and requirements are identified, negotiating is the final step of the making of a contract. The purchasing department has the responsibility of utilising the organisation's funds for making the purchase. Hence, it is important to follow a standardised step-by-step process that will help the purchasing department successfully achieve its goals. Inefficiencies in the process of purchasing can lead to the financial loss for the organisation with delayed purchases, loss of discounts and disputes in the process of transactions.

The different steps involved in the purchase cycle are as follows:

1. **Recognition of need:** The initial phase in the purchase process is to identify the needs and requirement of a product. It could be a recurring purchase or a new product. These needs are analysed and then the request is created for the purchase.
2. **Purchase requisition:** The requisition for the purchase starts with the process of the purchase. The request for the purchase of goods can be made in writing (by e-mail or hard copy) to the purchasing department.
3. **Reviewing of request:** The purchase request is reviewed by the purchasing department and the finance department. Once it is approved, the requests become a purchase order. If the request is rejected, then it is sent back to the department with a valid reason.
4. **Approval of the budget:** Once the purchase order is prepared, it is further moved to the finance department for obtaining approval with regard to the budget.
5. **Request for quotation:** When the budget is approved, the purchase team sends a request for bids and quotations for the best price to suppliers and vendors. The price quoted by various vendors is compared and scrutinised. On the basis of this, vendors are shortlisted.
6. **Negotiation with vendors and issuing the contract:** After the selection of the vendor and the negotiation of the pricing, the contract is made. The contract is then signed and the purchase order is then sent to the vendor. Later, the vendor accepts and acknowledges it.
7. **Receiving goods and services:** The vendor delivers the goods and the services at a time which is mentioned. The purchasing department monitors and examines the order, and informs the vendor regarding problems or issues with the items received.
8. **Three-way matching:** In the three-way matching, the purchase orders, packaging slips and vendor invoices are checked and reconciled for any kind of discrepancies.
9. **Approval of the invoice and making the payment:** After all the documentation process of three-way matching is completed, the invoice is cleared and sent for payment processing.
10. **Keeping the records:** After the payment is done, the records are sent for the process of bookkeeping and auditing. Subsequently, all the documents pertaining to purchase requests and approved invoices are stored at a central location.

Various stages involved in purchase are depicted in Figure 1:

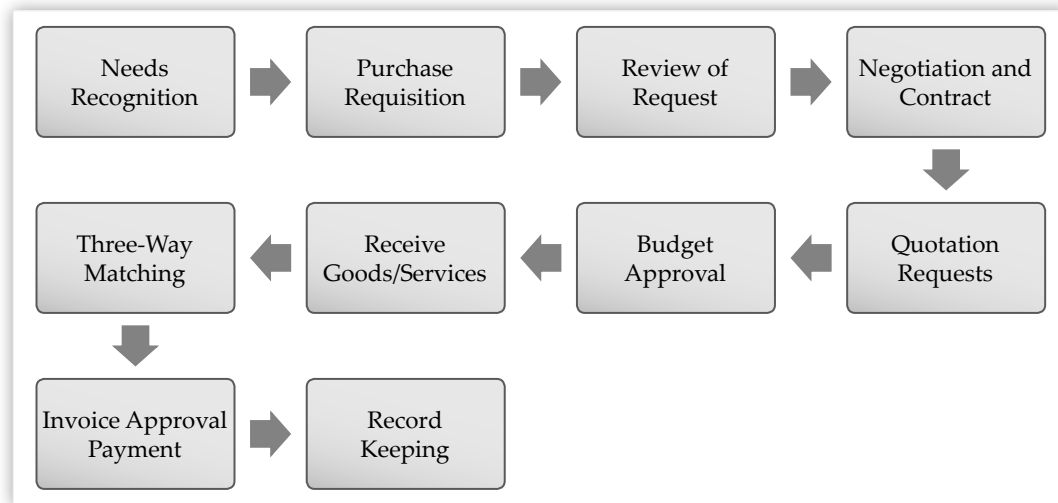


FIGURE 1: Stages of Purchase

Source: <https://kissflow.com/purchase-process/>



**SELF
ASSESSMENT
QUESTIONS**

10. _____ is the final stage of purchase.
11. In the three-way matching, the purchase orders, packaging slips and vendor invoices are checked and reconciled for any kind of discrepancies. (True/False)

6.6 ROLES AND RESPONSIBILITIES OF A PURCHASE MANAGER

The responsibility of a purchasing manager of any organisation is to regulate the flow of goods and services. He/she should monitor and control the flow of goods and services, along with client dealing with effective strategic planning. An efficient purchasing manager should have a good knowledge of the goods and services that need to be purchased and should be proficient in planning, executing and possessing calibre for yielding high profits for the organisation. The person handling the process of purchasing should be proficient in invoicing, inventory procedures, and have the required knowledge of the supply chain, business and tax laws. The person involved in the process of purchasing should be well-versed with the process of logistics and transportation.

Following are the roles and responsibilities of a purchase manager:

- Identifying requirements for a product or a service in the organisation
- Finding, vetting and selecting vendors to purchase the required product or service
- Establishing terms of payment
- Negotiating contracts
- Purchasing the required product or service within the desired quality specification at a lower price

- Maintaining adequate levels of inventory as per the requirements
- Building cordial relationships with suppliers



**SELF
ASSESSMENT
QUESTIONS**

12. Which of the following are the roles and responsibilities of a purchase manager?
- a. Identifying requirements for a product or a service in the organisation
 - b. Finding, vetting and selecting vendors to purchase the required product or service
 - c. Establishing terms of payment
 - d. All of these
13. The responsibility of purchasing manager of any organisation is to regulate the flow of goods and services. (True/False)

6.7 SUMMARY



Purchase management has evolved over the years and is considered as a critical activity in many organisations. The process of purchasing has moved on from being a transactional activity to becoming an activity which is strategy-oriented. Purchase management involves the process of transacting products and services from external agents to fulfil the objectives of an organisation. Purchasing management requires a good knowledge of handling various suppliers, directing the flow of goods and services with handling various data in terms of suppliers and contractors.

Purchasing management has contributed immensely in standardising the process of procuring goods or services for business. The purchasing department is the backbone of many organisations. The purchasing department has a major responsibility for identifying the sources of supply of goods and materials with the right quality and price. The purchasing process has become a specialised function with having a broad knowledge of the markets with an understanding of the reliability and delivery performance of suppliers.

Purchasing has a major impact on the profits of the business in regards to saving money or increasing the profits of the company. Purchasing is the process of negotiating and obtaining goods, materials and services from suppliers or vendors.

The success of a business depends a lot on the company's purchasing function which is important for long-term success. Centralised purchasing organisation is controlled by a single department which manages and monitors the purchasing for the entire organisation.

Decentralised purchasing refers to purchasing of materials independently by the different departments of the organisation for fulfilling their requirements and needs. It is necessary for organisations to have an effective purchase management process and understand the method of negotiating and purchasing of products and services.

6.8 KEY WORDS



- **Centralised purchasing:** A single department that manages and monitors the purchasing for the organisation
- **Decentralised purchasing:** The purchasing of materials independently by different departments of the organisation
- **Purchasing:** A process of acquiring goods or services for the requirements of the organisation
- **Quotation:** A formal statement which gives an estimated cost of goods and services
- **Supply chain management:** A series of activities needed for the flow of materials through various processes that transforms raw materials into the final product to be distributed to customers

6.9 CASE STUDY: PURCHASE MANAGEMENT OF RECKET GLOBALS PVT. LTD.



Recket Globals Pvt. Ltd. was a European-based manufacturer. It produced a wide variety of chemicals that included hydrogen peroxide, soda ash, speciality polymers, polyvinyl chloride, polyamide intermediate products, etc. Recket Globals had offices around the globe and it had around 35,000 employees working throughout 150 locations in over 60 countries.

The problem with Recket Globals Pvt. Ltd. was mainly with its purchasing pattern which was in disarray. The purchasing pattern of Recket Globals Pvt. Ltd. was fragmented, uncategorised and there was no method of tracing or analysing the patterns of purchasing. Recket Globals Pvt. Ltd. was interested in connecting with a business partner who was willing to help in consolidating and aggregating purchase function of Recket Globals Pvt. Ltd. throughout different locations. Apart from this, Rocket Globals Pvt. Ltd. was interested in outsourcing expertise and implement standardised methods of purchasing by using the methods of purchase and gaining a competitive advantage.

Recket Globals Pvt. Ltd. decided to hire Forbus who was a certified Minority Business Enterprise (MBE). Forbus' global headquarters were located outside of Dayton, in Ohio. Apart from Forbus' offices in the United States, it has 600 employees working over 25 countries which included China, Japan, Singapore, India, Panama and Switzerland. Forbus' employees were distributed geographically and were able to operate anywhere in the world. Forbus helps with delivering transformational global supply chain and program management solutions. Forbus' systems were enhanced with digital and process consulting. It performed a thorough analysis of the Recket Globals Pvt. Ltd.'s processes and systems. Forbus did an analysis and helped in the following ways:

- It identified issues and created a baseline spend report.
- It analysed the processes and identified the historical purchasing patterns.

- It worked out certain sourcing strategies that could be adopted and standardised.
- It initiated strategic relationships with suppliers and vendors.
- It started a supplier competition.
- It brought down the number of global suppliers.
- It started a digital-based electronic, catalogue-based on the purchase process for maintaining and controlling the future consumption patterns.
- It decreased the overhead costs of Recket Globals Pvt. Ltd.

The methods and changes adopted by Recket Globals Pvt. Ltd. helped in achieving savings of over 45%. Forbus provided Recket Globals Pvt. Ltd. perfect supplier rationalisation by significantly bringing down the number of global suppliers. Forbus initiated negotiated delivery and payment terms on an all-inclusive basis, which significantly increased the cash flow of Recket Globals Pvt. Ltd.

Source: https://corbus.com/sites/default/files/casestudies/StrategicSourcingOfOfficeSupplyProducts-Corbus_0.pdf

QUESTIONS

1. What were the issues faced by Recket Globals Pvt. Ltd.?
(**Hint:** Unorthodox methods of working and spending, no proper categorised data.)
2. Why did Recket Globals Pvt. Ltd. want a standardised method of purchase?
(**Hint:** To bring down the costs, have a standard process for purchase.)

6.10 SHORT ANSWER QUESTIONS



1. _____ is a managerial activity that aims to provide different departments with the right material, at the right time, in the right quantity and from the right source, as and when required.
2. It is necessary for the strategic objectives to be aligned with the _____ goals to improve performance and to prevent unethical practices.
3. When a purchase is made in the name of the organisation or company, it is known as _____ purchase.
4. The independent purchasing of materials by various departments of the organisation for fulfilling their requirements and needs is known as _____ purchasing.
5. _____ analysis is a purchasing strategy or technique used by purchasing managers to decide if the item or service should be made or provided by a project organisation or it should be sourced from outside.
6. _____ is the final step of the making of a contract.
7. Decentralised purchasing involves purchasing in bulk volumes which leads to lower pricing and better terms for the organisation. (True/False)

8. In the three-way matching, the purchase orders, packaging slips and vendor invoices are checked and reconciled for any kind of discrepancies. (True/False)
9. The person involved in the process of purchasing should be well-versed with the process of logistics and transportation. (True/False)
10. Organisations with inadequate technical capabilities or budget constraints prefer to take make decisions within the organisation rather than buying from the third party. (True/False)
11. Which of the following factors affect(s) the make or buy decision?
 - a. Skills available inside the organisation whether to make or to buy
 - b. Cost differential including direct and indirect costs between make or buy
 - c. Risks associated with making internally or buying from the external sources
 - d. All of these
12. Which of the following is the first step of purchase cycle?
 - a. Purchase requisition
 - b. Request for quotation
 - c. Recognition of need
 - d. None of these
13. Which of the following is not an advantage of decentralised purchasing?
 - a. The departments have ease of purchasing materials locally as and when required.
 - b. The materials can be purchased in the right quantity and quality for the independent department easily.
 - c. This form of purchasing does not require large investment initially.
 - d. It helps in purchasing in bulk quantities and reduces the cost to the organisation.
14. Which of the following monitors and controls the flow of goods and services along with client dealing with effective strategic planning?
 - a. Purchase manager
 - b. Marketing manager
 - c. Operations manager
 - d. None of these
15. Which of the following are the advantages of centralised purchasing?
 - a. It helps in purchasing in bulk quantities and reduces the cost to the organisation.
 - b. It results in lesser overhead cost.
 - c. It helps in developing good relations with suppliers, which can lead to lower prices.
 - d. All of these

16. Which of the following are the main objectives of purchase management?
 - a. To reduce the cost
 - b. To ensure regular supply and reduce cost
 - c. To fulfil business requirements
 - d. All of these
17. The process of purchasing has moved on from being a _____ activity to a strategy-oriented activity.
 - a. transactional
 - b. social
 - c. technical
 - d. None of these
18. The _____ department has to go through a number of processes with making strategic policy decisions and analysing different alternative solutions for making purchases.
 - a. marketing
 - b. purchase
 - c. operations
 - d. None of these
19. Which of the following is defined as a formal statement which gives an estimated cost of goods and services?
 - a. Quotation
 - b. Contract
 - c. Invoice
 - d. None of these
20. Which of the following is not a role or responsibility of a purchase manager?
 - a. Establishing terms of payment
 - b. Negotiating contracts
 - c. Promotions of discounted items
 - d. Purchasing the required product or service within the desired quality specification at a lower price
21. In three-way matching, which of the following documents are checked?
 - a. Purchase orders
 - b. Packaging slips
 - c. Vendor invoices
 - d. All of these

22. Which of the following is the final stage of purchase cycle?
 - a. Recognition of needs
 - b. Purchase requisition
 - c. Keeping the records
 - d. None of these
23. Which of the following purchase methods is less risky?
 - a. Individual
 - b. Organisational
 - c. Both a and b
 - d. None of these
24. Which of the following purchase methods is based on analytical decision making?
 - a. Individual
 - b. Organisational
 - c. Both a and b
 - d. None of these
25. Which of the following purchase methods gets affected by the social, cultural, personal and psychological factors?
 - a. Individual
 - b. Organisational
 - c. Both a and b
 - d. None of these

6.11 HIGHER ORDER THINKING SKILLS (HOTS)



1. Being a purchase manager, which of the following would be your utmost priority for long-term success?
 - a. Obtaining materials at minimum cost
 - b. Cordial relationships with suppliers
 - c. Negotiating contracts
 - d. None of these
2. Which of the following factors affects the organisational purchases?
 - a. Competitors' purchases
 - b. Price
 - c. Quantity of purchases
 - d. All of these

3. If an organisation has budget constraints, which of the following types of purchasing should be adopted by the organisation?
 - a. Centralised
 - b. Decentralised
 - c. Any of these
 - d. None of these
4. For a large-scale organisation, which of the following types of purchasing should be adopted?
 - a. Centralised
 - b. Decentralised
 - c. Any of these
 - d. None of these

6.12 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Concept of Purchase Management	1.	Purchase management
	2.	d. All of these
	3.	American railroads
	4.	True
Methods of Purchases	5.	Individual
	6.	False
Centralised and Decentralised Purchasing	7.	headquarters
	8.	False
Make-or-Buy Decisions	9.	True
Purchasing Cycle	10.	Record-keeping
	11.	True
Roles and Responsibilities of a Purchase Manager	12.	d. All of these
	13.	True

B. SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	Purchase
2.	organisational
3.	organisation
4.	decentralised

Q. No.	Answer
5.	Make-or-buy
6.	Negotiating
7.	False
8.	True
9.	True
10.	False
11.	d. All of these
12.	c. Recognition of need
13.	d. It helps in purchasing in bulk quantities and reduces the cost to the organisation.
14.	a. Purchase manager
15.	d. All of these
16.	d. All of these
17.	a. transactional
18.	b. purchase
19.	a. Quotation
20.	c. Promotions of discounted items
21.	d. All of these
22.	c. Keeping the records
23.	a. Individual
24.	b. Organisational
25.	a. Individual

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	b. Cordial relationships with suppliers
2.	d. All of these
3.	a. Centralised
4.	b. Decentralised

6.13 SUGGESTED BOOKS AND E-REFERENCES



SUGGESTED BOOKS

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VENDOR SELECTION

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Describe the role of different types of vendors
- ▶ Explain the importance of vendor evaluation and selection process
- ▶ Discuss various types of vendor evaluation methods
- ▶ Review challenges faced in vendor evaluation



INTRODUCTION

Read

Pre-read Connect

In the previous chapter, you have studied about the concept of purchase management. The success of purchase department is dependent on vendors' capabilities on the production side. A vendor refers to any supplier who supplies products, materials or services to another entity which could be a business enterprise, end consumer or government. Every business needs to outsource some function or activity which is not feasible or cost-effective on its own. One of the important factors determining a successful business is the quality of relationship with vendors.

A long-term mutually beneficial relationship can be built by choosing the right vendor. Therefore, selecting a vendor is one of the most important decisions a business enterprise must make which will have implications for its operations in the future. It is not as simple as choosing a vendor who is located nearby or is providing services at a very low cost. There are multiple factors, such as quality of work, financial stability, years in business, timely delivery, value for money, reliability, etc., which need to be considered for selecting the ideal outsourcing vendor. Undertaking extensive market research at the onset will help in saving substantial time and costs involved in the vendor selection process. Also, it will help in ascertaining if there is more than a single firm which can provide the required product, material or service. This is beneficial as it encourages competition in the bidding process. In addition, one becomes aware of the best practices, and processes which have worked well for similar organisations and can be incorporated in the evaluation and selection of vendors.

In this chapter, you will study the role of vendor selection in the purchase and materials management. You will gain insight into the types of vendor and vendor selection process. Next, you will understand various vendors' evaluation method. At last, you will study the challenges in evaluation.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the role of a vendor in the success of purchase management
- Outline technical aspects of vendor evaluation and selection
- Examine the best vendor evaluation method
- Resolve challenges or threats during vendor evaluation

7.1 TYPES OF VENDORS



NOTE

Vendor selection is a field of purchasing which is a subset of materials management.

A vendor is an integral part of the supply chain of an organisation by making timely availability of materials for production. There can be different types of vendors who have slightly different roles in supplying goods and services. These are broadly classified into the following categories:

- **Manufacturer:** A manufacturer researches, develops and produces supplies purchased by a buyer organisation. Many manufacturers produce supplies after they receive an order from the buyer organisation. This can take a comparatively longer time than what the buyer organisation can receive from wholesalers and retailers. However, buyer organisations prefer to purchase from manufacturers when quality and efficiency are the top priorities.
- **Distributor:** A distributor moves supplies from manufacturers to wholesalers.
- **Wholesaler:** A wholesaler purchases supplies in bulk, stores them and sells in small quantities to retailers.
- **Retailer:** A retailer purchases supplies from wholesalers and sells them to businesses/buyer organisations.
- **Importer:** Sometimes buyer organisations purchase supplies from organisations across borders. Buyer organisations prefer to import supplies in case of high-volume orders in standard sizes so as to offset shipping and transportation costs.

A buyer organisation selects vendors who best fits its business needs by performing a systematic process. In the next section, let us discuss the vendor selection process.



SELF ASSESSMENT QUESTIONS

1. Which of the following moves supplies from manufacturers to wholesalers?
 - a. Importer
 - b. Retailer
 - c. Wholesaler
 - d. Distributor
2. Buyer organisations prefer to purchase from manufacturers when quality and efficiency are the top priorities. (True/False)

7.2 VENDOR SELECTION AND EVALUATION PROCESS



NOTE

Total quality management and customer satisfaction can be achieved through a proper vendor selection and evaluation process.

Vendors are regarded as the most precious asset of any buyer organisation. Generally, the buyer organisation has more than one vendor for the same item. Therefore, identification of potential vendors and selection of reliable vendors are of utmost importance for production operations of the buyer organisation. However, it can be a challenge for the purchase manager at the buyer organisation to decide which vendors possess the ability to provide supplies on time and in a cost-effective manner. Here, the role of a comprehensive vendor evaluation and selection process comes into the picture.

Vendor selection and evaluation is a systematic process that aims at selecting the most efficient vendors that fit the needs of a buyer organisation and maintaining an up-to-date records of their performance. Figure 1 shows the process of vendor selection and evaluation:

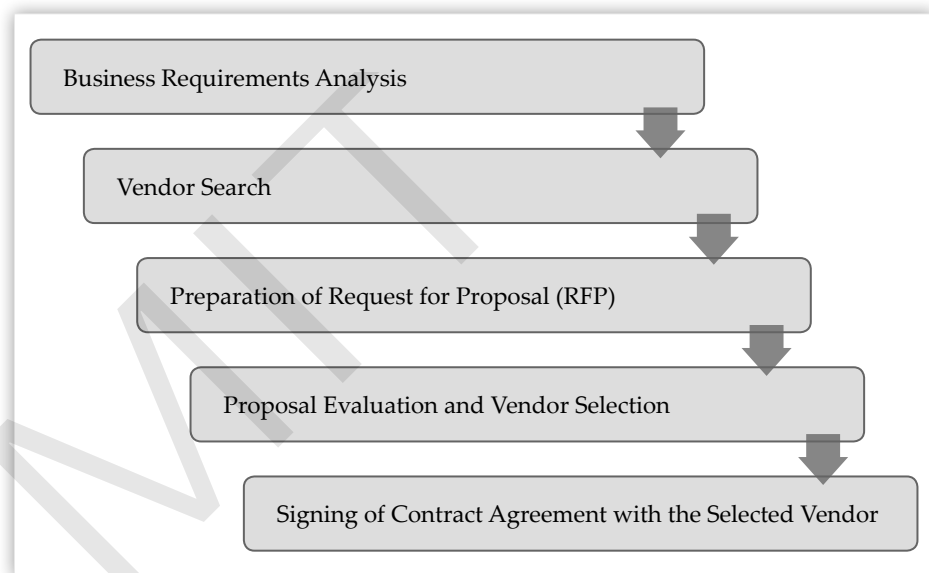


FIGURE 1: Process of Vendor Selection and Evaluation

Let us discuss these steps in detail.

1. **Business requirements analysis:** A buyer organisation needs to precisely define the product, material or service to be sourced from a vendor. The technical and business requirements as well as vendor requirements should be laid out at this stage. The requirements document may be finalised by incorporating the inputs given by the evaluation team and other departments directly or indirectly using the product, material or service.
2. **Vendor search:** In this step, a long list of potential vendors is created, who can deliver the required material, product or service. Thereafter, shortlisting is done to choose vendors from whom further information is required. After that, a request for information (RFI) document is circulated to selected vendors to collect information from them regarding their abilities to produce the supplies/product, technical capabilities, plant capacities, etc. Finally, based on evaluation of the responses of vendors, shortlisting of the possible vendors is done.

3. **Preparation of request for proposal (RFP):** RFP is created for soliciting further information to evaluate the shortlisted vendors. The RFP document includes the following sections:

- Submission details
- Introduction and executive summary
- Business overview and background
- Detailed specifications
- Assumptions and constraints
- Terms and conditions
- Selection criteria

The underlying objective of an RFP is to solicit proposals and decide how the procurement team will evaluate and negotiate a future contract. Also, adequate time should be given to prospective vendors to ask any questions, and seek clarifications before responding.

4. **Proposal evaluation and vendor selection:** Once all responses to the RFP have been obtained from the shortlisted vendors, the submissions need to be carefully reviewed by the procurement team to select the vendor for awarding the contract. The evaluation should be done following a fair, objective and standardised system so that the final decision is in the best interest of the buyer organisation.

In order to achieve this, a systematic methodology should be followed while obtaining inputs and feedback from all the relevant stakeholders. A weight must be assigned against every vendor requirement. A performance score must be assigned to each vendor against the specified requirements. The total performance score is computed to select the winning vendor. The procurement department needs to decide the method for examining the bids received from the potential vendors which should also be disclosed in the RFP document.

5. **Signing of contract agreement with the selected vendor:** The final step in the evaluation and selection process is awarding of contract to the selected vendor. To do so, a contract negotiation strategy needs to be developed. Such a strategy incorporates the following:

- The bottom line
- Any time constraints
- Assessment of potential liabilities and risks
- Confidentiality, dispute resolution, and so on

After negotiations have been concluded successfully, the contract is awarded to the selected vendor. Subsequently, the contract agreement is signed by representatives of both the contracting parties, i.e., the buyer organisation and the selected vendor. At this stage, the expectations from the vendor should be clearly defined. A clear flow of communication should be established so that there is no ambiguity. Further, a clear monitoring schedule with timelines should be chalked out and communicated to avoid any slippages. Also, in this regard, it would be useful if the vendor gets orientation to follow the internal best practices followed by the organisation at the onset.

Important Concept

Some major criteria to be considered for assigning the performance score are outlined as follows:

- Length of time in business
- Ability to continuously supply material, product or service
- Capacity to provide the complete solution and not just a part of the solution
- Flexibility to cater to changes in orders
- Financial stability and sustainability
- Testimonials and references
- Prices
- Terms of business
- Customer service

7.2.1 | CARTER'S 10 Cs MODEL OF VENDOR EVALUATION

Carter's 10 Cs model is an internationally recognised approach for evaluating vendors. The 10 Cs may be considered to evaluate the potential vendors as well as assess the performance of the on-going vendors. The Cs are summarised as follows:

1. **Competency:** The model stresses that first of all the buyer organisation should check how competent the selected vendor is. After that, the capabilities of the vendor must be assessed against the requirements of the buyer organisation.
2. **Capacity:** The buyer organisation must check the capacity of the vendor to handle business requirements particularly in terms of responding swiftly to the changing needs and market and supply fluctuations. Also, a stock should be taken of the supplier's resources (staff, equipment, storage, etc.) as to whether they are sufficient for meeting their commitments.
3. **Commitment:** The buyer organisation must examine whether the vendor is committed to high quality standards within the organisation, such as ISO 9001 or Six Sigma. Also, it should be checked whether the vendor is committed to make on-time deliveries.
4. **Control:** The buyer organisation must check the level of control the vendor has over its policies, procedures and processes to ensure that deliveries are made as per its commitment.
5. **Consistency:** The buyer organisation must assess whether the vendor has efficient processes to ensure high quality goods, services or materials are delivered consistently.
6. **Cash:** This is a strong indicator of financial health. It is of utmost importance for a buyer organisation to check the financial position of the vendor. This is because vendors with surplus cash are in a better position to face economic ups and downs.
7. **Cost:** The buyer organisation must evaluate the cost of providing the product or service from a potential vendor and compare it with what other suppliers are providing. Most organisations consider cost as the main factor for selecting a vendor. However, as per Carter's model, factors such as commitment to quality and delivery and financial health of a supplier are primary factors for the selection. This is because these factors can potentially affect the business more than the cost alone.
8. **Culture:** Long-term business relationships are forged when there is alignment of workplace values. For instance, suppose a buyer organisation has the culture of delivering quality products, but the vendor is most concerned about meeting deadlines. In such a case, the vendor may compromise on the quality aspect, which may not be acceptable to the buyer organisation.
9. **Clean:** The buyer organisation must ensure whether the vendor is committed to sustainability and adheres to environmental laws and best practices.
10. **Communication:** It must be checked by the buyer organisation how efficient the communication channel of the vendor is. Also, the buyer organisation should check the following:
 - How the vendor plans to keep in touch with the organisation

- How swiftly the vendor can notify if there is a disruption in supply
- Which mode of communication will be used by the supplier
- Whether the communication by the vendor is quick enough so that the buyer organisation can adjust to changes notified without any discrepancies

Carter's 10Cs model can form the basis of a robust procurement management policy. Evaluation processes may be based on how the procurement team chooses to measure the bids which are received during the procurement process. The most common method deployed assigns the highest score to the vendor who delivers the maximum value compared to costs.



**SELF
ASSESSMENT
QUESTIONS**

3. _____ is created for soliciting further information to evaluate the shortlisted vendors.
4. The final step in the evaluation and selection process is awarding of contract to the selected vendor. (True/False)

7.3 VENDOR EVALUATION METHODS

A vendor's performance needs to be evaluated in a systematic manner in terms of meeting the quality of goods supplied, delivery, price, lead time and a combination of other parameters. One of the important goals of such an evaluation system is that it guides the buyer organisation to carefully select vendors for future engagements. The data received through evaluation helps in negotiating better with vendors during the selection process and ensures a consistent standard of vendor performance.

An effective vendor evaluation process helps in risk mitigation against the poor performance of vendors and enables sourcing from suppliers who deliver high standards of product and service levels. This, in turn, results in mutually beneficial, long-term business relationships with the vendor. Figure 2 shows the techniques of vendor evaluation:

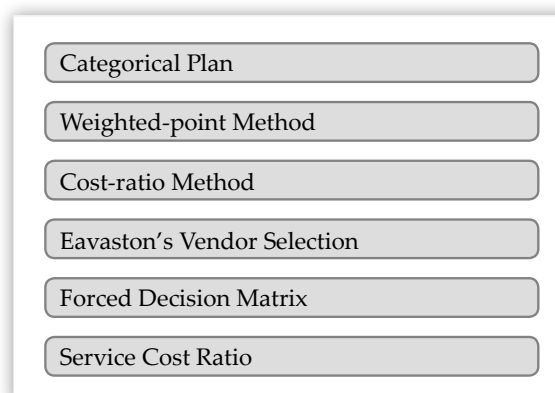


FIGURE 2: Vendor Evaluation Techniques

Let us discuss these techniques in detail.

7.3.1 | CATEGORICAL PLAN

In this method, the buyer organisation maintains a list of all vendors and their products. Periodic reviews of vendor performance are undertaken by an evaluation committee comprising all representatives. Vendors are given a positive, neutral or negative rating depending upon the performance. Further, performance trends are reviewed over a period of time and the vendor with increasing trend of positive rating is selected. Various parameters, such as price, quality, delivery time, etc., are considered and the vendor is assigned a grading of 'never', 'seldom', 'usual', 'always', etc., based on their performance against each. Although this system is subjective in nature, it provides a systematic record-keeping of performance criteria and is easy to implement.

7.3.2 | WEIGHTED-POINT METHOD

As compared to categorical method, the weighted-point method enables the buyer organisation to evaluate a vendor on a more objective basis. Weights are assigned to all key attributes, like price, quality, delivery based on their relative importance for the buyer organisation. The sum total of weights for all the attributes is 100. By multiplying each value of the attributes by their respective weights, the overall score/rating for a vendor is calculated, which would be compared with other vendors' score for making final selection. Thus, it combines quantitative and qualitative factors into a single score. This method requires proper records to be maintained. Let us understand this method with the help of an example.

ABC Ltd. is a manufacturing organisation that wants to select a vendor for obtaining supplies. The organisation has to select a vendor from three available options—Company X, Company Y and Company Z. It has decided to use the weighted-point method for vendor rating and make final selection. Factors considered will be quality (weight is 60%), delivery (weight is 25%) and price (weight is 15%). Let us rate the three vendors and make selection.

Solution

Price rating = (Price Ratio Lowest / Simpler Price) × 100

Here, the lowest price is ₹ 13.

Company X

Parameter of Rating	Lots Received	Lots Accepted/ Received as per Commitment	Quality Rating	Delivery Rating	Price Rating
Quality	90	80	$\frac{80}{90} \times 60$ = 53.33		
Delivery	90	70		$\frac{70}{90} \times 25$ = 19.44	

Parameter of Rating	Lots Received	Lots Accepted/Received as per Commitment	Quality Rating	Delivery Rating	Price Rating
Price per unit = ₹ 13.50					$\frac{13}{13.5} \times 15$ = 14.44
Weighted vendor rating of company X			53.33 + 19.44 + 14.44 = 87.21		

Company Y

Parameter of Rating	Lots Received	Lots Accepted/Received as per Commitment	Quality Rating	Delivery Rating	Price Rating
Quality	100	90	$\frac{90}{100} \times 60 = 54$		
Delivery	100	80		$\frac{100}{80} \times 25 = 20$	
Price per unit = ₹ 13					$\frac{13}{13} \times 15 = 15$
Weighted vendor rating of company Y			54 + 20 + 15 = 89		

Company Z

Parameter of Rating	Lots Received	Lots Accepted/Received as per Commitment	Quality Rating	Delivery Rating	Price Rating
Quality	70	60	$\frac{60}{70} \times 60$ = 51.42		
Delivery	70	60		$\frac{60}{70} \times 25$ = 21.42	
Price per unit = ₹ 14.50					$\frac{13}{14.5} \times 15$ = 13.44
Weighted vendor rating of company Z			51.42 + 21.42 + 13.44 = 86.28		

Company Y has got the highest vendor rating; thus it will be selected.

7.3.3 | COST-RATIO METHOD

In this method, all the identifiable purchasing costs are mapped to the value of shipments received from respective vendors. The rating of the vendor is inversely related to the ratio of costs to shipments. The higher the ratio of costs to shipments, the lower is the applicable rating of the vendor. The cost categories considered for the rating are quality, delivery, service levels and prices. Respective costs

are accumulated for each category. The respective cost ratios are factored in the vendor's quoted price to arrive at the net cost.

7.3.4 | EAVASTON'S VENDOR SELECTION

The past performance of the vendor is considered in selecting a vendor. The basic steps followed in this method are as follows:

1. The ranking of vendors is done based on the subjective evaluation of the buyer.
2. The first vendor which exceeds or meets the standards is selected.
3. If the vendors do not fulfil the minimum standards, then these may be relaxed till a satisfactory vendor is chosen.

7.3.5 | FORCED DECISION MATRIX

The primary factors affecting rating are first identified, like price, quality, service, reliability of the supplier, etc. These factors are then compared between themselves in pairs and the factor which is considered more important is given a weightage of one by the evaluation committee, whereas the other factor is given a zero weightage. For example, if price is considered more important than quality, then a weightage of one is given to price and zero to quality.

Each factor is compared against other factors and their relative weightages are recorded in the form of a matrix. Thereafter, for every attribute, weightages assigned are added up and then divided by the total number of comparisons to compute the weightage coefficient for every attribute. In the next step, vendors are compared in pairs with respect to each attribute to calculate the vendor weightage coefficient. Now the two types of coefficients calculated for vendors and attributes are multiplied and the total weightages added to determine the ranking of every vendor.

7.3.6 | SERVICE COST RATIO

There are some intangible factors that define a vendor's output which can only be measured subjectively. The first step is to tabulate service factors, like financial stability, research and development, quality of staff, location, flexibility in production, etc. Next, weights should be assigned to each factor depending upon the relative importance to the buyer and accordingly every vendor should be rated. A minimum acceptable standard of rating such as 70/100 should be established for choosing an appropriate vendor. In the next step, the percentage over or below the acceptable standard should be calculated. The figure calculated above should be multiplied by the value of package per cent depending upon whether it is a common or a sophisticated product. The percentage figure so calculated is minus if the percentage is above the minimum acceptable standard or plus if it is below the acceptable norm.

Let us understand the service cost ratio method with the help of an example.

A manufacturing company has to choose from three suppliers namely Supplier A, Supplier B, Supplier C. The company has given weights to different service factors

and the total of the weights given to service factors is 100. Further, the company has given rating to each of the supplier as shown in the following table:

***Acceptable service level is 70%**

*** Value of package percent for sophisticated items is 10% and for common items is 1%**

S. No.	Service Factor	Weight	Rating of Supplier A	Rating of Supplier B	Rating of Supplier C
1.	Financial Soundness	20	18	11	10
2.	Labour Stability	15	14	9	9
3.	Research and Development	10	9	6.5	8
4.	Skills of Staff	10	9	5.5	6.5
5.	Flexibility of Production	10	9	7	7.5
6.	Appropriateness of Location	10	9	5.5	6.5
7.	Precision Machinery	10	9	6.5	7.5
8.	Inventory Holding	5	4	1	3
9.	Cooperativeness	5	5	2	2
10.	Other Factors	5	5	2	3
TOTAL	100	91	56	63	

Now, let us calculate the percentage by which it is determined whether a supplier is above or below the acceptable norm. Thereafter, we will multiply the percentage obtained by value of package percent.

Supplier A

$$100 - \frac{91}{70} \times 100 = -30\%$$

On multiplying the percentage obtained by value of package percent, we will get:

$$-30 \times 10\% = -3\%$$

Supplier B

$$100 - \frac{56}{70} \times 100 = +20\%$$

On multiplying the percentage obtained by value of package percent, we will get:

$$+20 \times 10\% = +2\%$$

Supplier C

$$100 - \frac{63}{70} \times 100 = +10\%$$

On multiplying the percentage obtained by value of package percent, we will get:

$$+10 \times 10\% = +1\%$$

Thus, supplier A will be selected.



SELF ASSESSMENT QUESTIONS

5. In weighted point method, all the identifiable purchasing costs are mapped to the value of shipments received from respective vendors. (True/False)
6. In _____ method, the buyer organisation maintains a list of all vendors and their products.

7.4 CHALLENGES IN EVALUATION

Evaluating vendors can be a challenging, costly and inefficient process. Large organisations have a dedicated procurement department to undertake cost-benefit analysis to evaluate whether to perform an activity in-house or engage a vendor. Some challenges experienced by organisations in the evaluation of vendors can be mitigated with the use of appropriate tools like spreadsheets and Web electronic tendering systems. The ultimate goal of the organisation is to choose a vendor who can best fulfil the project objectives. Therefore, the selection process should be devoid of any bias and provide a basis for objective decision-making. The major challenges faced by the procurement team of the buyer organisation are explained as follows:

- **Managing the RFP/RFQ/RFI process:** The procurement team needs to strike a balance between over-specifying and under-specifying its requirements in the RFP/RFI/RFQ. The organisation runs the risk of engaging a vendor which fails to deliver the required functionality when it underspecifies its requirements. On the other hand, when detailed specifications are provided in the RFP/RFI/RFQ regarding what needs to be done and how it has to be done, the selected vendor has little flexibility to deliver innovative solutions.
- **Managing the interests of all stakeholders:** It can be a challenge to manage and co-ordinate procurement decisions among various stakeholders within the buyer organisation. A large cross-section of the buyer organisation should be involved in the decision-making process so that there is a greater buy-in of users across multiple levels and departments.
- **Vendor-related issues:** A major challenge faced by procurement professionals is related to identifying the best suppliers, ensuring a stable supply of quality materials from them, and monitoring performance of suppliers.
- **Lowest price bid:** A common mistake made by the procurement team is to select the vendor offering the lowest price bid without considering the total costs of ownership. For example, the price of software being purchased by the buyer organisation represents only 15%-20% of the total costs of ownership over a 10-year horizon. In addition to the cost of the software, one needs to factor in the costs of hardware to run it, implementation, maintenance and integration costs.

- **Recruiting, retaining and training talent:** Procurement is a specialised field and it is critical to have knowledgeable and experienced staff in the core team. Also, the primary focus should be on retaining the talent and providing skill upgrade and continuous professional development opportunities.
- **Anticipating future needs:** In most of the cases, buyer organisations focus only on their immediate needs and do not consider how their businesses will evolve over the years. As a result, they end up choosing vendors offering mature products built on earlier technology platform, thus losing out on using emerging technologies like IOT and Cloud.
- **Strategy selection:** Procurement is increasingly being viewed as a strategic function instead of merely being an operational function. However, figuring out how it can be implemented to unlock strategic value particularly when it may need co-ordination across multiple locations and functional units is quite challenging.



**SELF
ASSESSMENT
QUESTIONS**

7. Large organisations have a dedicated procurement department to undertake cost-benefit analysis to evaluate whether to perform an activity in-house or engage a vendor. (True/False)
8. A common mistake made by the procurement team is to select the vendor offering the _____ price bid without considering the total costs of ownership.

7.5 SUMMARY



In the globalisation era, contract with a vendor is found around the world. Selection and evaluation of vendors play a pivotal role in the success of the purchasing department. There are multiple factors, such as quality of work, financial stability, years in business, timely delivery, value for money, reliability, etc., which need to be considered for selecting the ideal outsourcing vendor. Vendors are broadly classified into the following categories – manufacturer, distributor, wholesaler, retailer and importer. A step-by-step vendor evaluation and selection process should be followed to ensure that the final decision is in the best interest of the buyer. This should broadly include the following steps: (i) analysing the business requirements; (ii) vendor search; (iii) request for proposal (RFP); (iv) proposal evaluation and vendor selection; and (v) awarding contract/signing agreement.

The Carter 10Cs model provides a broad framework for the evaluation of suppliers and the criterion defined in the model may be considered in designing the questionnaire during the evaluation process. The final step in the evaluation and selection process is preparing for awarding contract to the selected vendor, which culminates with the signing of the contract agreement. The key parameters determining rating of vendors are price, quality, delivery, and lead time of supply. The categorical plan uses qualitative factors for the evaluation of the vendor, whereas the weighted point method uses a combination of quantitative and qualitative factors for assigning ratings. The past performance of the vendor is considered in the Eavaston's vendor selection method. Large firms have a dedicated procurement department to undertake cost-benefit analysis to evaluate

whether to perform an activity in-house or engage an external vendor. The major challenge faced by procurement team of the buyer is in managing the RFP/RFQ/RFI process in a balanced way.

7.6 KEY WORDS



- **Bid price:** The highest price that a buyer is willing to pay for a product
- **Importer:** A person or company that buys goods from another country in order to sell them
- **RFP:** A request for proposal is a formal document which solicits bid proposals from contractors
- **RFQ:** A request for quotation is a formal document which an organisation submits to the potential suppliers to gain quotes for products and services
- **Risk mitigation:** A strategy to prepare for and lessen the effects of threats of something

7.7 CASE STUDY: BING DESIGN AGENCY'S STRATEGY FOR VENDOR SELECTION



Bing Design Agency is a small marketing communications firm that employs around 15 people. Its customer base includes corporate clients, colleges, hospitals and non-profit organisations. The agency requires a company-wide calendar.

Employees are a mix of in-house and virtual who are operating from the remote locations. It was difficult to schedule meetings, communication of vacations and out-of-office time in the absence of a company-wide calendar.

Meetings were scheduled blindly, which led to multiple revisions of time and date through multiple emails/phone calls to all the participants.

Objective

Select a company-wide calendaring application

Challenges

Bing Design faced the following challenges:

- Poor IT infrastructure – There was no exchange server
- Majority of employees had little or no knowledge of MS Office applications
- Majority of employees did not see value in using global calendar
- Users were mostly working on Macs and PCs
- In-house and virtual users who had time zone differences
- Limited budget **Bing's Approach Phase 1**

Detailed preliminary research of calendar applications which could be installed in the existing environment was done. Major players which offered calendaring

solutions were identified. Market research was done to identify what other marketing communication agencies and small businesses were deploying.

Extensive primary research of the five shortlisted players was undertaken. Criteria used to conduct research and request for proposals to solicit bids are as follows:

- Summary of current systems
- Budget
- Implementation
- Client-based solution vs. Web-based solution

Following applications were researched:

- Clients and Profits – time and project tracking for creative professionals
- Functionfox – time and project tracking for creative professionals
- NowTime – Calendar and contact management tool
- HyperOffice – Online collaboration set of tools
- Google applications – Online collaboration set of tools

Phase 2

Put the entire team together including IT, internal users and virtual users. Final selection was supported by a structured approach for vendor selection which included:

- Trial usage if available
- Live demo
- Written and verbal questions to vendor

Benefits

Bing reaped benefits from going through a vendor selection experience. In the past, users were not part of the selection process and gave perspective to users of the importance of involving a cross-section of the firm. The key benefits of this process were that the application providers were thoroughly researched, users realised the significance of having a global calendar and comparison of different solutions resulted in substantial cost savings.

Result

Bing was able to select the vendor which would provide the most robust solution at the best price – Google applications. The major advantages of this selection was that (i) there was no capital expenditure on the application; and (ii) this application paved the way for using other services offered in Google applications.

QUESTIONS

1. As a procurement team member, would you recommend Bing to outsource the company calendar application after evaluating costs and benefits?

(Hint: Outsourcing firm performed thorough research which would lead to substantial cost savings)

2. How will you convince the management in following this evaluation approach which is more time-consuming and requires extensive market research?

(Hint: It can help in providing the most robust solution at the best price)

7.8 SHORT ANSWER QUESTIONS



1. A _____ purchases supplies in bulk, stores them and sells in small quantities to retailers.
2. In preparing for awarding contract, a contract _____ strategy needs to be developed.
3. A _____ document is circulated to selected vendors to collect information from them regarding their abilities to produce the supplies/product, technical capabilities, plant capacities, etc.
4. Carter's 10Cs model provides a broad framework for _____ of suppliers.
5. An effective vendor evaluation process helps in _____ mitigation against poor performance of vendors and enables sourcing from suppliers who deliver high standards of product and service levels.
6. The rating of the vendor is _____ related to the ratio of costs to shipments.
7. The weighted point method relies on quantitative as well as qualitative factors to rank vendors (True/False)
8. A manufacturer purchases supplies from wholesalers and sells them to businesses/buyer organisations. (True/False)
9. Carter's 10Cs model can form the basis of a robust procurement management policy. (True/False)
10. In the cost-ratio method, the higher the ratio of costs to shipments, the higher is the applicable rating of the vendor. (True/False)
11. Which of the following purchases supplies from wholesalers and sells them to businesses/buyer organisations?
 - a. Importer
 - b. Retailer
 - c. Distributor
 - d. Manufacturer
12. In which of the following cases do buyer organisations purchase supplies from organisations across borders?
 - a. Importer
 - b. Retailer
 - c. Distributor
 - d. None of these

13. Which of the following activities are of utmost importance for production operations of the buyer organisation?
 - a. Identification of potential vendors
 - b. Selection of reliable vendors
 - c. Both a and b
 - d. None of these
14. Which of the following details are provided in an RFP?
 - a. Submission details
 - b. Introduction and executive summary
 - c. Business overview and background
 - d. All of these
15. Which of the following is computed to select the winning vendor?
 - a. Total performance score
 - b. Total cost to company
 - c. Total investment cost
 - d. None of these
16. In which of the following methods is the past performance of the vendor considered in selecting a vendor?
 - a. Cost-ratio method
 - b. Eavaston's vendor selection
 - c. Service cost ratio
 - d. None of these
17. In which of the following methods all are identifiable purchasing costs mapped to the value of shipments received from respective vendors?
 - a. Cost-ratio method
 - b. Eavaston's vendor selection
 - c. Service cost ratio
 - d. None of these
18. Vendor selection is dependent on which of the following factors?
 - a. Price
 - b. Quality
 - c. Delivery time
 - d. All of these
19. Which of the following methods enables the buyer organisation to evaluate a vendor on a more objective basis?
 - a. Cost-ratio method
 - b. Eavaston's vendor selection
 - c. Service cost ratio
 - d. Weighted-point
20. Which of the following does not come under the 10 Cs model?
 - a. Competency
 - b. Commitment
 - c. Control
 - d. Client
21. In which of the following cases are vendors given a positive, neutral or negative rating depending upon the performance?
 - a. Categorical plan
 - b. Cost-ratio method
 - c. Service cost ratio
 - d. None of these

22. Which of the following is the first step of the process of vendor selection and evaluation?
 - a. Vendor Search
 - b. Business requirements analysis
 - c. Preparation of Request for Proposal (RFP)
 - d. None of these
23. Which of the following is the last step of the process of vendor selection and evaluation?
 - a. Vendor search
 - b. Business requirements analysis
 - c. Preparation of Request for Proposal (RFP)
 - d. Proposal evaluation and vendor selection
24. Which of the following documents is created for soliciting further information to evaluate the shortlisted vendors?
 - a. RFQ
 - b. RFP
 - c. RFI
 - d. None of these
25. Which of the following is a strong indicator of financial health?
 - a. Commitment
 - b. Cost
 - c. Cash
 - d. Culture

7.9 HIGHER ORDER THINKING SKILLS (HOTS)



1. Which of the following qualities of vendors are of utmost importance?
 - a. Financial security
 - b. Value for money
 - c. Quality
 - d. All of these
2. Which of the following 'Cs' from Carter's model delineates that the buyer organisation must ensure whether the vendor is committed to sustainability and adheres to environmental laws and best practices?
 - a. Clean
 - b. Control
 - c. Cost
 - d. Competency
3. When a buying organisation asks the vendor to provide the quotes for supplies, which of the following documents is used?
 - a. RFQ
 - b. RFP
 - c. RFI
 - d. None of these
4. A budget-constraint buying organisation faces quality issues in supplies with the vendor. According to you, which of the following would be the most probable reason of facing quality issues?
 - a. Lowest-price bid
 - b. Managing the RFQ
 - c. Vendor-related issues
 - d. Both a and c

7.10 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Types of Vendors	1.	d. Distributor
	2.	True
Vendor Selection and Evaluation Process	3.	RFP
	4.	True
Vendor Evaluation Methods	5.	False
	6.	categorical plan
Challenges in Evaluation	7.	True
	8.	lowest

B. SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	wholesaler
2.	negotiation
3.	request for information (RFI)
4.	evaluation
5.	risk
6.	inversely
7.	True
8.	False
9.	True
10.	False
11.	b. Retailer
12.	a. Importer
13.	c. Both a and b
14.	d. All of these
15.	a. Total performance score
16.	b. Eavaston's vendor selection
17.	a. Cost-ratio method
18.	d. All of these
19.	d. Weighted-point
20.	d. Client
21.	a. Categorical plan
22.	b. Business requirements analysis
23.	d. Proposal evaluation and vendor selection
24.	b. RFP
25.	c. Cash

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	d. All of these
2.	a. Clean
3.	a. RFQ
4.	d. Both a and c

7.11 SUGGESTED BOOKS AND E-REFERENCES**SUGGESTED BOOKS**

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VALUE ANALYSIS

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Discuss the value analysis framework
- ▶ List objectives of value analysis
- ▶ Describe advantages of value analysis
- ▶ Explain advanced value analysis tools
- ▶ State the importance of value analysis questionnaire



INTRODUCTION



Read

Pre-read Connect

In the previous chapter, you have studied about the concept of negotiation. You have studied how negotiation helps the buyer organisation get best price quotes of supplies from vendors, which ultimately helps the organisation manage overall cost. Another important technique of cost reduction in materials management is value analysis.

Value analysis is used by managers as a means of cost reduction and cost control tool to ensure that the required functions of a product can be offered at the minimum possible cost without compromising an features like quality, reliability, performance and appearance of the product. The concept of value analysis was originated in the General Electric Company. The post-World War II period witnessed a shortage of materials which affected production activities all over the world. To find a solution to this problem, a committee was created where a young engineer, Lawrence D. Miles suggested that alternate substitute materials could be used for production only if they cost less and were available easily. Until now, there was no concept using value alternatives and his findings gave the concept of value as a ratio of function cost.

Thus, Lawrence D. Miles gave the concept of value analysis as a 'systematic, organised effort to identify hidden, unnecessary costs of materials, products and processes which do not add to value; and eliminate these unnecessary costs and features to get the intended function at the minimum cost':

Value Ratio = Function/Cost

The above implies that value ratio can be improved either by reducing the cost for the same functions or increasing the functions while keeping the costs the same.

Lawrence D. Miles opined that 99 per cent of products/production systems are designed in a way that they involve various unnecessary functions, and potential cost reduction in the range of 10-15 per cent is possible by identifying and eliminating the same. Thus, value addition is basically 'getting more from less'.

In this chapter, you will study about the value analysis framework, its objectives and advantages. The chapter also explains advanced value analysis tools. Towards the end, the chapter outlines the significance of value analysis questionnaire.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the role of value analysis in cost reduction
- Outline the objectives of value analysis
- Examine the advantages of value analysis
- Determine the role of advanced value analysis tools
- Explain the importance of the value analysis questionnaire

8.1 VALUE ANALYSIS FRAMEWORK

Important Concept

Generally, the term 'value analysis' is used synonymously with the term 'value engineering'. However, there is a difference between the two. Value analysis is associated with the cost-function analysis of the existing product or process, while value engineering is related to design analysis and engineering of the product before manufacturing.

Important Concept

Before dwelling into the concept of value analysis, let us first understand the meaning of the term 'value'. Value serves as a measure to accomplish the expected performance of a function along with necessary appearance and attractiveness. Value is identified as primary, secondary and tertiary based on functional performance. For an organisation especially in materials management, value can be of the following types:

- **Use value:** It comprises the basic features required to accomplish a work. In other words, tangible features of a product that satisfy consumers' needs/wants, or serve a required purpose contribute to its use or functional value.
- **Esteem value:** It provides attractive features required.
- **Scrap value:** It refers to money that can be recouped when an item/material is not in use.
- **Cost value:** It includes costs associated with resources, such as labour and material, required to produce a product.
- **Exchange value:** It includes features that allow exchanging a product/item for something else. In other words, the additional price that a product/service can draw owing to some unique features that make costumers feel good about owning the product constitutes the esteem value.
- **Best value:** It is provided when a consumer is satisfied with the performance and agrees to buy the product at a competitively better price.

Since obtaining value is important for an organisation, a great amount of time and effort are employed by the organisation in analysing value. Value analysis is a method that is used to improve value by eliminating unnecessary costs in various areas, such as product design, testing, manufacturing, construction, operations and maintenance. However, the method stresses upon the fact that there should be no loss of functional utility/guarantee/safety performance while eliminating unnecessary costs of the product.

According to Lawrence D. Miles, "Value Analysis is a philosophy implemented by the use of a specific set of techniques, and a group of learned skills. It is an organised creative approach which has the purpose of the efficient identification of unnecessary cost, i.e., cost which provides neither quality, nor use, nor appearance, nor customer features."

In an organisation, the value analysis process is carried out by the value analysis team. The process is performed in sequential phases, which are listed in Figure 1

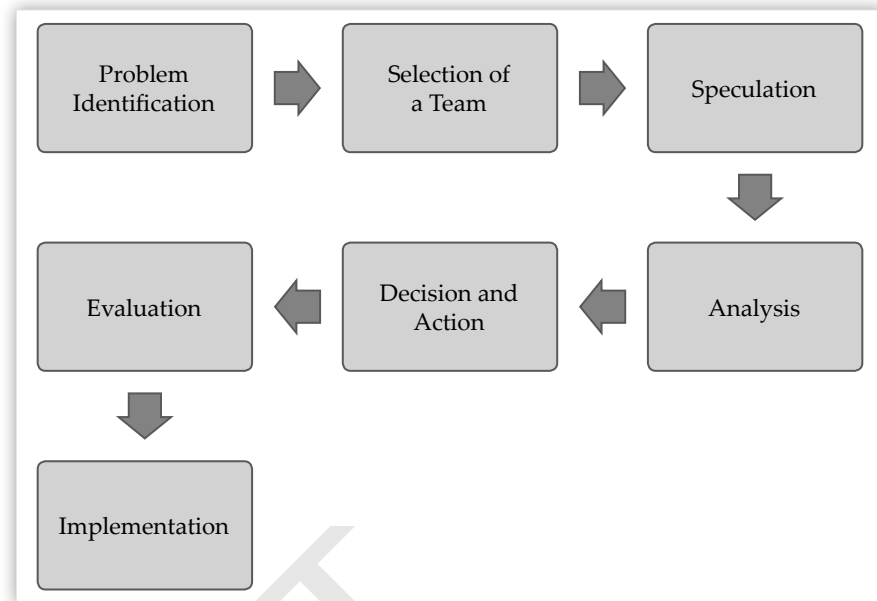


FIGURE 1: Phases in Value Analysis

Let us discuss these phases in detail.

1. **Problem identification:** This is the foremost step wherein the management recognises the problem and gets ready for the value analysis process. These problems can be related to high production cost, low yield rates, better product of competitors, complex design of the product, remodelling of market demands, and so on. Basically, in this phase, a function whose cost is to be reduced is defined and all the facts are obtained and interpreted.
2. **Selection of a team:** At this phase, a team of 6-8 members is formed from different departments, such as purchasing, accounting, production and engineering. This team is responsible for carrying out the value analysis process.
3. **Speculation:** At this phase, issues/problems identified in the first phase are addressed. Also, the management discusses the scope of improvement and evaluation factors with the team members. This is done by obtaining information about an organisation's internal environment (information on manufacturing and marketing efforts, materials, product design, etc.) and external environment (information on competitors' product design, new technologies, etc.)
4. **Analysis:** At this phase, all key and supporting functions of a product are identified. Thereafter, all parts of the product are dismantled and demonstrated. After that, the functional relationship of all the parts is developed. Finally, a table is created that shows the relationship between the functions and parts and their associated costs.
5. **Decision and action:** In this phase, a number of ideas are generated so that the problem identified in the first phase can be resolved. During this exercise, ideas are not evaluated and are taken as they come. The ideas given

by team members are accumulated for the evaluation and development of a satisfactory solution of the problem identified.

6. **Evaluation:** In this phase, the best idea is selected, approvals are taken from all the departments and new specifications are developed. The main aim of selecting the best solution for the problem is to lower down the cost. The selected idea can be related to using a new material, adopting a new manufacturing method, adding new functions/modifying functions to/of the existing product, eliminating some functions, and so on.
7. **Implementation:** This is the final phase of the value analysis process wherein the best alternative is developed and presented to the management. Thereafter, a course of action for initiating the best alternative is developed. Once the approval from the management is taken, the solution is actually implemented.



EXHIBIT

**VALUE ENGINEERING AT THE FEDERAL HIGHWAY
ADMINISTRATION (FHWA), THE US DEPARTMENT OF
TRANSPORTATION**

The Federal Highway Administration defines Value Engineering (VE) as *'the systematic application of recognised techniques by a multi-disciplined team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost'*. The *'systematic application of recognised techniques'*, referred to in the above definition is embodied in the VE Job Plan.

Following table shows the VE job plan of FHWA:

Phase	Objective	Key Questions	Techniques	Tasks
Selection	Select a project	<ul style="list-style-type: none"> • What is to be studied? • Who is best able to study the problem? • What must be known to start the study? 	<ul style="list-style-type: none"> • Solicit project ideas • Identify high cost/ low value areas • Plan the project to obtain • Authorisation to proceed • Allocate resources 	<ul style="list-style-type: none"> • Speculate on project sources • Develop plan to identify projects • Evaluate projects for potential • Present projects to management • Select projects for VE studies • Implement study plan
Investigation	Investigate the project	<ul style="list-style-type: none"> • What is the project? • What is the problem? • What is the cost? • What is accomplished now? • What must be accomplished? 	<ul style="list-style-type: none"> • Get information from best sources • Get all facts and available costs • Work with specifics • Identify the functions • Challenge everything 	<ul style="list-style-type: none"> • Speculate on data sources • Develop plans to gather data • Implement data search plan • Investigate project audit data • Speculate on functions performed

Phase	Objective	Key Questions	Techniques	Tasks
	Analyse function and cost	<ul style="list-style-type: none"> • What is the basic function worth? • What are secondary functions worth? • What are high cost areas? • Can any functions be eliminated? 	<ul style="list-style-type: none"> • Evaluate by comparison • Put money on specs. and requirements • Put money on key tolerances and finishes • Put money on key standards 	<ul style="list-style-type: none"> • Analyse costs • Analyse functions • Evaluate function cost/ worth • Evaluate project potential • Select specific study areas
Speculation	Speculate on alternatives	<ul style="list-style-type: none"> • What else will perform the function? • Where else may function be done? • How else may function be done? 	<ul style="list-style-type: none"> • List everything Be imaginative • Use creative techniques • Defer judgement • Do not criticise • Be courageous 	<ul style="list-style-type: none"> • Select techniques to be used • Speculate on alternatives • Speculate on parameters
Evaluation	Evaluate alternatives	<ul style="list-style-type: none"> • What is the project? • What is the problem? • What is the cost? • What is accomplished now? • What must be accomplished? 	<ul style="list-style-type: none"> • Weigh alternatives • Choose the evaluation criteria • Refine ideas • Put money on each main idea • Evaluate by comparison 	<ul style="list-style-type: none"> • Speculate on the evaluation criteria • Evaluate the alternatives • Select the best alternative
Development	Develop alternatives	<ul style="list-style-type: none"> • How will the new idea work? • How can the disadvantages be overcome? • What will be the total cost? • Will it meet all the requirements? • What are the life-cycle costs? 	<ul style="list-style-type: none"> • Get information from best sources, specialists and suppliers • Consider specialty material, products and processes • Consider standards • Use new information • Compile costs • Work with specifics 	<ul style="list-style-type: none"> • Speculate on the information needed • Speculate on the information sources • Develop a plan of investigation • Develop the selected alternatives • Select preferred alternatives • Develop the implementation plan • Audit data
Presentation	Present alternatives	<ul style="list-style-type: none"> • Who must be sold? • How should the idea be presented? • What was the problem? 	<ul style="list-style-type: none"> • Make recommendations • Use selling techniques • Be factual • Be brief 	<ul style="list-style-type: none"> • Develop a written proposal • Speculate on roadblocks to acceptance

Phase	Objective	Key Questions	Techniques	Tasks
		<ul style="list-style-type: none"> • What is the new way? • What are the benefits/ savings? • What is needed to implement the idea? 	<ul style="list-style-type: none"> • Give credit • Provide an implementation plan 	<ul style="list-style-type: none"> • Present VE study alternatives
Implementation	Implement alternatives	<ul style="list-style-type: none"> • Who is to implement change? • How will plans/ contract be amended? • Have all resources been allocated? 	<ul style="list-style-type: none"> • Translate plan into action • Overcome problems • Expedite action • Monitor project 	<ul style="list-style-type: none"> • Develop change document • Implement approved alternatives • Evaluate process
Audit	Audit results	<ul style="list-style-type: none"> • Did the new way work? • What did it cost? • What was saved? • Did the change meet expectations? • Who is to receive recognition? 	<ul style="list-style-type: none"> • Verify accomplishments • Make awards • Report to the management 	<ul style="list-style-type: none"> • Audit implementation results • Evaluate project results • Present project results • Present awards

Source: <https://www.fhwa.dot.gov/ve/vejjob.cfm>

8.1.1 OBJECTIVES OF VALUE ANALYSIS

According to Lawrence D. Miles, "On an average, one-fourth of manufacturing cost is unnecessary. The extra cost continues because of patterns and habits of thought, because of difficulties in promptly disseminating ideas, and because today's thinking is based on yesterday's knowledge." This can be achieved by reducing or eliminating unnecessary costs without affecting the desired quality and reliability of the product as expected by the end users. The basic objective of value analysis is to deliver total cost control at any point in a product's life cycle. Following are some other objectives of value analysis:

- To select the necessary functions so as to reach the required performance with the lowest overall cost of product or processes
- To improve/enhance product design and create better product value
- To identify the essential and non-essential functions of products and processes through a multi-disciplined team of experts
- To find out alternate ways of performing functions at a lower overall cost
- To enable the organisation to improve its competitive position

8.1.2 | ADVANTAGES OF VALUE ANALYSIS

The main advantage that value analysis offers is the potential to reduce product cost without hampering the use value. Some of the main advantages of applying the value analysis in the production process are listed in Figure 2:

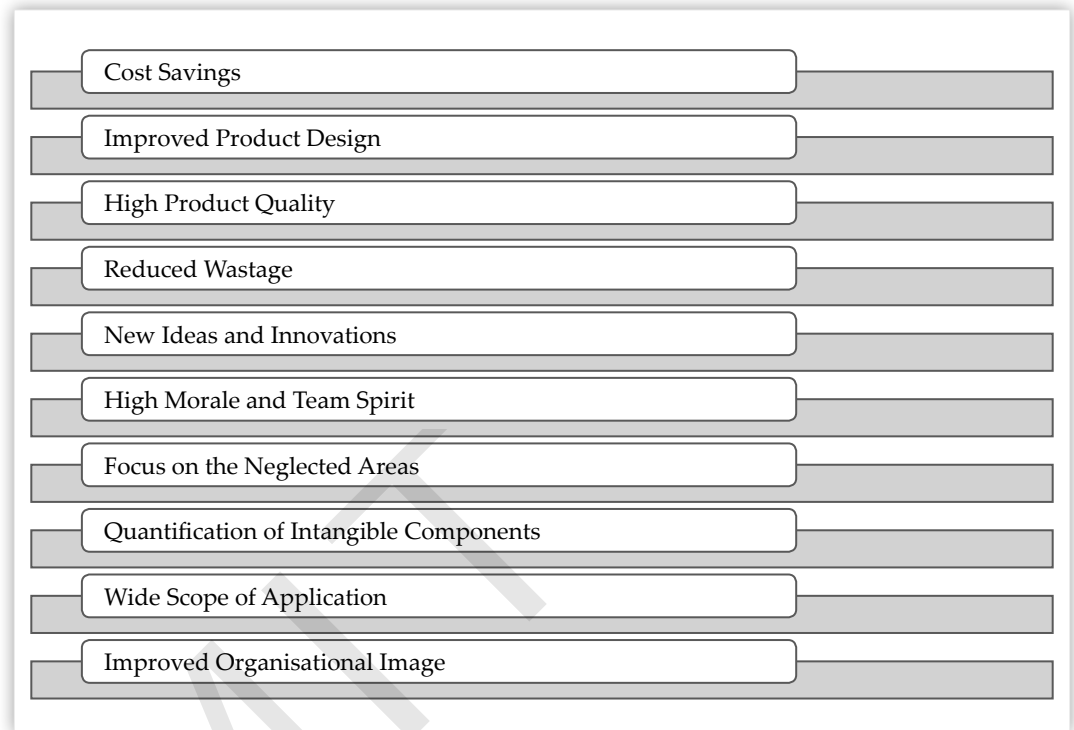


FIGURE 2: Advantages of the Value Analysis Technique

Let us discuss each of these advantages in detail:

- **Cost savings:** The main advantage of value analysis is to remove unnecessary costs without altering the functional value and quality of the product. For example, making bulk purchases would further reduce the cost of material and, hence, the cost of product.
- **Improved product design:** Value analysis results in improvement in product design so that more useful products can be offered to consumers. For example, with improvement, ball-point pens nowadays have no clogging and ink flow. Also, rubber cushioning reduces the strain on fingers.
- **High product quality:** High quality leads to better product value. Therefore, dry batteries have become leak-proof come in smaller sizes and are rechargeable.
- **Reduced wastage:** Value analysis improves organisational efficiency by eliminating various types of wastages. For example, many consumer items can now be recycled and reused which avoid them finding their way into dump yards.
- **New ideas and innovations:** New alternatives to produce a given item are discovered through value analysis of the production cycle. For example,

implementation of Kaizen philosophy has resulted in several organisations continuously finding new ways to improve quality, reduce set-up time, mitigate errors, and improve workflow while eliminating unwanted costs of production.

- **High morale and team spirit:** The benefits of value analysis cannot be achieved by an individual alone and is rather a team effort. In this way, value analysis cultivates team spirit and increases employee morale as they work together for greater success of the organisation.
- **Focus on the neglected areas:** Through value analysis, areas that need improvement are focussed upon. In this way, weak areas of the production process are improvised and contribute to join the cost reduction objective.
- **Quantification of intangible components:** The whole process of value analysis involves quantifying intangible factors that affect production into tangible factors for decision making. Through value analysis, decision makers get access to qualified data based on which they can make changes or suggest improvements in the production process.
- **Wide scope of application:** The principles and techniques of value analysis can be applied to various divisions within an organisation, such as procurement, machinery, products, process and systems.
- **Improved organisational image:** The status of an organisation depends on the quality of product/service that they offer to customers. Value analysis helps these organisations further improve the quality of their output at even lower costs. Such products are highly competitive and earn a good image in the market.



**SELF
ASSESSMENT
QUESTIONS**

1. _____ serves as a measure to accomplish the expected performance of a function along with the necessary appearance and attractiveness.
2. _____ is a method that is used to improve value by eliminating the unnecessary costs in various areas, such as product design, testing, manufacturing, construction, operations and maintenance.
3. In the implementation phase of the value analysis process, the best alternative is developed and presented to the management. (True/False)
4. The basic objective of value analysis is to increase cost at any point in a product's life cycle. (True/False)
5. Value analysis results in improvement in _____ so that more useful products can be offered to consumers.

8.2 ADVANCED VALUE ANALYSIS TOOLS

From the discussion so far, it can be said that value analysis is based on the application of a systematic work plan with an aim to reduce cost by eliminating functions that do not provide specific advantages to satisfy customer needs. This is done by using various tools and techniques.

Figure 3 shows some commonly used techniques of value analysis:

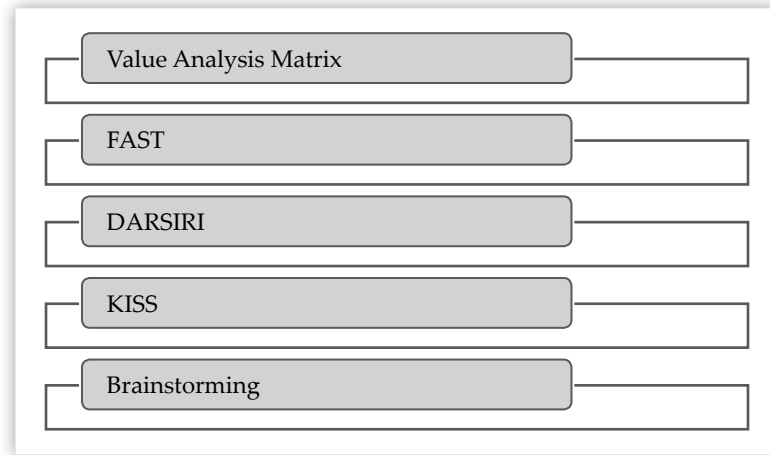


FIGURE 3: Techniques of Value Analysis

Let us discuss these techniques in detail.

- **Value analysis matrix:** The matrix is used to identify the cost of providing product functions by linking each function with a component part of the product. The purpose of this matrix is to focus it on the contribution of product functions and not just emphasise on the cost of components.

Let us understand the value analysis matrix with the help of an example. Brooke Bicycles uses the value analysis matrix to develop a new bike. For this purpose, the bike is broken down into components in order to depict how each component contributes to four basic functions of a bicycle, which are:

- Structural
- Motion
- Control
- Aesthetic

Figure 4 shows the value analysis matrix of Brooke Bicycles:

Component	Cost	Functions							
		Structural		Motion		Control		Aesthetic	
Front fork	\$16	45%	7.20			45%	7.20	10%	1.60
Pedals	\$8			90%	7.20			10%	0.80
Gears	\$14			70%	9.80	30%	4.20		
Saddle	\$10	20%	2.00					80%	8.00
Total	\$48		9.20		17.00		11.40		10.40

FIGURE 4: Value Analysis matrix of Brooke Bicycles

Source: <https://www.praxisframework.org/en/library/twe-value-analysis>

The benefit of conducting such an activity is that the value analysis team can assess whether the cost of each function and component is balanced. Based on their assessment, new ideas and combinations can be explored and tested and the best possible outcome can be put to use for achieving a competitive advantage.

- **FAST:** FAST stands for 'Functional Analysis System Technique'. This technique was developed in 1965 by Charles W. It is used to visually show the relationship between functions performed by a product, service or system. The same is done to identify areas that bear the greatest impact on costs. This gives a detailed understanding of the interaction of function and cost. FAST is similar to a network diagram and involves the following steps in construction:
 - a. Make a list of all functions of the product
 - b. Write each function on a small card
 - c. Select the card relating to the basic function
 - d. Find the position of the higher and lower functions by answering the following questions:
 - ✓ How is this function completed?
 - ✓ Why is this function required?
 - ✓ When is this function executed?

A critical path is created comprising only vital functions that must be performed to accomplish the functions.

- **DARSIRI:** In Sanskrit, Darsiri means 'to consider' and also follows similar approach in value engineering. The Darsiri method involves the following steps:
 - Data collection
 - Analysis
 - Record ideas
 - Speculate
 - Investigate
 - Recommend
 - Implement

These steps are similar in application to the VE Job Plan.

- **KISS:** The KISS principle stands for 'Keep it Short and Simple' and states that most systems work best if they are kept simple rather than complex. Simplicity should be one of the main objectives in design, and unnecessary complications must be avoided. Organisations should aim to make the production system simple avoiding unwanted steps so as to reduce costs and keep the system dynamic. The basic idea is to reduce the definition of value of a function down to two words, a noun and a verb. For example, the function of a gas stove is to 'provide ignition'. Later, the functions are classified as

primary and secondary. There should be only one primary function and a few important secondary functions.

- **Brainstorming:** The objective of value engineering/value analysis is to develop ideas for alternatives and substitutes to accomplish functions defined in a system. To improve the quality and innovativeness of the suggested alternatives, value-focussed brainstorming is performed. It incorporates two features of value-focussed thinking. One, it identifies the value of potential alternatives, specified as objectives in order to guide participants to create alternatives that generate higher value. Second, all participants individually create alternatives prior to group discussions, which ensures that the complete range of each participant's thoughts are articulated.



**SELF
ASSESSMENT
QUESTIONS**

6. _____ is used to identify the cost of providing product functions by linking each function with a component part of the product.
7. The KISS principle stands for _____ and states that most systems work best if they are kept simple rather than complex.
8. To improve the quality and innovativeness of the suggested alternatives, value-focussed _____ is performed.

8.3 VALUE ANALYSIS QUESTIONNAIRE

Organisations constantly assess and test ways to reduce manufacturing and purchasing costs in order to offer a product at the lowest possible price. Value analysis is the tool that comes in handy to achieve this objective as it offers organisations, the benefit to weigh costs against the function of a product or service. It allows managers to take into consideration every aspect of a process with regard to how useful it is to the customer, stakeholder or another business. Through this method, each step is studied and questioned from the perspective of the benefit that it can accrue to a prospective buyer. In case the value generated from a cost is negligible, the same can be removed completely from the product allowing organisations to align operations efficiently and reducing the use of resources. A flexible and progressive business is more likely to remain competitive and sustainable in the long run.

However, the question is how organisations determine whether a certain value addition was useful for the consumer or not. One of the most reliable methods is to gather information from users directly through the questionnaire. The existing system offers the facility of gathering information through an electronic project management workflow tool. This tool engages multiple stakeholders, collects facts and accumulates various informational resources that can be evaluated to make the best decisions.

Given herewith are examples of the key pieces of information that organisations consider which can be customised to suit individual needs:

Questionnaire A

Suppliers

- What type of materials do you supply?

- Is there any typical process to place an order by a customer?
- Once the order is placed, how is it processed?
- Do you use any computer to process the orders?
- Who monitors the process?
- Do you use any technology (i.e., barcodes, EDI, RFID) for inventory control?
- What happens if you don't have the quantity required by the customer?
- Do you have many customers asking the price matching?
- Do you pack all materials needed by a contractor in a pallet and have them ready for pick-up by the customer?
- Do you do JIT delivery?
- How effective is your delivery in terms of time and quality?
- What are the major problems that you can identify in the system?

Contractors

- What is the type of materials that you usually buy from suppliers?
- How do you typically place an order?
- Who monitors the process and ensures that the materials will be on site when needed?
- Do you use any technology (i.e., barcodes, EDI, RFID) for inventory control on site?
- Do you typically pick your materials or you like the supplier to deliver them?
- Do you keep inventory on site?
- Do you use JIT delivery?
- How effective is the delivery of suppliers in terms of time and quality?
- What are the major problems that you can identify in the system?

Questionnaire B

Storage Process

- Where are the materials stored?
- How do you keep track of materials installed/remaining? Tie with the stock requisition question.

Inventory

- Who manages the on-site inventory?
- Does the distributor provide an on-site truck?
- Does the supplier provide inventory management?
- Based on what do you schedule a material's release?

Materials Handling

- What are the major difficulties when handling materials on-site?
- Who is in charge of the materials handling plans and procedures?
- Based on what do you move materials to the site?
- How often do you move materials to the site?
- What happens if there are problems with material shortages or materials damaged?

Problem Areas

- What do you think are the bottlenecks?
- Are there any suggestions for improvement?

Questionnaire C

General

1. Do you have a classification for materials? Can you provide examples.
2. What are the major problems that you can identify in the system overall? What is the major problem that you feel has to be fixed? Can you elaborate on major issues?
3. What are the types of material that you usually buy from suppliers?
4. How do you typically place an order? Give examples. Is the process different for different types of materials?
5. Do you typically pick your materials or would you like the supplier to deliver them?
6. Which type of materials you must likely pick up? Which type of materials would you prefer to be delivered to you?
7. Who follows up the order and makes sure that the materials will be on site when needed?
8. What are the procedures used to evaluate the potential suppliers?
9. What are the typical problems associated with the qualification process?
10. How are quality issues specified to the supplier?
11. What are the typical problems associated with quality issues?
12. How are inspection procedures specified to the suppliers? Are the inspection procedures different for different types of materials?
13. What are the typical problems associated with the received materials from suppliers?
14. Do you use a computer in your company for material ordering, material tracking?
15. How effective is the computer system used for materials ordering, tracking?
16. Do you use any technology for inventory control on site?

17. What are the problems associated with technologies used for materials management?
18. Do you use JIT delivery?

Source: https://shodhganga.inflibnet.ac.in/bitstream/10603/3404/17/17_appendix.pdf



SELF ASSESSMENT QUESTIONS

9. One of the most reliable methods is to gather information from users directly through questionnaire. (True/False)
10. _____ engages multiple stakeholders, collects facts and accumulates various informational resources that can be evaluated to make the best decisions.

8.4 SUMMARY



Value serves as a measure to accomplish the expected performance of a function along with necessary appearance and attractiveness. For an organisation especially in materials management, value can be of various types namely use value, esteem value, scrap value, cost value, exchange value and best value. The value analysis process is performed in sequential phases, which are problem identification, selection of team, speculation, analysis, decision and action, evaluation and implementation. The basic objective of value analysis is to deliver total cost control at any point in a product's life cycle. Some advantages of value analysis are cost savings, improved product design, high product quality, reduced wastage, new ideas and innovations, high morale and team spirit, focus on neglected areas, qualification of intangible components, wide scope of application and improved organisational image.

The value analysis process makes use of certain specific tools that include matrices, KISS, MISS, EXCHANGE, Brainstorming, etc. One of the most reliable methods is to gather information from users directly through questionnaires. A material management specific questionnaire engages multiple stakeholders, collects facts and accumulates various informational resources that can be evaluated to make the best decisions.

8.5 KEY WORDS



- **Brainstorming:** The process of generating creative ideas in a group by
- **Exchange value:** A proportion in which values in use of one kind are exchanged for those of another kind
- **FAST:** A network representation of various basic and secondary functions permitting free and uninhibited discussions among the team members showing their inter-relationships
- **Team spirit:** Harmony among the members of a group that motivates them to cooperate and work well together
- **Value engineering:** Modification of designs and systems according to value analysis

8.6 CASE STUDY: VALUE ANALYSIS FOR COST REDUCTION IN MANUFACTURING OF LEAD PENCILS



This case study aims to describe how the technique of value analysis was applied to achieve cost reduction in the manufacturing process of conventional lead pencil. The same was done in phases where first the problem areas were identified. In order to reduce the cost of manufacturing the lead pencil, the detailed study of current costing is undertaken to identify possible areas of improvement. Small changes in design aspects were capable of leading to appreciable changes in the cost of manufacturing which were thoroughly identified and analysed. Through the value analysis technique, the managers were able to propose minor, but significant changes in the design of the product by altering the shape of the pencil and the glitter paint used to coat the wood.

Changes in design also resulted in reduction in the cost of manufacturing. In addition, the existing and proposed costs were compared to estimate the savings per unit. The existing total cost of production of the lead pencil was ₹ 4. It was deduced that wood and glitter paint were two most expensive elements in the manufacturing of a pencil contributing to 37.5% of the total cost of a pencil. The primary focus was now to find alternatives for these two elements for cost reduction. Following ideas were generated:

- **Change in the design:** Use round shape instead of hexagonal shape to reduce manufacturing time and, thereby, manufacturing cost.
- **Use normal paint instead of glitter paint:** Normal paint could be used for coating to save cost.

With these modifications, the cost for the manufacturing of one piece of pencil was reduced by 25%, leading to savings per order worth ₹ 5,000, which could be utilised for the manufacturing around 1,700 more pencils. Moreover, the manufacturing process was simplified resulting in reduced production time.

Source: <https://www.ijirst.org/articles/IJIRSTV3I11060.pdf>

QUESTIONS

1. What changes were made in order to reduce the manufacturing cost of lead pencil?
(Hint: Change in design, glitter paint, etc.)
2. What benefits did the exercise offer to manufacturers?
(Hint: Cost for the manufacturing of one piece of pencil was reduced by 25%, manufacturing process was simplified, etc.)

8.7 SHORT ANSWER QUESTIONS

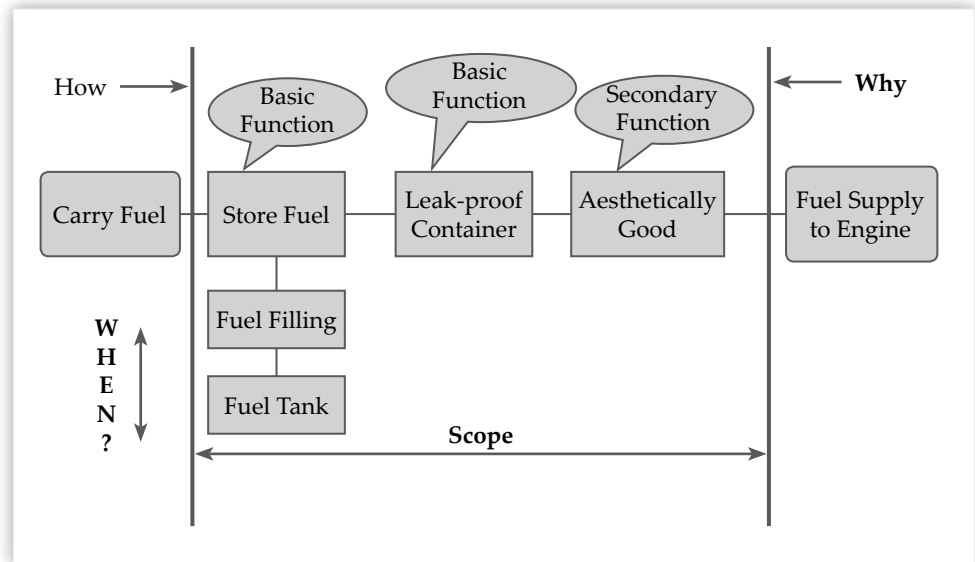


1. In _____ phase, a number of ideas are generated so that the problem identified in the first phase can be resolved.
2. In Sanskrit, Darsiri means ' _____ ' and also follows a similar approach in value engineering.

3. A _____ is created comprising only the vital functions that must be performed to accomplish the functions.
4. The basic objective of value analysis is to deliver _____ at any point in a product's life cycle.
5. _____ involves quantifying the intangible factors that affect production into tangible factors for decision making.
6. _____ is the sequence of stages determining the minimum time needed to complete a project.
7. The tangible features of a product that satisfy consumers' need/want or serve a required purpose contribute to its use or functional value. (True/False)
8. The objective of value engineering/value analysis is to develop ideas for alternatives and substitutes to accomplish functions defined in a system. (True/False)
9. Value analysis does not affect the morale and team spirit of organisation's employees. (True/False)
10. Brainstorming is used to identify the cost of providing product functions by linking each function with a component part of the product. (True/False)
11. The total cost of manufacturing a product which comprises cost of labour, capital, assets, and other overhead costs comprises its:
 - a. Use value
 - b. Esteem value
 - c. Cost value
 - d. Exchange value
12. In which phase of value analysis does the management discuss the scope of improvement and evaluation factors with the team members?
 - a. Speculation
 - b. Selection of team
 - c. Analysis
 - d. Evaluation
13. Which of the following are used to visually show the relationship between functions performed by a product, service or system?
 - a. Value Analysis Matrix
 - b. Darsiri
 - c. FAST
 - d. Brainstorming
14. What are the benefits of value analysis?
 - a. Cost reduction
 - b. Product innovation
 - c. Reduced process time
 - d. All of these
15. Which of these is a value analysis tool?
 - a. DARSIRI
 - b. KISS
 - c. MISS
 - d. All of these
16. Which of these methods leads to process improvement in manufacturing industries?
 - a. JIT
 - b. RFID
 - c. EDI
 - d. All of these

17. What are the major issues faced by organisations while procuring inputs from suppliers?
 - a. Delivery times
 - b. Quantity
 - c. Quality
 - d. All of these
18. Who gave the concept of value analysis?
 - a. Lawrence D. Miles
 - b. Michael Porter
 - c. Henry Gantt
 - d. Peter Drucker
19. The additional price that a product/service can draw owing to some unique features is:
 - a. Use value
 - b. Esteem value
 - c. Cost value
 - d. Exchange value
20. Removing unnecessary cost will have an impact on the product's
 - a. Aesthetic value
 - b. Utility
 - c. Functionality
 - d. None of these
21. The value analysis process begins with
 - a. Recognising the problem
 - b. Preparing new specifications
 - c. Discussing the scope of improvement
 - d. Generating a number of ideas
22. Which of following tools of value analysis focus on the contribution of product functions and not just emphasise on the cost of components?
 - a. Value analysis matrix
 - b. KISS
 - c. Brainstorming
 - d. DARSIRI
23. Which of following are the objectives of value analysis?
 - a. To select the necessary functions so as to reach the required performance with the lowest overall cost of products or processes
 - b. To improve/enhance product design and create better product value
 - c. To identify the essential and non-essential functions of products and processes through a multi-disciplined team of experts
 - d. All of these
24. Which of the following information bears importance for value analysis team in an organisation?
 - a. Procurement information
 - b. Manufacturing information
 - c. Customers' experience
 - d. All of these

5. Consider the following image:



Source: http://www.msruas.ac.in/pdf_files/sastechJournals/May2013/7.pdf

The above diagram represents an application of _____, a technique of value analysis.

- a. DARSIRI
- b. KISS
- c. Brainstorming
- d. FAST

8.9 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Value Analysis Framework	1.	Value
	2.	Value analysis
	3.	True
	4.	False
	5.	product design
Advanced Value Analysis Tools	6.	Value analysis matrix
	7.	Keep it Short and Simple
	8.	brainstorming
Value Analysis Questionnaire	9.	True
	10.	Value analysis questionnaire

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	decision and action
2.	to consider
3.	Critical path
4.	total cost control
5.	Value analysis
6.	Critical path
7.	True
8.	True
9.	False
10.	False
11.	c. Cost value
12.	a. Speculation
13.	c. FAST
14.	d. All of these
15.	d. All of these
16.	d. All of these
17.	d. All of these
18.	a. Lawrence D. Miles
19.	b. Esteem value
20.	d. None of the above
21.	a. Recognising the problem
22.	a. Value analysis matrix
23.	d. All of these
24.	d. All of these
25.	b. KISS

C. | HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	b. A – iii; B – ii; C – i
2.	d. Analysis

Q. No.	Answer
3.	a. Developing complex products
4.	c. Only statements A and B are true
5.	d. FAST

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NEGOTIATIONS IN PURCHASING

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶▶ State the objectives of negotiation
- ▶▶ Discuss the process of negotiation
- ▶▶ Explain the negotiations strategies and tactics
- ▶▶ Discuss the guidelines for negotiations
- ▶▶ Describe the qualities of a good negotiator



INTRODUCTION

Read

Pre-read Connect

In the previous chapter, you have studied about the role of value analysis in cost reduction. Value analysis is a cost reduction technique used by organisations to maintain cordial relationship with suppliers or vendors at optimum cost. The other strategy adopted by organisations to achieve minimum price is negotiation. The main objective of negotiation is to obtain goods and services at a price that seems reasonable to both the buyer and the seller. Negotiation aims to achieve the five rights of procurement, i.e., securing supplies, materials and services of the right quality in the right quantity at the right time from the right source at the right cost. The ability to negotiate effectively is a fundamental skill of the purchasing professionals and is the key to providing efficient purchasing and supply management service.

Negotiations enable involved parties to develop shared expectations about their motivations and reasons, possible investments and the expected uncertainties (known unknowns). The involved parties also get a chance to be acquainted to each other and understand the other side's reasons. To a certain extent, they also get to know and understand each other. Preparing for discussions, fixing boundaries, converting tacit knowledge into plans, sharing knowledge and assumptions, lowering the influence of biases and judgement errors while negotiating, help both parties understand why the transaction is important and how it adds value to the two parties.

In this chapter, you will study the concept of negotiation along with its process. Next, you will gain insights into the negotiations strategy and tactics. Guidelines for negotiations will also be discussed in the chapter. At last, the chapter talks about the qualities of a good negotiator.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the widespread adoption of negotiations in materials management
- Outline the technical aspects of negotiations process
- Examine the benefits of negotiation tactics and strategy
- Appreciate how a good negotiator can help the buyer organisation in achieving minimum cost and higher productivity

9.1 CONCEPT OF NEGOTIATION

Important Concept

According to chartered Institute of procurement & supply, negotiation can be defined as communication with the objective of reaching an agreement by means, where appropriate, of compromise.

Negotiation can be defined as the process of communication and bargaining between the buyer and the seller with the goal of reaching an acceptable agreement on price, schedule, terms and conditions of the contract, payment terms, etc. In purchasing, negotiation aims at purchasing supplies, materials and services of the right quality in the right quantity at the right time from the right source at the right cost. Negotiation is extremely important in the purchasing process as it enables businesses to minimise their expenses and enhance their purchasing power at the same time.

Negotiation helps an organisation settle on improved rates with its suppliers whilst upholding the expected quality and service. Earlier, buyer organisations used to purchase different items from different sources and would choose a vendor after comparing prices from catalogues. But recently there has been a shift from negotiating for lowest prices to single sourcing. Now, buyer organisations economise the supplier base and enter into long-term integrative partnerships with a single or fewer suppliers. Long-term partnerships allow buyer organisations to not only negotiate lower prices for materials they were earlier buying from multiple separate vendors but also ensure better quality, service and conditions.

While negotiation is generally concerned with price reductions and discounts, it does not always have to be about bargaining for lower prices. The main concern of negotiation is to obtain the best value of money spent on buying. Therefore, negotiation involves proper planning and analysis of all aspects of the business by both the buyer and the supplier to reach a satisfactory agreement or compromise.

9.1.1 OBJECTIVES OF NEGOTIATION

Negotiating helps both parties understand why the transaction is important and how it adds value to each of their sides. The following are main objectives of negotiation:

- To ensure whether the requirements of a buyer organisation are commercially valid or add some value

- To bring about an acceptable and reasonable price for the buyer and the supplier
- To ensure on-time execution of the contract
- To provide control to the buyer and the supplier on how the contract is executed
- To remove any future obstacles in the execution of the contract
- To settle on terms and prices in detail to avoid unfair dictating of terms by either of the parties
- To bring together the interests and cooperation between negotiating parties wherever possible
- Negotiation enables a buyer to develop healthy long-term relationships with capable and reliable suppliers
- To resolve conflicts between the buyer and the supplier

9.1.2 | TYPES OF NEGOTIATION

Negotiation is part science and part art with both the analytical and the psychological aspects. Negotiation can be classified into two broad types as shown in Figure 1:

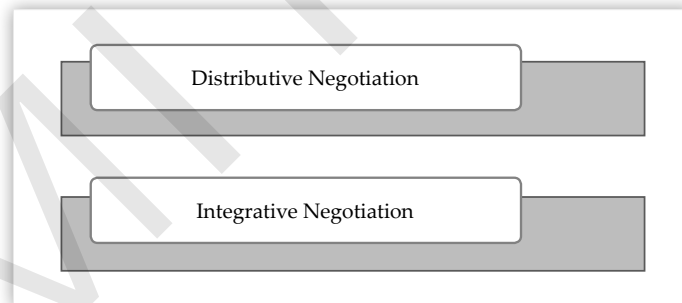


FIGURE 1: Types of Negotiation

Let us discuss these two types of negotiations in detail.

Distributive Negotiation

In distributive negotiation, both the parties (the buyer organisation and the supplier) seek their own gain which results in a win-lose kind of outcome. In this type of negotiation, both the parties are not particularly interested in a long-term relationship and just look for a one-off transaction instead. The word distributive means giving out or dividing things. In any transaction, there is a finite amount of what will be given out or divided and both sides enter a negotiation to gain the most value possible. Most distributive negotiations occur between two parties with no preexisting relationship. The following are the features of distributive negotiation:

- It provides the other side with little or no information, including the reasons for the purchase, preferences, walk-away points, etc.

**NOTE**

Anchoring bias takes place when people rely on the first information they find about a product when making decisions. For instance, a customer may find a bag of ₹1000 to be a cheap if he/she has already seen a bag of ₹ 2500 at the first instance.

- In fact, the only information that should be revealed to the other side is the presence of alternative options. This helps to make the seller aware of competition.
- This kind of negotiation tries to get as much information as possible from the other party.
- It makes the first offer to gain the advantage of the “anchoring bias”.

Integrative Negotiation

In integrative negotiation, parties enter into discussions with an aim to build long-term relationships and try to achieve value for both the parties. Integrative negotiations result in a win-win outcome. The term ‘integrative’ means combining several parts into a whole. In the context of negotiations, integration means cooperation of both the parties to achieve something collectively. Integrative negotiations require advanced negotiation skills, trust between both sides and interest in building a long-term relationship. Ideally, an integrative negotiation should lead to both sides getting what they want. But in the real world, this is a little unlikely. This is due to the fact that both the sides do not wield equal power on the discussions. Despite this, the integrative approach comes with many benefits. Cooperation and problem solving at both ends usually results in something of value for both parties. Achieving a mutually beneficial result for both sides is termed a win-win scenario. The following are the features of interrogative negotiation.

- Unlike distributive negotiations that revolve around one main issue, integrative negotiations involve a variety of issues. Here, each party seeks to gain something of value while trading something they find of lesser value.
- Both the parties should share as much information as possible to be able to appreciate each other’s reasons and interests. This helps to build cooperation.
- This approach uses a problem-solving approach to integrate problems and determines solutions.
- Integrative negotiations are all about building long-term relationships as these provide greater security and higher chances of success in the future.



**SELF
ASSESSMENT
QUESTIONS**

1. _____ can be defined as the process of communication and bargaining between the buyer and the seller with the goal of reaching an acceptable agreement.
2. Negotiation helps both parties understand why the transaction is important and how it adds value to each of their sides. (True/False)
3. In _____ negotiation, both the parties seek their own gain which results in a win-lose kind of outcome.

9.2 NEGOTIATION PROCESS

From the discussion so far, it can be said that negotiation is process of reaching an agreement with suppliers through bargaining about contract conditions.

Negotiation is a systematic process that is performed in various phases, which are shown in Figure 2:

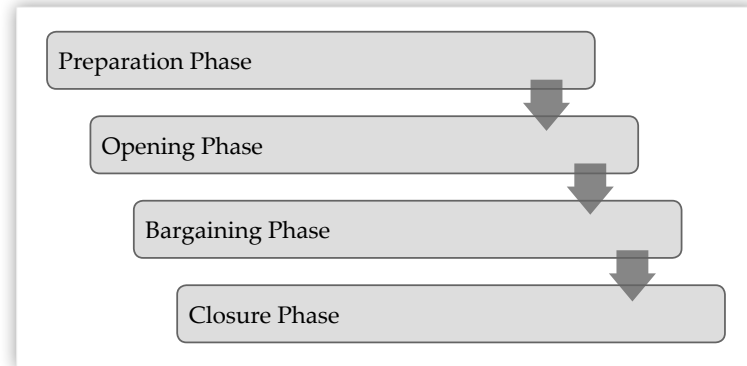


FIGURE 2: Phases of the Negotiation Process

Let us now try to understand these four phases.

1. **Preparation phase:** It is the most important stage in the negotiation process, which involves various sub-phases. These sub-phases are explained as follows:
 - i. **Identify issues:** Issues that have to be negotiated upon, such as parts of the supplier's offering that are unacceptable to the buyer, are determined at this sub-phase.
 - ii. **Collect information:** Detailed information and facts about the issue/s to be negotiated are gathered and notes are made on the information that will be required from the other party.
 - iii. **Determine objectives:** The buyer organisation determines its objectives and sets priorities at the onset of negotiations and prepares arguments accordingly.
 - iv. **Analyse strengths:** In this sub-phase, strengths and weaknesses of both the parties are assessed so as to leverage them in negotiations.
 - v. **Identify people in the other party:** At this sub-phase, the buyer organisation tries to familiarise with the people of the other party with whom negotiation will take place and connect with them beforehand.
 - vi. **Predict the type of negotiation:** Negotiations can be very competitive or cooperative, in person or through some channel. Identifying the type of negotiation beforehand can help the buyer organisation to prepare accordingly.
2. **Opening phase:** At this phase, both the parties involved in the negotiation exchange facts and information openly and honestly. The work done in the preparation stage makes the buyer organisation aware of priorities and interests and put them forward in the opening phase. Being well prepared helps the organisation communicate clearly with the other party and build trust.

3. **Bargaining phase:** In this phase, the buyer organisation tries to make the other party understand that its demands are reasonable and then makes efforts to persuade them to yield to those demands. It is important that the buyer organisation should not forget the welfare of the other party and should also work out where both the parties can and cannot concede to the other party.
4. **Closure phase:** The last phase of the negotiation process requires the buyer organisation to obtain commitment from the supplier and make the agreement official in a written contract or letter of intent once both the parties agree upon terms and conditions.



SELF ASSESSMENT QUESTIONS

4. At the _____ phase, both the parties involved in the negotiation exchange facts and information openly and honestly.
5. It is important that the buyer organisation should always seek its own welfare and should not work out where both the parties can and cannot concede to the other party.
6. The buyer organisation determines its objectives and sets priorities at the onset of negotiations and prepares _____ accordingly.

9.3 NEGOTIATIONS STRATEGY AND TACTICS

Negotiating the right deal when procuring materials is not always concerned with getting the lowest possible price for buying materials, components, products or services. Effective negotiation also involves agreeing on several other factors such as delivery times, quality and payment terms. There are various strategies for going about a negotiation. Some effective strategies for negotiation are given in Figure 3:

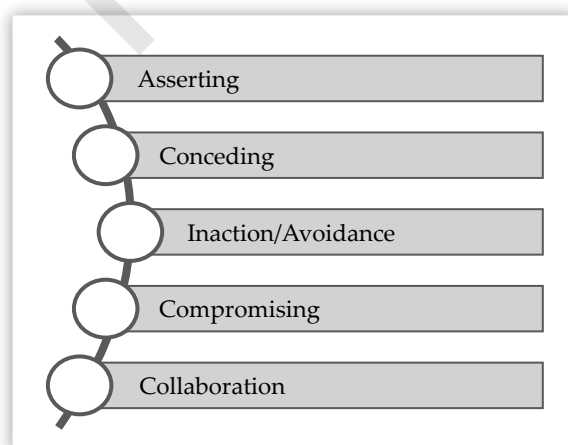


FIGURE 3: Negotiation Strategies for Effective Buying

Let us discuss these strategies in detail.

- **Asserting:** This is a competitive, result-driven type of approach where one party persuades the other party to give in to demands with no concern for the welfare. This approach is useful when unpopular decisions have to be

taken for the benefit of the organisation or when there is a need to protect own interests. However, using this strategy makes sense only when:

- there are strong alternatives
- there is a one-time transaction
- the outcome is more important than the relationship

This strategy is avoided if there is intention to build a long-term relationship with the other party.

- **Conceding:** This approach focuses more on the other party's welfare than your own in order to build trust and maintain a relationship. This strategy makes sense in the following scenarios:
 - There is a healthy, long-standing relationship and trust between negotiating parties.
 - The relationship is more significant than the outcome.
 - You need to build trust and goodwill in the long-term.
 - You realise you have made an error and need to remedy it.
- **Inaction/avoidance:** This method is employed when interests are not aligned with the other party's or there is a need to buy time to consider the proposal, gather more information or determine the next course of action. The avoidance approach is useful when the goal and outcome is important but not worth putting in too much effort.
- **Compromising:** In this approach, both parties give up on their ideal outcomes and agree on an outcome that is acceptable to each. This strategy is useful in the following cases:
 - When stakes are not as high
 - A timely solution is more important
 - Problem-solving approach has failed to produce an acceptable outcome
 - The involved parties have conflicting or incompatible interests and goals
 - The outcome of negotiation is important but not so much as to pursue an assertive approach
 - There are only a few contentious issues in otherwise satisfactory agreement
- **Collaboration:** This is a problem-solving approach both the parties involved in the negotiation remain committed to investigating, assessing and discussing problems carefully before any long-term agreement. In this approach, underlying interests of both the parties, rather than their individual positions are given more importance. The main principles behind this approach are:
 - Both parties work as a team to identify a possible agreement acceptable to both rather than not having an agreement at all.
 - The emphasis is building an association and avoiding conflict.

- Any commitment should be postponed until it has been decided how the value of the agreement can be maximised and dispensed fairly between both parties.



**SELF
ASSESSMENT
QUESTIONS**

7. In _____ approach, both parties give up on their ideal outcomes and agree on an outcome that is acceptable to each.

9.4 GUIDELINES FOR NEGOTIATIONS

“You must never try to make all the money that’s in a deal. Let the other fellow make some money too, because if you have a reputation of always making all the money, you won’t have many deals.” ~ J. Paul Getty

The skill of effective negotiation is necessary for all purchasing professionals. This skill is developed over time through training and practice. But there are general guidelines that help professionals become successful when they negotiate on behalf of their organisations. Some of these important guidelines for negotiations are explained as follows:

- **There should be a bargaining zone:** Both negotiating parties will always have an ideal outcome for negotiation, but most times getting that outcome is not possible and both the parties will usually settle for something lower. Before starting negotiation, the buyer organisation must know the upper limit that it is prepared to give and lower limit that it can be prepared to take. For an agreement to occur there has to be an overlap between the two parties. The overlap between the ideal and walk-away prices of both the parties is called the bargaining zone. Negotiation is pointless in the absence of bargaining zone.
- **Know what is required before beginning:** Efficient negotiation requires having a clear vision of objectives and desired outcome. This is possible through a clear understanding of the mission, objectives and long-term goals of the organisation.
- **Bargaining power is driven by information and alternatives:** Bargaining power is driven by the amount and quality of information both the parties have along with the number of alternatives each party has when buying or selling. The party that has more knowledge and alternatives has more bargaining power and stands to gain more from negotiation.
- **Understand the motives of the other party:** Knowledge about the objectives, interests, limitations and motives of the other party gives an edge in the negotiation. Therefore, before heading onto a negotiation, each party should try to get as much as information about the objectives, interests, limitations and motives of the other party.
- **Make clear whether a party is serious about the deal or willing to walk away:** Generally, parties are willing to enter the deal if terms are favourable, or willing to walk away from when they are not. If the buyer organisation shows interest in the deal, the supplier can be prepared to offer concessions.

 **Quick TIP**

As a buyer, it is a good idea to perform thorough background research on the actual costs required in manufacturing products you are looking to buy before going into a negotiation. This will help you remain realistic about the scope when negotiating on prices.



NOTE

Competitive pricing can be created by generating a strong BATNA (Best Alternative to a Negotiated Agreement) and using it to increase the bargaining power.



SELF ASSESSMENT QUESTIONS

- **Do not negotiate in a rush:** Negotiating terms when one party is in a rush will give the other party more bargaining power. Both the parties should take time to do research, make calculations and look for alternatives to prevent the building of pressure.
- **Separate wants from needs:** Both the sides of negotiation will attribute some value to the negotiable item but these values may be different. Therefore, it is important to separate wants from needs. It is important for both the parties to determine what is really needed and getting it in return for something that not as important to one party but actually needed by the other party.
- **Being honest is important to build trust:** Concealing information and not being completely honest may give one short-term competitive advantage but comes with the risk of ruining the organisation's reputation. It is a good practice to be completely honest and sincere to improve the chances of creating a productive, long-standing partnership based on trust.
- **Being cooperative and open-minded is important:** Being overly harsh or combative can often lead to break-down of negotiations. It is better to take hostility out of negotiations and remain cooperative and open-minded.
- **On-going relationship may need short-term sacrifices:** While an aggressive tactic may work for negotiating a single transaction but for an on-going relationship short-term sacrifices might need to be made for long-term benefits.
- **Propose a contingent contract:** Often, disagreements can occur about how a particular scenario will unfold in the future. A contingent contract is, therefore, proposed, based on the predictions about future events. For example, a contingent contract can be proposed to penalise a supplier for late deliveries.
- **Plan for the execution stage:** Placing milestones and deadlines in the contract makes it robust and helps to make sure that commitments made by both the parties are satisfied. It is also a good practice to insert a dispute resolution clause that calls for the use of some sort of arbitration in the case of conflicts.

8. The overlap between one party's ideal and walk-away prices, and between the other side's ideal and walk-away prices is the _____ zone.
9. Negotiating terms when you are in a rush will give your side bargaining power. (True/False)

9.5 QUALITIES OF A GOOD NEGOTIATOR

A negotiator is responsible for enabling the organisation achieve the maximum value of money spent on purchasing. For this, a negotiator should have certain qualities. Some of them are explained as follows:

- **Knowing what you want before you begin:** Going into negotiation with a clear idea of what will be success is an important aspect of any negotiation.

Aiming simply for buying or selling without any clear boundaries of how high or low you can go, is giving bargaining power to the other side. Good negotiators spend considerable time determining their best alternative to a negotiated agreement, or BATNA, and put efforts to improve it before beginning any negotiation.

- **Fixing limits on what you will negotiate:** This quality is related to the first one, and means that you need to be mindful of the boundaries that you will set yourself. To set these boundaries, you need to consider three price points for the negotiation:
 - The price you would ideally want to get/pay, i.e., your opening offer or base price
 - The price you expect to get/pay, i.e., the mid-point
 - The price point you cannot go outside of, i.e., the walk-away point
- **Collecting information on the other side:** Conducting research on what the other side may want from negotiations before going into discussions will help you appreciate where you stand with them. It will help you remain realistic and avoid considering a position that is completely out of sync with theirs.
- **Patience:** Going into any negotiation too quickly will be perceived as desperation for business by the other side and may give them undue bargaining power. Taking your time and having patience will help you analyse the situation completely and prevent hasty decisions that can cause regret in the future.
- **Paying attention to the other side's arguments:** You want to have an understanding of what the other side wants and their reasons behind it. Hence, not only does a good negotiator listen actively and read between the lines, they also ask pertinent questions that may reveal the reasons behind the stand the other side has.
- **Focussing on interests instead of positions:** Concentrating on positions rather than interests may shift the focus only on the pressures of price, time, etc. A good negotiator focuses on the interests of the other side instead and is able to determine why a particular position is more justified in serving those interests.
- **Trading instead of giving away easily:** A good negotiator appreciates the fact every negotiation has the potential where something needs to be traded, instead of giving away too quickly. Looking for smart trade-offs, for example, a request for a bigger discount can always be traded for faster payment terms, larger volumes, regular orders in the future, etc., to compensate for reduced margins you will be getting in this deal.
- **Collaborating instead of compromising:** A good negotiator determines what the other side puts more importance to in the final solution that they want, to be able to collaborate with them. Using this approach, a good negotiator establishes if there is something that would bring themselves closer to their organisations' ideal position, at the same time helping the other side to get closer to theirs.



Quick TIP

A good negotiator tries to understand what others expect from negotiation. If you are a buyer, try to think like a supplier. What do they want? For one, the supplier has the product and would like to sell as much as he/she can. Therefore, you have to make them aware that you have the resources to buy from them and also sell in the market to the end user.

- **Building rapport:** Whenever feasible, building rapport with the counterpart will help to improve collaboration and make reaching an agreement between the two parties easier.
- **Making the other side appreciate the end benefits of the negotiated position:** A good negotiator makes both sides appreciate the benefits of accepting the final negotiated position, thus securing confidence in the outcome and preventing further negotiating tactics after an agreement has been arrived at.
- **Being aware of the anchoring bias:** Research shows that the first number stated in a negotiation wields a strong influence on the ensuing negotiation. Being the first to offer a number allows negotiators to steer the negotiation in their favoured direction. Being aware of the anchoring bias also helps a negotiator remain mindful of their aspirations during negotiations.



**SELF
ASSESSMENT
QUESTIONS**

10. A good negotiator determines what the other side puts more importance to in the final solution that they want, to be able to _____ with them.



ACTIVITY 1

Research on the Internet and find out one case of assertive approach of negotiation strategy followed by an organisation to win a deal.

9.6 SUMMARY



Negotiation can be defined as the process of communication and bargaining between the buyer and seller with the goal of reaching an acceptable agreement on price, schedule, terms and conditions of the contract, payment terms, etc. The main objective of negotiation is to obtain the goods and services at a price that seems reasonable to both the buyer and the seller. While negotiation is generally concerned with price reductions and discounts, it does not always have to be about bargaining for lower prices. The main concern of negotiation is to obtain the best value of money spent on buying. There are two types of negotiation which are distributive negotiation or integrative negotiation.

Negotiating strategy plays pivotal role in effective buying such as asserting, conceding, inaction/avoidance, compromising and collaboration. The skill of effective negotiation is necessary for all purchasing professionals. Also, a good negotiator is a must-have for organisations to acquire best deals. Negotiation skills are developed over time through training and practice. But there are general guidelines that help professionals become successful when they negotiate on behalf of their organisations. Preparing for discussions, fixing boundaries, converting tacit knowledge into plans, sharing knowledge and assumptions, lowering the influence of biases and judgement errors while negotiating help both the parties to attain a position of win-win.

9.7 KEY WORDS



- **Anchoring bias:** A situation when individuals rely heavily on preexisting information or information initially offered when making decisions or subsequent judgments
- **Contingent contract:** A contract whose terms are not final and are based on the occurrence of particular conditions or specific outcomes
- **Purchasing power:** An ability to buy goods and services in financial terms

9.8 CASE STUDY: SARAH TALLEY AND WALMART



Price is almost going to be a contentious issue in any negotiation between a supplier and a buyer. But when the two sides set that conflict aside, and try to work together on improving sales and customer service along with their relationship, price will become one of the many issues being negotiated upon, most of which the two sides will agree on.

The case of Sarah Talley and Walmart is a perfect example of the above.

In 1997, Sarah Talley who was just 19 at the time, started negotiating with Walmart to buy pumpkins and watermelons from her family's Frey Farms. Sarah Talley had to face the usual hardball price tactics of Walmart. Walmart being much bigger and powerful than Frey Farms, the power relationship between the two was highly unbalanced. If a distributive approach was taken, only one side would win the negotiation. Walmart's sheer size and bargaining power could make Frey Farms agree to the low prices it was asking. But there were chances Frey Farms provided quantities lower than that needed by Walmart, forcing Walmart to look for other suppliers, thus raising its transportation costs.

Before going into discussions with a giant like Walmart, Talley did her homework and developed an acute understanding of its organisational culture. Talley had two options when approaching the negotiation with Walmart:

- She could look at the short-term, and bargain on the immediate pricing or
- She could look at building a long-term relationship with Walmart so that Frey Farms could grow alongside Walmart.

When Walmart was adamant on a low pricing despite Talley explaining to them about the bad weather and abnormally high pest and disease exposure to local farmers, Talley looked at the long-term and requested for becoming a co-managed supplier. This request was first resisted by Walmart management, stating that co-management is reserved for mega suppliers as it required investing a huge amount of resources. Talley skilfully bargained for a co-managed supplier agreement with Walmart while accepting Walmart's pricing. She convinced Walmart how Frey Farms could split the responsibility of managing inventory levels and sales with Walmart. This would not only save customers money but also better their own margins. At the same time, Talley was creative in her tactics in the supply chain to find new money. As an example, Talley used school buses (\$1,500 each) rather than expensive tractors (\$12,000 each) to transport melons from Frey Farms to the warehouse.

Let us look again at Sarah Talley's negotiation guidelines:

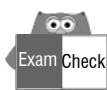
- **She focussed on long-term mutual partnership gains:** Whenever she needed to engage with Walmart in case of conflicts and issues, she tried to think of it in terms of partnership and focussing on a common goal. She asked questions to improve on any issue that came up.
- **She took the problem-solving approach:** Instead of complaining when differences came up, she concentrated on solving the problems instead. She made Walmart appreciate the fact that it would be cheaper for them to stay with her and let her improve instead of thinking to replace her.
- She made efforts to learn from and lobby with people who have authority and experience in the field and also with those that were having difficulties in the field.
- Talley made sure Walmart did not become more than 20% of the family business. This ensured that they did not become too dependent on any one customer. (You need to always remember that depending heavily on one supplier or buyer weakens your BATNA and lowers your bargaining power.)

Source: <https://www.negotiations.com/case/negotiating-wal-mart/>

QUESTIONS

1. What, in your opinion, would be the outcome of a distributive negotiation between Walmart and Frey Farms?
(Hint: It would be a win-lose type of outcome because of Walmart's bargaining power against Frey Farms.)
2. What did Sarah Talley use as a trade-off against the low pricing Walmart was keen on?
(Hint: She looked at her long-term growth alongside Walmart by becoming a co-managed supplier.)

9.9 SHORT ANSWER QUESTIONS



1. Securing supplies, materials and services of the right quality in the right quantity at the right time from the right source at the right cost are the five rights of _____.
2. In _____ negotiation, parties enter into discussions with an aim to build long-term relationships and try to achieve value for both the parties.
3. _____ approach is useful when you need to buy time to consider the proposal, gather more information or determine the next course of action.
4. In _____ negotiation, both the parties (the buyer organisation and the supplier) seek their own gain which results in a win-lose kind of outcome.
5. It is good practice to insert a _____ clause that calls for the use of some sort of arbitration in case of conflicts.
6. Placing _____ and _____ in your contract makes it robust and helps to make sure that commitments made on both sides are satisfied.

7. A good negotiator appreciates the fact that every negotiation has the potential where something needs to be traded, instead of giving away too quickly. (True/False)
8. In any negotiation, the walk-away price you are prepared to pay needs to be equal to or higher than the walk-away price the other side is prepared to take. (True/False)
9. The party that has more knowledge and alternatives has less bargaining power. (True/False)
10. Short-term relationships provide greater security and higher chances of success in the future. (True/False)
11. Negotiation is not important in which of the following cases?
 - a. In presence of competitive bidding
 - b. When production schedule is frequently modified by new orders
 - c. In case whereof make or buy situation
 - d. In case prices are not fixed by law or regulation
12. Which of the following is not an objective of negotiation?
 - a. For purchasing department to make sure that the requirements make sense commercially or add some value
 - b. To bring about an acceptable and reasonable price for the buyer and supplier
 - c. To allow dictating of terms by buyer to supplier
 - d. To help resolve conflicts between the buyer and the supplier
13. Which of these is not true for distributive negotiation?
 - a. Try to get as much information as possible from the other party
 - b. Provide the other side with all the relevant information
 - c. Reveal to the other side the presence of alternative options
 - d. Make the first offer to gain the advantage of the “anchoring bias”
14. Which of the following is true for integrative negotiations?
 - a. Integrative negotiations involve a single issue
 - b. Both sides share the least information possible
 - c. Problem-solving approach is used to integrate problems and determine solutions to both side’s issues
 - d. Integrative negotiations focussed on short-term relationships
15. _____ is a competitive, result-driven type of approach where you persuade the party you are negotiating with to give in to your demands with no concern for their welfare.
 - a. Asserting
 - b. Conceding
 - c. Collaboration
 - d. Inaction

16. Asserting type negotiation strategy is not useful when:
 - a. unpopular decisions have to be taken for the benefit of your organisation
 - b. you need to protect your own interests
 - c. you have strong alternatives
 - d. you are looking for a long-term relationship
17. Which of the following strategies is useful when you realise you have made an error and need to remedy it?
 - a. Asserting
 - b. Conceding
 - c. Collaboration
 - d. Compromising
18. In _____ approach, both parties give up on their ideal outcomes and agree on an outcome that is acceptable to each.
 - a. Conceding
 - b. Collaboration
 - c. Compromising
 - d. Asserting
19. The factor that dictates the negotiation strategy is:
 - a. The objectives of the negotiation
 - b. The setting of the negotiation
 - c. The level of cooperation between the negotiating parties
 - d. All of the above
20. Which of the following is incorrect about guidelines of negotiation?
 - a. There should be a bargaining zone
 - b. Know what you want from the negotiation
 - c. Bargaining power is driven by information and alternatives
 - d. Negotiate in a rush
21. Which of the following helps when disagreements occur about how a particular scenario will unfold in the future?
 - a. Present multiple offers simultaneously
 - b. Propose a contingent contract
 - c. Make short-term sacrifices
 - d. Plan for the execution stage
22. Which of the following are the main objectives of negotiations?
 - a. To ensure on-time execution of the contract
 - b. To provide control to the buyer and supplier on how the contract is executed
 - c. To remove any future obstacles in the execution of the contract
 - d. All of these

23. Achieving a mutually beneficial result for both the are sides termed a _____.
- win-win strategy
 - win-lose strategy
 - lose-lose strategy
 - None of these
24. Which of the following is not true for a good negotiator?
- Fixes limits on what they will negotiate
 - Collects information on the other side
 - Pays attention to the other side's arguments
 - Focuses on positions rather than interests
25. In which of the following phase of the negotiation process requires the buyer organisation to obtain commitment from the supplier and make the agreement official in a written contract or letter of intent once both the parties agree upon terms and conditions?
- Closure phase
 - Opening phase
 - Bargaining phase
 - Preparation phase

9.10 HIGHER ORDER THINKING SKILLS (HOTS)



- If a negotiator is being too pushy for a deal, which type of approach is he/she following?
 - Collaboration
 - Asserting
 - Compromising
 - None of these
- If the bargaining zone is not known or identified by the negotiator, do you think it is sensible to put efforts in negotiation? Yes/No
- Which of the following is a problem-solving technique used by negotiators to build strong association and avoid conflicts between both the parties?
 - Collaboration
 - Asserting
 - Compromising
 - None of these

9.11 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Concept of Negotiation	1.	Negotiation
	2.	True

Topic	Q. No.	Answer
Negotiation Process	3.	distributive
	4.	opening
	5.	False
Negotiations Strategy and Tactics	6.	arguments
	7.	compromising
Guidelines for Negotiations	8.	bargaining
	9.	False
	10.	Collaborate

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	procurement
2.	integrative
3.	inaction
4.	distributive
5.	dispute resolution
6.	milestones, deadlines
7.	True
8.	True
9.	False
10.	False
11.	a. In presence of competitive bidding
12.	c. To allow dictating of terms by buyer to supplier
13.	b. Provide the other side with all the relevant information
14.	c. Problem-solving approach is used to integrate problems and determine solutions to both side's issues
15.	a. Asserting
16.	d. you are looking for a long-term relationship
17.	b. Conceding
18.	c. Compromising

Q. No.	Answer
19.	d. All of the above
20.	d. Negotiate in a rush
21.	b. Propose a contingent contract
22.	d. All of these
23.	a. win-win strategy
24.	d. Focuses on positions rather than interests
25.	a. Closure phase

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	b. Asserting
2.	No
3.	c. Compromising

9.12 SUGGESTED BOOKS AND E-REFERENCES



SUGGESTED BOOKS

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LEGAL ASPECTS IN PURCHASING

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- B. Short Answer Questions
- C. Higher Order Thinking Skills (HOTS)

10.12 Suggested Books and e-References

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶▶ Explain the importance of legalities
- ▶▶ Describe the main postulates of the Indian Contract Act, 1872
- ▶▶ Elucidate the Sales of Goods Act, 1930
- ▶▶ Describe special purchase contracts
- ▶▶ Explain various negotiable instruments



INTRODUCTION

In the previous chapter, you studied the concept of negotiation and its importance in purchasing. It is quintessential for a purchase manager to know legalities related to purchasing because he/she is accountable to perform purchasing functions without unnecessary conflicts and legal issues in order to allow a smooth flow of business operations.

To facilitate the same, the purchasing staff should be aware of potential legal issues that may arise during purchase functions with special consideration to the knowledge of the Contract Act and in particular how and when the organisation may be legally bound, types of contracts, termination or renewal of contracts. Appropriate training in these areas should be considered for an efficient procurement and materials management system. As part of the risk management procedures, the procurement staff should ensure that only reputable suppliers are identified and dealt with. This is because such suppliers comply with their contractual obligations in purchasing documentation keeping unnecessary issues at bay.

This chapter discusses the importance of legalities, the Contract Act and special contracts that managers and staff must be aware of for smooth operations and functions within an organisation.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the importance of law in the smooth functioning of purchase management
- Outline the technical aspects of the Indian Contract Act and Sales of Goods Act
- Resolve legal issues in purchasing by gaining insight into the special purchase contract
- Examine the role of negotiable instruments for smooth operations

10.1 IMPORTANCE OF LEGALITIES



NOTE

A purchase manager cannot afford to ignore the legal repercussions of his actions.

A purchase manager needs to have a thorough understanding of laws associated with purchasing such as Sales of Goods Act, Special Purchase Contracts. It is important to note that an organisation remains secured in purchase transactions made through legal counsel. One of the important aspects of legalities is the requirement of a contract between two parties in order to ensure that an agreement actually exists. Certain elements that must be compulsorily checked for a legally binding contract include:

- **An offer:** An expression of willingness to make a contract which states the terms of the contract clearly.
- **Acceptance:** A well-defined absolute and unconditional agreement that states the terms accepted in the offer, either oral or in writing. The acceptance should be exactly in line with the offer made.
- **Consideration:** The mere fact that an agreement is made does not make a contract. The concerned parties must give their consideration in case they decide to agree on the contract. This implies that the party to the contract must promise to offer something to the other.
- **Intention to create legal relations:** An intention to enter into a legally binding agreement or contract is a necessary element of a contract. This is to ensure that both the parties are willing to accept the legal consequences of entering into the agreement.

Another important area which requires that individuals dealing with purchase should be aware of legalities is in case a dispute arises with the goods supplier. The concerned person should be aware of several options he/she might have to resolve it. As a general rule of thumb, the first step is to resolve it by fostering authentic communication. In most cases, the buyer and supplier must meet and discuss to find a way to the issue which is acceptable by both the parties. It is important that purchase staff is trained to remain tough on critical issues that should be resolved by the supplier immediately and exhibit flexibility on less significant issues.

If communication is not enough to resolve an issue, one may opt for other methods such as mediation, conciliation and arbitration. However, if nothing works, then

legal proceedings are the only way to resolve disputes between buyers and sellers. It requires enough legal training to understand basic legalities involved in procurement work.



**SELF
ASSESSMENT
QUESTIONS**

1. Concerned parties to the contract must give consideration in case they decide to agree on the contract. (True/False)

10.2 THE INDIAN CONTRACT ACT, 1872

The contracts or agreements between two or more parties interested in carrying out mutual transactions are drafted and validated by the Indian Contract Act. The Act regulates and monitors dealings or transactions carried out by businesses. Let us first understand the concept of a contract.

According to the Indian Contract Act, the term “Contract” under its Section 2 (h) is defined as “An agreement enforceable by law”. This implies that a contract is any agreement between transacting parties which is enforceable by the law of the land. The definition can be broken down as having two major elements, i.e., agreement and enforceable by law. In order to understand the Act better, let us first understand the concept of these two elements in the definition:

- i. **Agreement:** Section 2 (e) of the Indian Contract Act defines agreement as, “every promise and every set of promises, forming the consideration for each other”. Therefore, simply put, an agreement is derived from a proposal made by one or more parties once it is accepted by all concerned. The above can be summed up as follows:

Agreement = Offer + Acceptance

To clear any ambiguity that the term ‘promise’ may hold, the Act states in its Section 2(b), “when the person to whom the proposal is made signifies his assent thereto, the proposal is said to be accepted. Proposal, when accepted, becomes a promise”. Therefore, it can be said that an agreement is an accepted promise which is agreeable by all parties involved or affected by it.

- ii. **Enforceable by law:** There are certain cases which cannot be taken into consideration under the scope of law. For instance, suppose you agree to sell a unicorn in exchange of a magic wand with your friend. Is it possible to have a contract for such a transaction? You may suggest that once you and your friend agree on the above promise, it would become an agreement. However, in order for an offer to become a contract, it must be legally enforceable. Therefore, for an agreement to change into a ‘contract’ according to the Indian Contract Act, it must lead to legal obligations or must come under the scope of the law.

The definition can now be summarised as follows:

Contract = Accepted Proposal (Agreement) + Enforceable by law (defined within the law)



NOTE

A proposal has to be accepted first to become a promise.

Table 1 shows how contracts differ from agreements:

TABLE 1: Difference between a Contract and an Agreement

Contract	Agreement
A contract is an agreement that is enforceable by law.	An agreement is a promise or a number of promises that are not contradicting and are agreed upon by the concerned parties.
A contract is only legally enforceable.	An agreement must be socially acceptable. It may or may not be enforceable by the law.
A contract has to create some legal obligation.	An agreement does not create any legal obligations.
All contracts are also agreements.	An agreement may or may not be a contract.

Source: *The Contract Act 1871(R) - Course Hero*

10.2.1 | ESSENTIALS OF A CONTRACT

Figure 1 shows essential elements of a valid contract:

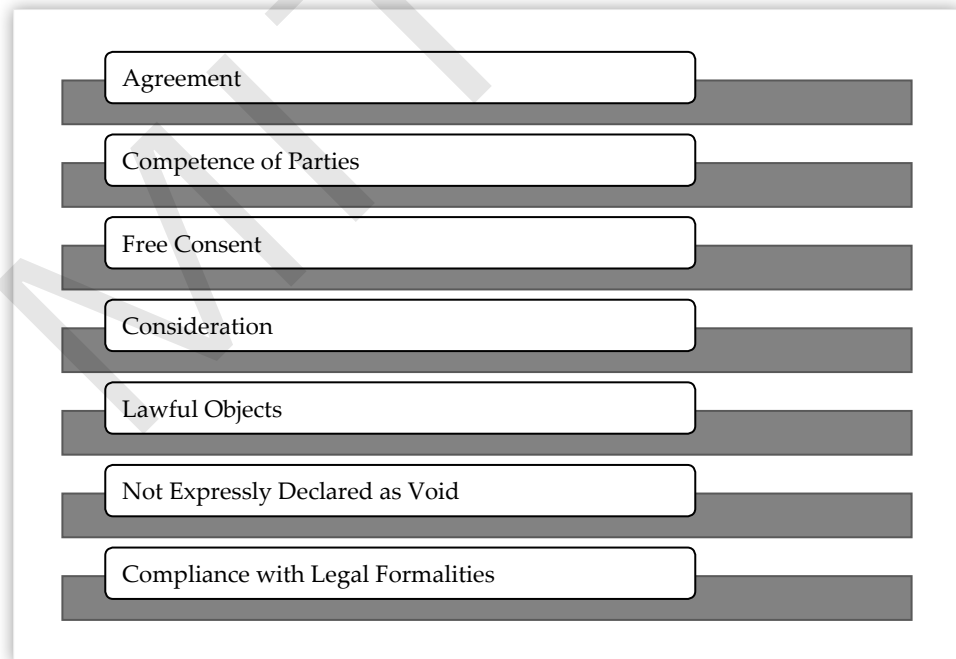


FIGURE 1: Essentials of a Contract

Let us discuss these essential elements of a contract in detail.

- **Agreement:** The parties involved in a contract should have intention to become partners for a deal. There must be an offer by one party and its acceptance by the other.
- **Competence of parties:** According to Section 11 of the Contract Act, “Every person is competent to contract who is of the age of majority according to the law to which he is subject to and who is of sound mind and is not disqualified from contracting by any law to which he is subject.”

Therefore, the following are exempted to enter into a contract:

- A minor
 - A person of unsound mind
 - A person expressly declared disqualified by law
- **Free consent:** Another requirement for a valid contract is the wilful consent of parties involved. As per Section 3 of the Act, “Two or more parties are said to consent, when they agree upon the same thing in the same sense.” According to Section 14, “the consent is said to be free, when it is not induced by any of the following:
- Coercion
 - Misrepresentation
 - Fraud
 - Undue influence
 - Mistake
- **Consideration:** This refers to a promise offering ‘something in return’. A promise without giving anything in return to a party would not be enforceable by law and, hence, would not make a valid contract. The consideration must also be lawful.
- **Lawful objects:** According to Section 10 of the Act, “an agreement may become a valid contract only if it involves a lawful consideration and lawful object. The following considerations and objects are defined as unlawful under the Act:
- If it is forbidden by law
 - If it is against the provisions of any other law
 - If it is fraudulent
 - If it damages somebody’s person or property
 - If it is in the opinion of court, immoral or against the public policy
- **Not expressly declared as void:** The agreement must not have been declared void by any law in the country. As per the Act, the following agreements are considered to be expressly void:
- Agreements made with the parties having no contractual capacity
 - Agreements made under a mutual mistake of fact
 - Agreements with unlawful consideration or object
 - Agreements whose consideration or object is unlawful in part
 - Agreements having no consideration
 - Agreements in restraint of marriage
 - Agreements to do impossible acts



NOTE

In law, an action, document, or transaction is said to be void if has no legal effect and it is considered if it had never existed or happened.

- **Compliance with the legal formalities:** The agreement may be oral or in writing. When an agreement is in writing it should meet all legal formalities. If the agreement does not comply with adequate legal formalities, then it cannot be enforced by law. Following documents must be in writing to valid contracts:
 - A promise to pay a time-barred debt
 - An arbitration agreement
 - Lease agreements for a period of more than three years
 - Contracts of insurance
 - Bills of exchange, cheques or promissory notes
 - Memorandum and articles of association of company
 - Contracts relating to transfer of immovable properties

10.2.2 | TYPES OF CONTRACTS

Legal contracts are classified based on three categories based on three aspects, namely validity, formation and performance, as shown in Figure 2:

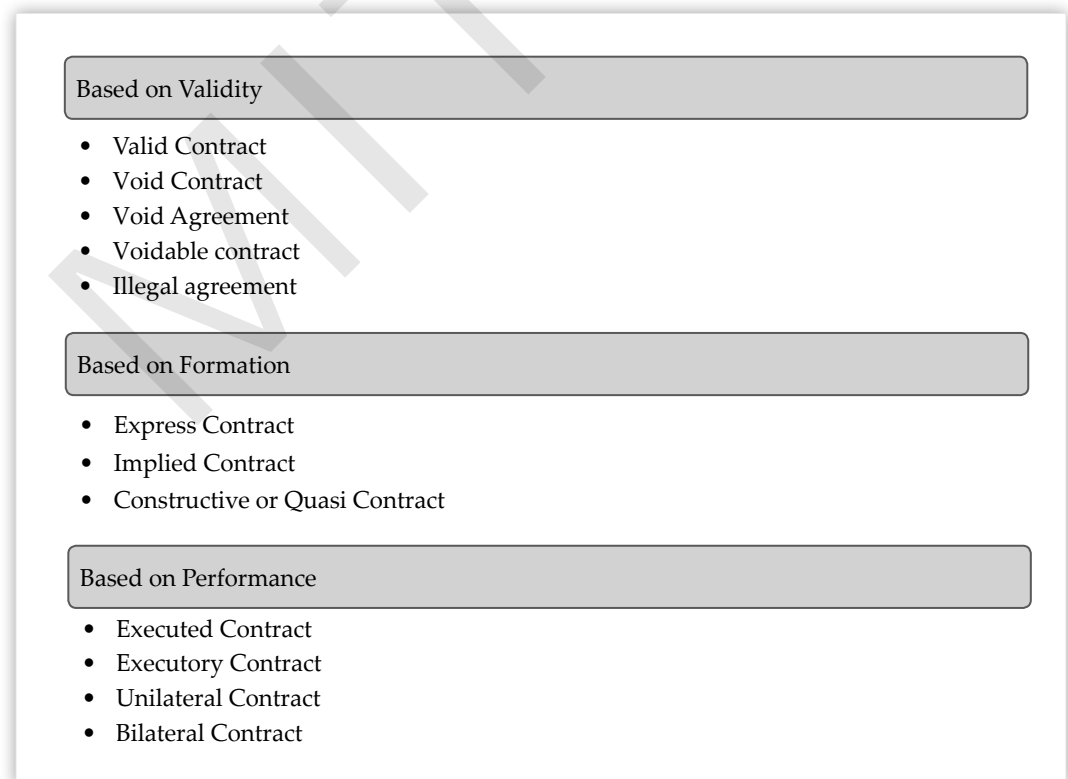


FIGURE 2: Classification of Contracts

Let us discuss these in detail:

- **Based on validity:**
 - **Valid contract:** An agreement which has all essential elements of a contract and can be enforced by law. For example, if Person X offers to

sell his car to Person B for the sum of ₹3 lacs and Person B delivers the cash for the same, providing both Person X and Person Y are of major, the car is rightfully Person X's to sell and there is nothing illegal about the transaction, the parties have a valid contract.

- **Void contract:** A contract which cannot be enforced by law. A contract may be valid and binding on parties initially and may subsequently turn void. For example, a popular Kathak dancer contracts with an event management company to perform in an award show. However, unfortunately, she meets an accident just two days before the show, in which her forefoot gets fractured and she is not allowed to dance by the doctor. In such a case, the contract becomes void.
 - **Void agreement:** According to Section 2(g) of the Contract Act, "An agreement not enforceable by law is said to be void." Therefore, a void agreement lacks the essentials of a legal contract and is considered to be non-existent and null in its effects since very beginning. For example, Sudha offers Reena (who is a minor) to supply 100 kg of rice for ₹ 6000, at a certain date in future, but she does not supply the stated quantity of rice to Sudha. Now, Sudha cannot sue Reena, as Reena is a minor and an agreement with minor is void ab-initio.
 - **Voidable contract:** An agreement which is enforceable by law at the option of one or more of the parties thereto, but not at the option of other or others, is a voidable contract. The aggrieved party may reject or accept the contract and has the legal right to do so. For example, Person A threatens Person B to sell his retail shop for ₹ 50 lacs to Person A. In such a case, Person B is the aggrieved party as his consent is obtained by coercion; hence the contract is voidable. However, Person B can exercise an option to repudiate the contract within a time limit before the shop is sold to Person C. If Person B chooses to repudiate the contract, he has to return ₹ 50 lacs to Person A.
 - **Illegal agreement:** An agreement is considered illegal if it is forbidden by law. It is formed in a way that if legalised, it would defeat provisions of the law and may involve or imply injury to a person/property. Such contracts are considered to be immoral or opposed to public policy and are punishable under the law. These are *void-ab-initio*. For example, Jessica agrees to pay ₹ 1 crore to John for killing her neighbour. In such a case, the agreement between them is illegal as its object is unlawful.
- **Based on contract formation:**
- **Express contract:** When the terms of a contract are explicitly agreed upon in writing at the time of formation, the contract is considered as express contract. For example, Shyam writes a letter to Mohan asking whether Mohan would like to purchase his car for ₹ 3 lacs. Mohan writes a reply to Shyam that he is ready to buy his car for ₹ 3 lacs. It is an expressed contract made between them.
 - **Implied contract:** When there is no explicit expression of bindings within a contract, these are called implied contracts. For example, travelling in a bus is an implied contract between the passenger and bus owner.

- **Constructive or quasi contract:** In such contracts, there is no offer or acceptance, and hence no contractual relations between the partners. Such contracts created by the virtue of law are called quasi contracts. Quasi contracts are formed by the court in the absence of an official agreement between the parties in case of disputes over payments for goods or services. The goal in the court's creation of these contracts is to prevent unjust enrichment to any party.
- **Based on contract performance:**
 - **Executed contract:** A contract where both the parties have met their respective obligations. For example, A offers to sell his shop to B for ₹ 80 lacs and B accepts the offer. A gives the possession of the shop to B, and B pays ₹ 80 lacs to A. It is an expressed contract as all obligations of the contract are fulfilled.
 - **Executory contract:** A contract where one or both the parties have yet to perform their obligations. Such a contract is partially performed or wholly unperformed is called an executory contract. Lets consider the above example. Suppose A has not given the possession of the shop to B and B still has to pay the amount to B. It is an executory contract.
 - **Unilateral contract:** A contract where only one party has to perform its obligation at the time of the contract formation while the other party has already done its due is a unilateral contract. An insurance policy contract is an example of a unilateral contract , wherein the offeror is the only party with a contractual obligation.
 - **Bilateral contract:** A contract where both parties to a contract have to perform their legal obligations at the time of the contract formation is a bilateral contract. An example of bilateral contract is present in our day-to-day life. Whenever we make a purchase at a store, order a meal at a restaurant, receive services at a doctor's clinic and so on, we promise a certain action to another person or party in response to that person or party's action in each circumstance.



**SELF
ASSESSMENT
QUESTIONS**

2. A person 'A' agrees to sell his house to a person 'B' for ` 50 lakh." This is an example of:
 - a. A contract
 - b. An agreement
 - c. Neither a contract nor an agreement
 - d. It is a contract as soon as 'A' gets the money
3. A contract where both the parties involved in a contract have to perform their legal obligations at the time of the contract formation is a unilateral contract. (True/False)

10.3 SALE OF GOODS ACT, 1930



NOTE

The Law Commission of India in its 103rd Report (1984) on "Unfair Terms in Contracts" suggested that the Indian Contract Act, 1872, needs to be modified so that consumer's rights could be protected against some of the unfair practices in the contract. However, so far, no steps have been taken to make any modifications.

The Sale of Goods Act came into force on 1st July, 1930. According to the Indian Contract Act, 1872, *A contract of sale of goods is a contract whereby the seller transfers or agrees to transfer the property in goods to the buyer for a price. There may be a contract of sale between one part-owner and another.* Thus, in simple terms, the Sale of Goods Act, 1930, deals with the sale of goods. There are basically two parties, i.e., one agrees to sell goods and receives a price for it, and the other party receives the goods and pays the price for it. Hence, one party is the buyer and the other party is the seller. Selling may involve either existing goods or future goods. The contract to sale must be absolute and unconditional and there should be a price or consideration for goods to be transferred.

The Sale of Goods Act, 1930 is based on provisions of the erstwhile English Sale of Goods Act, 1893. Though the erstwhile English Sale of Goods Act, 1893 is modified by the Supply of Goods Act, 1973, and Unfair Contract Terms Act, 1977, in England, The Indian Sale of Goods Act continued as earlier without any modifications.

There are certain provisions, which govern the sale of goods and these provisions are mentioned in sections 76-123 of the Indian Contract Act, 1872. The provisions of the Act are covered under the title 'Condition and Warranties'. A condition is a promise or statement of fact, which is an essential term of the contract. The breach of a condition gives the right to the concerned party to terminate or repudiate the contract.

A warranty, on the other hand, is a provision collateral to the key purpose of the contract, the violation of which gives rise to a claim for damages but not to a claim to reject the goods and treat the contract as renounced.

The conditions and warranties in the Sale of Goods Act, 1930, focus primarily at protecting the interests of consumers in the following matters:

- The time for payment and delivery of goods
- Right to reject the goods or claim damages in definite situations
- Protection of title and possession of goods purchased
- Merchantability and fitness of goods, for the sale purpose
- Description of goods in terms of qualities or characteristics given by the seller



SELF ASSESSMENT QUESTIONS

4. As per the Sale of Goods Act, 1930, the selling may involve either existing goods or future goods. (True/False)
5. A _____ is a promise or statement of fact, which is an essential term of the contract.

10.4 SPECIAL PURCHASE CONTRACTS

There are different contracting approaches to support different requirements or specific details. Basically, special purchase contracts can be of three types, as shown in Figure 3:

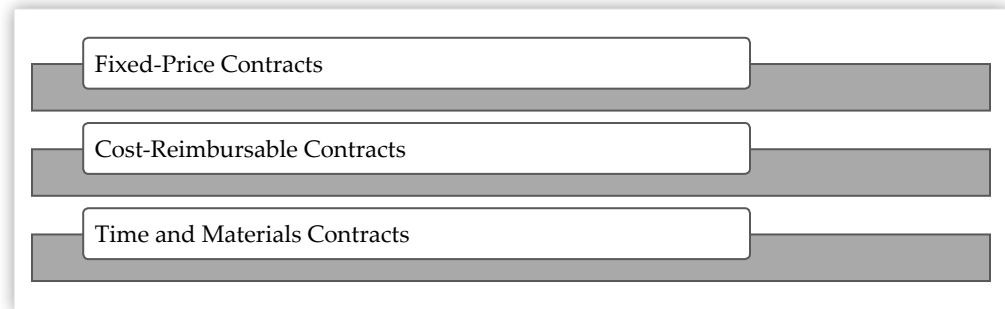


FIGURE 3: Types of Special Purchase Contracts

Let us discuss these special purchase contracts in detail.

10.4.1 | FIXED-PRICE CONTRACTS

Fixed-priced contracts have a clear statement of work, wherein the buyer accepts a seller's price for goods and services. The contract explains the quality of goods and services, the timing and the price for delivering those goods and services. Purchase order is an example of such type of contract, wherein the price, quantity and date for the deliverable is established. There are three main categories of fixed-price contracts:

1. **Firm-Fixed-Price (FFP):** It is the most common fixed-price contract. As the name suggests, in this type of contract, the price is preset and does not change unless there is any change in scope.
2. **Fixed-Price Incentive Fee (FPIF):** In this type of contract, both the buyer and the seller share some risk and in case of profit, both the parties are eligible to reap benefits from it. This contract establishes a ceiling price, which is the maximum amount the buyer will pay to the seller. Then, both the parties settle upon a target cost (FP) and the target fee (IF). Both the FP and the IF, collectively become the target price. Lastly, both parties come to an agreement to a share ratio of cost overruns or under-runs. This share ratio is used to calculate the point of total assumption (PTA) in which the buyer stops paying to cost overruns and all extra costs incurred come from the seller's profit.

Let us understand the concept of this contract with the help of an example.

Suppose 'A' wants to buy customised equipment that a contractor 'B' will make. 'A' and 'B' agree that 'A' will pay no more than ₹ 1,25,000 for this equipment and that it should cost B ₹ 1,00,000 to make. Both 'A' and 'B' agree that if 'B' can make the equipment for that, he deserves ₹ 10,000 as incentive fee. Thus, in this case, 'A' would pay the price of ₹ 110,000. It looks like this:

Target Cost – ₹ 100,000

Target Profit – ₹ 10,000

Target Price – ₹ 110,000 (target cost + target profit)

Ceiling Price – ₹ 125,000

Next, suppose, both 'A' and 'B' agree to an 80/20 share ratio. This says that if 'B' is able to make the equipment for less than ₹ 100,000, his profit goes up by ₹ 20 for every rupee he saves. On the other hand, any costs beyond ₹ 110,000 will be paid 80% by 'A' and 20% by 'B', which eats into his profit. It looks like this:

Share Ratio – 80% buyer, 20% seller

As 'A' is not paying any more than ₹ 125,000 total, the share ratio goes to 100% to 'B' and 0% to 'A'. This is the PTA and is calculated like this:

PTA – [(ceiling price – target price)/buyer's share ratio] + target cost

PTA = [(₹ 125,000- ₹ 110,000) / 0.8] + ₹ 100,000

PTA = ₹ 18,750 + ₹ 100,000 PTA = ₹ 118,750

Therefore, as soon as the costs go above ₹ 118,750, 'B' incurs 100% of them.

3. **Fixed-Price with Economic Price Adjustment (FP-EPA):** This fixed-priced contract is used for contracts that extend for multiple years.

10.4.2 | COST-REIMBURSABLE CONTRACTS

These contracts are primarily made to pay all actual costs incurred to the seller and then add a fee amount as the seller's profit. Usually, this type of contract is less desirable by buyers as the majority of the risk falls on the buyer. Cost-reimbursable contracts are more suitable if there is ambiguity or complexity in the statement of work or when risks are too high for the seller to accept in a fixed price. Different cost-reimbursable contracts are discussed as follows:

- **Cost plus Percentage of Cost (CPPC):** This is the least desirable cost-reimbursement contract for the buyer as in this type of contract, the buyer accepts all risks and the seller bears zero risk. In such contracts, there is always a chance that the seller does not attempt to control costs, as they should ethically but tries to increase the cost as it would increase their profit.
- **Cost plus Fixed Fee (CPFF):** In this type of contract, whilst the buyer still carries all the risks, the seller's margin does not rise with the rise in costs. The profit is set at the beginning of the work and it does not alter unless there is any change in scope.
- **Cost plus Award Fee (CPAF):** In this type of contract, the seller also bears a share of risk along with the buyer. Here, the buyer reimburses the seller for actual costs and then pays a fee depending on the achievement of performance standards mentioned in the contract.
- **Cost plus Incentive Fee (CPIF):** In this type of contract, the seller and the buyer share the most of the risk. Here, the buyer reimburses the seller for actual costs and then pays an incentive fee as well. However, this incentive fee is pre-decided and well-mentioned in the contract and is given in case the seller achieves certain objectives.

10.4.3 | TIME AND MATERIALS CONTRACTS

Time and materials contracts or T&M contracts are a mixture of both the fixed price and the cost-reimbursable contracts. T&M contracts are used in cases where a clear statement of work cannot be generated. In order to prevent huge cost overruns, it is always suggested to fix a ceiling or a not-to-exceed (NTE) price in this type of contract.



SELF ASSESSMENT QUESTIONS

6. _____ contract establishes a ceiling price, which is the maximum amount the buyer will pay to the seller.
7. Which of the following type of contract is less desirable by buyers as the majority of the risk falls on the buyer?
 - a. Cost-reimbursable contracts
 - b. Time and materials contracts
 - c. Fixed-price incentive fee
 - d. None of these
8. In the cost plus incentive fee contract, the seller and the buyer share the most of the risk. (True/False)

10.5 | NEGOTIABLE INSTRUMENTS

A negotiable instrument is defined as a written contract comprising terms and conditions and their benefits which could be transferred from its original holder to a new holder. Negotiable instruments are thus any transferrable documents that pledge a payment/sum of money to the assignee when claimed or in a time to come. In India, the law relating to negotiable instruments is governed by the Negotiable Instruments Act, 1881. The Act extends to the whole of India. A negotiable instrument has the following characteristics:

- **Unconditional promise:** The promise or order in a negotiable instrument must be unconditional. A conditional promise or order is not a part of negotiable instrument.
- **Written instrument:** Negotiable instrument must be a written document with a signature on it. This written document should indicate that the drawer of the instrument is intended to pay to the drawee. The written document can be in the form of handwritten notes, printed, engraved, typed, etc.
- **Easy transaction:** Negotiable instruments are easily and freely transferable. As the ownership of an instrument can be transferred easily by delivery or by a valid endorsement, no formalities or much paperwork is required in such a transfer.
- **Definite time of payment:** The time of payment in a negotiable instrument must be certain. If the instrument says that the payment would be made as per convenience, it does not come under a negotiable instrument. Thus, the time period for the payment must be certain even if it is not a specific date.

- **Specific payee:** Apart from definite time of payment, the person to whom the payment is to be made should also be specified in the negotiable instrument. In other words, a negotiable instrument must state a specific person or persons to whom payment is to be made. Here, “person” may also include artificial persons such as body corporates, trade unions, chairman, secretary, etc.

Let us discuss some negotiable instruments.

10.5.1 | PROMISSORY NOTES

A promissory note is a written promise to its payee by an entity or an individual to pay a certain sum of money by a specific date. In other words, promissory notes indicate the specific amount which is to be paid to a specific person by someone at a specific time. The promissory note consists of two parties, namely one is maker who makes the promissory document, and the other is payee who promises to pay at some decided future date.

In a promissory note, a maker can pay money only to –

- a certain person; or
- the order of a certain person.

Take an example where A buys goods worth ₹ 5,000 from B. Now, if in case A is unable to pay B for the purchase in cash, he could give a promissory note to B. This promissory note is A's promise to pay B the specific amount on a specified date or on demand.

However, the decision of accepting or rejecting the promissory note entirely depends on the seller. In other words, a seller cannot be forced to accept the promissory note. A promissory note always needs to be:

- drawn and duly signed by the maker
- in writing
- properly stamped (as required under the Indian Stamp Act)
- taken as a clear and unconditional promise to pay a certain sum to a specified person or on demand
- specific about the amount to be paid
- specific regarding the name of the maker and payee

10.5.2 | BILLS OF EXCHANGE

A bill of exchange is a legally binding, written negotiable instrument that carries an unconditional order to pay a specified sum of money to the holder of the instrument, as directed in the instrument by the maker. The bill of exchange is to be paid either when claimed, or after a fixed time period. In a business transaction, when goods are sold on credit to the buyer, the seller can make the bill and send it to the buyer for acceptance. This bill may contain details such as name and address of the seller and the buyer, amount of bill, maturity date, signature, and so on.

A bill of exchange can be employed in transactions related to both goods and services. It is signed by a payer (a party who owes money) and given to a payee or a seller (a party entitled to receive money). Thus, a bill of exchange can be used for fulfilling the contract for payment. When the bill of exchange is issued by financial institutions, it is normally referred to as a bank draft. On the other hand, if it is issued by an individual, it is called a trade draft.

Following are the features of bill of exchange:

- This instrument is drawn by the creditor against his debtor.
- It carries an absolute order to pay a specified sum of money on a specified date.
- The amount is to be paid to the person whose name is stated in the bill, or the order of the drawer, or to the holder of the instrument.
- It requires to be stamped, duly signed by the maker and accepted by the drawee.
- It contains a date by which the sum should be paid to the creditor.

10.5.3 | CHEQUES

A cheque is perhaps the most common form of negotiable instrument. It is an instrument in writing containing an unconditional order, addressed to the banker wherein the account holder directs the transfer the money in the name of the addressee. Here, on demand, the banker pays a certain sum of money only to the bearer of cheque or to any other person who is directed to be paid as per instructions.

The person who draws a cheque is called the 'drawer'. The banker on whom it is drawn is the 'drawee' and the person in whose favour it is drawn is the 'payee'. The following are characteristics of cheque:

- **Writing:** A cheque is always in the written form. The person who wants to address the cheque to another person can write the name of the person and the amount can be transferred to the addressee. Further, the cheque should be drawn on the name of a specific person without any conditions attached to it.
- **Unconditional order to pay:** Any contingent condition attached with the cheque can make the value of the cheque null and void.
- **It should be drawn on banker:** It is drawn on a specific bank, to direct the bank to transfer the amount in the account of the addressee.
- **Order to pay certain sums:** A cheque cannot be issued for any other reason except for the payment. The cheque contains a space below the name of addressee wherein a specific amount is written which is transferred to the addressee.
- **Signed:** A person who is addressing the cheque should sign the cheque to make it valid.
- **Validity:** A cheque is normally valid for three months from the date it bears.



EXHIBIT

THE NEGOTIABLE INSTRUMENTS (AMENDMENT) BILL, 2017

In January, 2018, the Negotiable Instruments (Amendment) Bill, 2017, has been introduced in the Lok Sabha. The bill aimed at amending the existing Act. The bill not only defines the promissory note, bill of exchange and cheques but also specifies the penalties for dishonour of cheques and various other violations associated to negotiable instruments.

As per the recent amendment, up to ₹ 10,000 along with interest at the rate of 6 to 9 per cent would be levied on an individual if cheques are dishonoured. The new bill also emphasises on bringing a provision for letting the court to order for compensation to people whose cheques have bounced due to a dishonouring party. However, such compensation shall not surpass 20 per cent of the total cheque value.



**SELF
ASSESSMENT
QUESTIONS**

9. A negotiable instrument means a promissory note, bill of exchange or cheque payable either to order or to bearer. (True/False)
10. Which of the following are the characteristics of a promissory note?
 - a. Written
 - b. Signed
 - c. Properly stamped
 - d. All these
11. The person who draws a cheque is called the _____.
12. A cheque is valid for how many months?
 - a. Three
 - b. Six
 - c. Nine
 - d. Twelve
13. A bill of exchange can be used in transactions related to goods as well as services. (True/False)



ACTIVITY 1

Research on the Internet and find differences between bill of exchange and promissory note.

10.6 SUMMARY


Legal issues in procurement should be an essential subject to consider while training the concerned employees. The purchasing staff should be aware of the potential legal issues that may arise during purchase functions with special consideration to the knowledge of the Contract Act and in particular how and when the organisation may be legally bound, types of contracts, termination or renewal of contracts. Therefore, as part of the risk management procedures, the procurement staff should ensure that only reputable suppliers are identified and dealt with.

Contracts or agreements between two or more parties interested in carrying out mutual transactions are drafted and validated by the Indian Contract Act. An agreement is an accepted promise which is agreeable by all parties involved or affected by it. For an agreement to change into a 'contract' according to the Indian Contract Act, it must lead to legal obligations or must come under the scope of the law. Legal contracts may be classified based on their validity, formation, performance.

The Sale of Goods Act, 1930, deals with sale of goods. There are basically two parties, i.e., one of which agrees to sell the goods and receive a price for it, and the other party receives the goods and pays the price for it. Fixed-priced contracts have a clear statement of work, wherein the buyer accepts a seller's price for it. Cost-reimbursable contracts are primarily made to pay all actual costs incurred to the seller and then add a fee amount as the seller's profit. Special purchase contracts and negotiable instruments play important role in facilitating secure transactions by keeping the legal aspect into consideration.

10.7 KEY WORDS



- **Arbitration:** A process in which a dispute is presented, by agreement of the parties, to arbitrators who make a binding decision on the dispute
- **Coercion:** The act of coaxing an individual or group to do one's bidding either through the use of force or threats
- **Indian Stamp Act:** An that deals with the charging of stamp duty on instruments recording transactions
- **Quasi contract:** An obligation of one party imposed on another by law independently of an agreement between the parties
- **Void-ab-initio:** A contract that is legally void from the time it was created

10.8 CASE STUDY: DUNLOP PNEUMATIC TYRE CO. LTD. vs. SELFRIDGE & CO. LTD.



Dunlop Pneumatic Tyre Co. Ltd. is a leading tyre manufacturing company. Dew is a trade purchaser that entered into a formal agreement with Dunlop for tyres at a discounted price. The stipulation in the contract was that Dew was not allowed to resell tyres any lower than the listed price and if a person intended to purchase and resell the tyres from Dew, they also had to accept the stipulation of not selling any lower than Dunlop's listed price.

Later, Dew sold the tyres to Selfridge & Co. Ltd. at the listed price and signed a contract with Selfridge to not sell the tyres at a lower price than that was listed and that they would have to pay £5 in damages in case they violated the agreement.

Selfridge & ampersand Co. Ltd., however, went ahead and sold the tyres below the price promised. Dunlop Pneumatic Tyre Co. Ltd. took action and sued Selfridge for the same but was overturned by the Court of Appeal. The Court of Appeal did not take any action against Selfridge as legally, there was no contract between Dunlop and Selfridge (the contract was between Dunlop and Dew) and, therefore, Dunlop

could not hold against Selfridge. The fundamental principles of law sustaining their decision were as follows:

- The doctrine of privacy of contract, which states that only a party to a contract can sue in breach of the contract. According to law, a stranger is not allowed to file a suit on the contract.
- The doctrine of consideration which requires the promisee (Dunlop) to give consideration to Selfridge for the contract to be completed. The same was not the case as Dunlop did not give anything in writing to Selfridge

The only way that an entity outside a contract can be sued is if one of the parties to the original contract acts as an agent to the unnamed party. In this case, Dew was not acting as Selfridge's agent, and thus Selfridge could not be charged against for selling the tyres at lower prices. The court decided that as Dunlop had already sold the tyres to Dew, they were the property of Dew and not the former.

Source: https://casebrief.fandom.com/wiki/Dunlop_Pneumatic_Tyre_Co._Ltd._v_Selfridge_%26_Co._Ltd.

QUESTIONS

1. Why could Dunlop not sue Selfridge for selling tyres at a lower price?
(**Hint:** Only parties to a contract can sue for a breach of the contract)
2. Under which circumstances could Selfridge be signed for breach of contract?
(**Hint:** If Dew was acting as an agent of Selfridge)

10.9 SHORT ANSWER QUESTIONS



1. _____ is an "an agreement enforceable by law".
2. _____ must be socially acceptable. It may or may not be enforceable by the law.
3. _____ refers to a promise offering 'something in return'.
4. _____ agreement lacks the essentials of a legal contract and is considered to be non-existent and null in its effects.
5. When there is no explicit expression of bindings within a contract, these are called _____.
6. _____ contracts have a clear statement of work, wherein the buyer accepts a seller's price for it.
7. An intention to enter a legally binding agreement or contract is a necessary element of a contract. (True/False)
8. The contract to sale must be absolute and unconditional and there should be a price or consideration for the goods to be transferred. (True/False)
9. A contract is "every promise and every set of promises, forming the consideration for each other". (True/False)
10. A proposal has to be accepted first to become a promise. (True/False)

11. A legally binding contract must include:
 - a. Offer
 - b. Acceptance
 - c. Consideration
 - d. All of the above
12. A valid contract should have the following essential elements:
 - a. Agreement
 - b. Competence of parties
 - c. Free consent
 - d. All of the above
13. An agreement may become a valid contract only if it involves:
 - a. A lawful consideration
 - b. A lawful object
 - c. Both a and b
 - d. None of the above
14. The following considerations and objects are defined as unlawful under the Act:
 - a. If it is forbidden by law
 - b. If it is against the provisions of any other law
 - c. If it is fraudulent
 - d. All of the above
15. Which of the following agreements are considered to be expressly void?
 - a. Agreements having lawful object
 - b. Agreements having lawful consideration
 - c. Agreements in restraint of marriage
 - d. Agreements made with the parties with contractual capacity
16. Which of these documents must be in writing to valid contracts?
 - a. A promise to pay a time-barred debt
 - b. An arbitration agreement
 - c. Bills of exchange, cheques or promissory notes
 - d. All of the above
17. When there is no offer or acceptance, and hence no contractual relations between the partners, the contract is called a/an:
 - a. Explicit contract
 - b. Express contract
 - c. Quasi contract
 - d. Implied contract
18. A contract which is partially performed or wholly unperformed is called a/an:
 - a. Executory contract
 - b. Unilateral contract
 - c. Bilateral contract
 - d. Executed contract

19. The conditions and warranties in the Sale of Goods Act, 1930, focus primarily on:
 - a. The time for payment and delivery of goods
 - b. Right to reject the goods or claim damages in definite situations
 - c. Protection of title and possession of goods purchased
 - d. All of the above
20. Which of these fixed-priced contracts is used for contracts that extends for multiple years?
 - a. Firm-Fixed-Price (FFP)
 - b. Fixed-Price with Economic Price Adjustment (FP-EPA)
 - c. Fixed-Price Incentive Fee (FPIF)
 - d. All of the above
21. In which of these contracts, the seller also bears a share of risk along with the buyer?
 - a. Cost plus Percentage of Cost (CPPC)
 - b. Cost plus Fixed Fee (CPFF)
 - c. Cost plus Award Fee (CPAF)
 - d. Cost plus Incentive Fee (CPIF)
22. Which of these is the least desirable cost-reimbursement contract for the buyer where the buyer accepts all risks and the seller bears zero risk?
 - a. Cost plus Percentage of Cost (CPPC)
 - b. Cost plus Fixed Fee (CPFF)
 - c. Cost plus Award Fee (CPAF)
 - d. Cost plus Incentive Fee (CPIF)
23. A promissory note always needs to be:
 - a. drawn and duly signed by the maker
 - b. in writing
 - c. properly stamped (as required under the Indian Stamp Act)
 - d. All of the above
24. Which of these is a legally binding, written negotiable instrument that carries an unconditional order to pay a specified sum of money to the holder of the instrument, as directed in the instrument by the maker?
 - a. Bills of Exchange
 - b. Promissory note
 - c. Cheque
 - d. All of the above

25. As per the Negotiable Instruments (Amendment) Bill, 2017, what punishment would be levied on an individual if cheques are dishonoured?
- up to 1000 along with interest at the rate of 5 per cent
 - up to 10,000 along with interest at the rate of 6 to 9 per cent
 - up to 1,00,000 along with interest at the rate of 6 to 9 per cent
 - up to 10,000 along with interest at the rate above 10 per cent

10.10 HIGHER ORDER THINKING SKILLS (HOTS)



- X promised his son Y to pay a sum of ₹ 2 lakh if Y passed the CA exams in the first attempt. Y passed the CA exams in the first attempt, but X failed to provide the amount as promised. State whether Y can recover the amount under the Indian Contract Act, 1972.
 - B can sue A
 - B has to pay ₹ 1 Lakh to A
 - B has no remedy against A
 - None of these
- A contract is considered to be discharged by breach, when a party to contract:
 - refuses to perform his promise
 - fails to perform his promise
 - disables himself from performing his part of the promise
 - All of the above
- In case of sales, risk is associated with:
 - Money
 - Possessions
 - Ownership
 - None of these
- When ownership is transferred from one party to another, a contract is said to be completed. (True/False)

10.11 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Importance of Legalities	1.	True
The Indian Contract Act, 1872	2.	c. Neither a Contract nor an Agreement
	3.	False
	4.	True
Sale of Goods Act, 1930	5.	condition
	6.	Fixed-Price Incentive Fee (FPIF)
Special Purchase Contracts	7.	a. Cost-reimbursable contracts
	8.	True

Topic	Q. No.	Answer
Negotiable Instruments	9.	True
	10.	d. All of the above
	11.	drawer
	12.	a. Three
	13.	True

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	Contract
2.	Agreement
3.	Consideration
4.	Void
5.	Implied
6.	Fixed-priced
7.	True
8.	True
9.	False
10.	True
11.	d. All of the above
12.	d. All of the above
13.	c. Both a and b
14.	d. All of the above
15.	c. Agreements in restraint of marriage
16.	d. All of the above
17.	c. Quasi contract
18.	a. Executory contract
19.	d. All of the above
20.	b. Fixed-Price with Economic Price Adjustment (FP-EPA)
21.	c. Cost plus Award Fee (CPAF)
22.	a. Cost plus Percentage of Cost (CPPC)
23.	d. All of the above
24.	a. Bills of Exchange
25.	b. up to 10,000 along with interest at the rate of 6 to 9 per cent

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	c. B has no remedy against A
2.	d. All of the above
3.	c. Ownership
4.	True

10.12 SUGGESTED BOOKS AND E-REFERENCES**SUGGESTED BOOKS**

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STRATEGIC COST MANAGEMENT

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CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Discuss the structured approach to cost reduction
- ▶ Explain the concept of price analysis
- ▶ Describe cost analysis techniques
- ▶ State the role of the total cost of ownership
- ▶ Discuss the collaborative approach to cost management



INTRODUCTION

Read Pre-read Connect

In the previous chapter, you have studied about legalities involved in purchase management. Purchasing involves agreement on various terms and conditions and signing of various terms and conditions. Thus, it is important that the purchasing department must be aware of the laws associated with purchasing.

Today's business environment is characterised by extreme competitive pressures and hence organisations need to employ strategies to manage and reduce costs not only on a short-term basis, but also over the long-term (Nimocks, Rosiello, & Wright, 2005). Strategic Cost Management (SCM) is the deliberate alignment of an organisation's resources and associated cost structure with long-term strategy and short-term tactics (Anderson & Dekker, 2009). Structural cost management is one form of SCM that refers to the cost management activities aimed at changing the cost structure of a business. It includes organizational tools, products and processes designed to build a cost structure that is coherent with strategy. It basically refers to the strategic decisions that define the gross parameters of the firm's cost structure (Henri, Boiral, & Roy, 2016). SCM is thus defined as the process of lowering total costs, along with improving the strategic position of a business by combining the decision-making structure with the cost information. SCM achieves this by thoroughly analysing which costs support a company's strategic position, which costs have no effect, and which costs undermine it. The cost reduction initiatives following this analysis either focus on lowering costs that undermine the strategic position of the business or have no effect on it; or increasing costs that support the strategic position.

SCM is an on-going process as the organisation may adopt different strategies over time. Therefore, certain costs may be indisputable when one strategy is employed but may need to be discarded when the strategy changes. Thus, SCM is concerned not just with managing costs but also applying the information to decision making. It is a critical element of the value chain that deals with various aspects such as design and development, procurement, production, and sales and service. It analyses cost information and offers improved understanding of the overall cost structure. It enables determination of the cost correlation between value chain activities and their management.

In this chapter, you will study about a structured approach to cost reduction. Thereafter, you will study about the concept of price analysis. Also, cost analysis techniques are explained in detail. The concept of total cost of ownership is discussed at length. Finally, the chapter will provide insight into the collaborative approach to cost management.



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the role strategic approach to cost reduction in materials management
- Outline the importance of negotiations process
- Examine the advantages of cost analysis techniques
- Determine the role of total cost of ownership
- Relate collaborative approach to cost management with materials management

11.1 STRUCTURED APPROACH TO COST REDUCTION

In today's competitive world, every organisation strives to stay ahead, earn high profits, make optimum use of scarce resources and increase productivity. This can be possible if an organisation follows a systematic approach to reduce its costs. In materials management, cost reduction involves actual and permanent bringing down of unit cost of goods or services without impacting the quality, function and value. It involves various activities such as eliminating waste, improving operations and productivity, reducing costs of materials, standardising, and so on. The following are some important ways to reduce costs in materials management:

- **Optimisation of material flow:** Generally, time is wasted in transporting materials to and from different operations on the assembly floor. Therefore, there should be a direct and short path to move material to production. This can reduce manufacturing time and increase earnings to a large extent.
- **Reduction in touch labour:** The most efficient way to reduce cost is to increase employee productivity by reducing the number of times a worker spends time in moving, sorting, preparing or storing material. If the worker spends a lot of time in these activities, then it leads to lost productivity. For instance, the need for receiving, inspection, sorting or storing materials is eliminated in vendor-managed inventory.
- **Prevention of damage:** It is important to ensure that there are proper storage procedures in place with regard to monitoring shelf life, maintaining adequate temperature, checking moisture levels, avoiding breakage, and so on. Also, providing training to employees helps to reduce damage, which ultimately results in cost savings.

Cost reduction is a systematic approach that involves various phases. Let us discuss the cost reduction process in detail in the next section.

11.1.1 COST REDUCTION PROCEDURE

In materials management, cost reduction cannot be achieved casually, it has to be planned and followed up systematically. Figure 1 shows five phases of the cost reduction procedure:

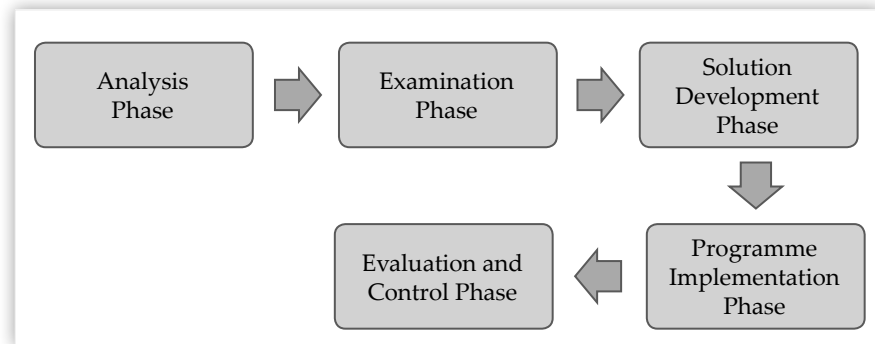


FIGURE 1: Phases in Cost Reduction

Let us explain these phases in detail.

1. **Analysis phase:** The first step to cost reduction is to find out the following aspects:
 - **What:** First of all, it is important to determine the purpose of cost reduction and how it will help the organisation in materials management.
 - **Where:** Once the purpose is decided, it is important to recognise all cost drivers so as to move forward with cost reduction.
 - **How:** It is of utmost importance for the organisation to decide on the approach/method to be selected for cost reduction. A detailed analysis on these methods is given in detail later in the chapter.
 - **Who:** The organisation decides the person who will be responsible for carrying out the cost reduction process.
 - **When:** Thereafter, the organisation determines the beginning and end period of the cost reduction process.

Apart from this, any internal and external factors that can have an impact on the cost reduction process should also be examined at this stage.
2. **Examination phase:** The second phase involves development of a detailed plan and schedule for each cost reduction initiative. This phase involves identifying existing resources in the organisation that can enable it to accomplish the defined goals and objectives. Also, areas, where external resources might be needed, are determined. The strengths and weaknesses, along with opportunities and risks should be considered and the issues should be prioritised according to their importance.
3. **Solution development phase:** This phase involves answering the following questions:
 - Will the organisation be able to achieve its objectives fully?
 - Is it practical to reduce costs?

- Will the selected method help to reduce costs?
 - Will it be acceptable to different stakeholders?
4. **Programme implementation phase:** Once the preparation has been done and solutions are developed at the previous phase, all employees of the organisation are made aware of their roles and responsibilities in the whole process of cost reduction. At this phase, actions are taken for reducing costs in all areas recognised at the first phase.
 5. **Evaluation and control phase:** Once the program has been implemented, it is important to measure its performance and take corrective actions when required. The evaluation of the plan includes performance measurements, constant monitoring of internal and external problems and remedial measures when needed. This is done by measuring the actual results against the planned ones.

11.1.2 | APPROACHES TO COST REDUCTION

Buyer organisations adopt a group of techniques for the systematic identification of unnecessary costs and exploring areas of performance improvement. Figure 2 lists some of the popular approaches to cost reduction:

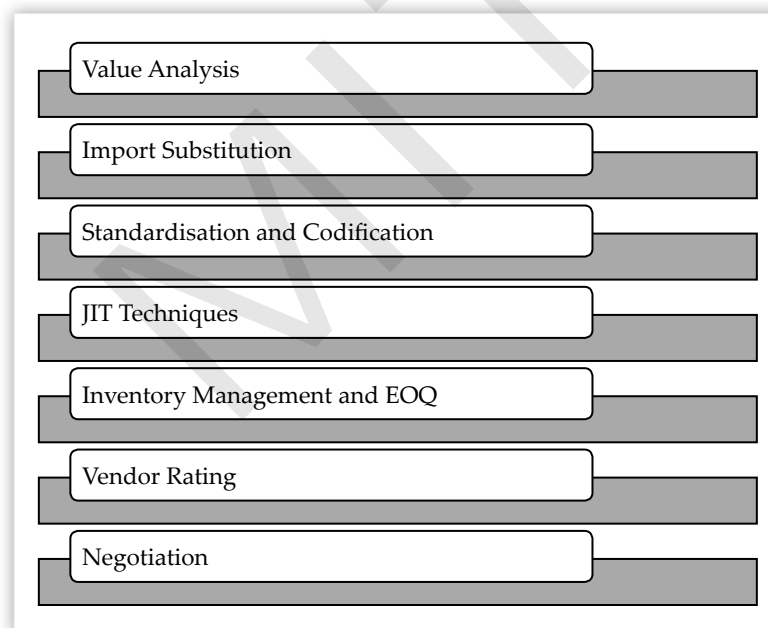


FIGURE 2: Cost Reduction Techniques

Let us understand these techniques in detail.

- **Value analysis:** You have already studied about value analysis in detail in Chapter 8 of the book. Value analysis refers to a technique of identifying various areas of a concern with an aim to explore performance improvement. It strives to achieve the maximum possible value for a given cost through a planned action and aims at cost reduction from the point of view of value.
- **Import substitution:** It is an approach to promote industrialisation by protecting domestic producers from the competition of imports.

Importing materials from foreign suppliers can be a costly deal for a buyer organisation in the form of high tariffs. Sharp increase in demand for imported materials leads to critical foreign-exchange shortages. Therefore, by purchasing supplies from domestic suppliers instead of importers can prove to be an effective cost reduction technique.

- **Standardisation and codification:** As manufacturing involves various activities from the selection of raw materials to finishing, standardisation of items reduces unnecessary repetition of work, which further leads to reduction in inventory costs and makes future maintenance easier. On the other hand, codification involves having a unique record of each of the items in stores and in work-in-process or in warehouse so as to facilitate the better inventory control.
- **JIT techniques:** JIT stands for Just-in-Time, which refers to a system wherein raw materials are brought to production floor only after an order is received and the product is ready to be produced. The benefit of this strategy is that an organisation needs to hold only a minimum amount of inventory. This not only means reduced costs but also enables the organisation to adjust to variations in demand. The basic idea of JIT is the elimination of waste by reducing stocks of raw materials and finished goods so that the carrying cost of inventory is minimal.
- **Inventory management and EOQ:** Inventory management is a practice of supervising the ordering, storage and use of components used in the production of the items sold by an organisation. The Economic Order Quantity (EOQ) refers to the number of units that an organisation should add to inventory with each order to minimise the total costs of inventory which may include holding costs, order costs and shortage costs.
- **Vendor rating:** You have already studied about vendor selection in Chapter 7 of the book. In vendor rating, the most efficient supplier is selected according to the weightage received when the comparisons with other supplier is done. By selecting the efficient supplier, the buyer organisation can reduce costs involved in receiving faulty products.
- **Negotiation:** A detailed explanation on negotiation is given in Chapter 9 of the book. Negotiation can be defined as the process of communication and bargaining between the buyer and seller with the goal of reaching an acceptable agreement on price, schedule, terms and conditions of the contract, payment terms, etc. By negotiating and receiving effective prices from suppliers can add to profitability of the organisation and lead to reduced costs.



**SELF
ASSESSMENT
QUESTIONS**

1. In materials management, _____ involves actual and permanent bringing down of unit cost of goods or services without impacting the quality, function and value.
2. If the worker spends a lot of time in these activities, then it leads to lost productivity. (True/False)

3. It is important to ensure that there are proper _____ in place with regard to monitoring shelf life, maintaining adequate temperature, checking moisture levels, avoiding breakage and so on.
4. Which of the following is the second step in cost reduction procedure?
 - a. Solution development phase
 - b. Analysis phase
 - c. Examination phase
 - d. Evaluation and control phase



ACTIVITY 1

Using the Internet, find out how EOQ is beneficial for manufacturing organisations.

11.2 PRICE ANALYSIS

Price analysis can be defined as the process of comparison of prices quoted by a supplier against external points of reference. It refers to the process of studying and evaluating a proposed price without assessing its separate cost elements and anticipated profit. Price analysis is generally favoured for evaluating product options whenever possible. It is used to compare the price of products or services of one seller against competing alternatives. In case of bids or proposals by competing sellers, price analysis would involve a detailed analysis of the merits of each offering against quoted prices. Price analysis uses information from historical prices, market prices and published prices.

Price analysis is applied when there are a number of appropriate and comparable alternatives in a purchase decision. A common prerequisite for price analysis is that the product or service is available on the open market and the available options are fairly equal in benefits. For price analysis strategy to be effective, it needs to be applied to products whose procurement can be compared to similar procurements. Price analysis aims to identify whether a price is reasonable, depending on the market where the supplier operates. There are four basic elements to price analysis, which are:

1. Analysis of available price history, if any
2. Comparison of price to internal estimates
3. Comparison of competitive bids from multiple suppliers
4. Making use of existing catalogues or government prices for a product or service

Some widely used techniques for comparing price are given below:

- Comparison of competitive bids
- Comparison of prior quotations

- Comparison of published price list
- Prices set by law or regulation
- Similar item comparison



**SELF
ASSESSMENT
QUESTIONS**

5. _____ can be defined as the process of comparison of prices quoted by a supplier against external points of reference.

11.3 COST ANALYSIS TECHNIQUES

Cost analysis is an approach used when making decisions on the right value of products or services before purchase. It is the process of examining each individual cost component that makes up the final cost. Cost analysis is usually more complex and involves a thorough analysis of the specified product and service components and related costs. Purchase managers apply historical data, their experience and general understanding of costs of each element of the solution to arrive at a decision on the advantages of the solution. While price analysis focuses solely on a seller's price perspective giving less consideration to actual cost of production, cost analysis focuses on each individual cost element and the final cost of product. This analysis determines a fair and reasonable price and helps to develop a plan to achieve future cost reduction.

Cost analysis is generally applied where price analysis is not possible. This might be due to the fact that no alternative solutions exist for making a comparison or no comparable proposals were proposed. Cost analysis is also required for novel research, new product development work, internal development of a product and also when unique patents or products are involved. Cost analysis is more challenging as it involves applying all direct (traceable) and indirect costs into formulas to generate a specific cost breakdown of a process or product. It is good to determine direct costs and profit that can be ascribed to the final cost of the product to work out the cost drivers behind a product or service. Material costs, salaries, labour costs, materials, fringe benefits, travel, etc., are all included in this list. Examples of indirect costs associated with the final product or service (that are not directly associated with the final product) may include advertising, marketing, legal expenses, travel, rent, repairs, communication costs, insurance, taxes, fees, depreciation, and utilities.

Apart from the elements of price analysis, cost analysis also takes into account five key factors:

1. Required workforce
2. Hours put in by the workforce
3. Cost of resources such as raw materials and machine time
4. Estimate of indirect costs such as transport, storage, rent, taxes, fees
5. Analysing whether costs are necessary and justified



NOTE

Direct costs are incurred on direct labor, direct materials, commissions, piece rate wages and manufacturing supplies. On the other hand, indirect costs include production supervision salaries, quality control costs, insurance and depreciation.

The widely used techniques for cost analysis are listed in Figure 3:

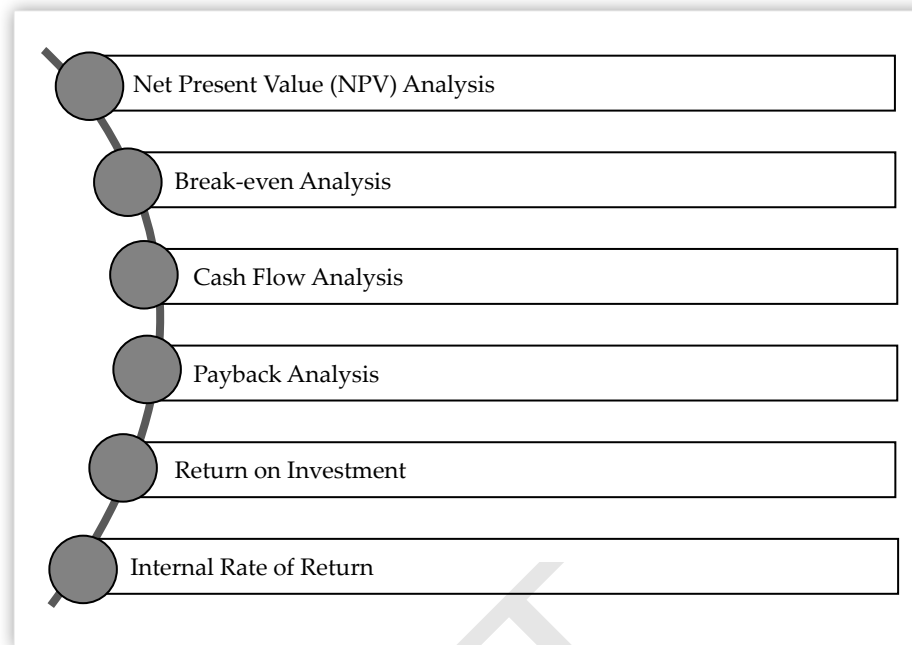


FIGURE 3: Techniques of Cost Analysis



STUDY HINT

Discount rate has two different definitions and usages. First, the discount rate refers to the interest rate charged to the commercial banks and other financial institutions for the loans they take from the Federal Reserve Bank through the discount window loan process, and second, the discount rate refers to the interest rate used in discounted cash flow (DCF) analysis to determine the present value of future cash flows.

Let us discuss these techniques one by one.

- **NPV Analysis:** When the present value analysis is performed for net benefits it is called the net present value. NPV uses time value of money for both costs and benefits. NPV compares the benefits of available options and annual discounted costs. NPV is the current value of all net benefits of a project. This sum is discounted at the discount rate. If the NPV is greater than zero, the project would seem to be attractive. NPV can be calculated using the following formula:

$$NPV = \frac{\text{Cash flow}}{(1+r)^t} - \text{initial investment}$$

Where

r = Required return or discount rate t = Number of time periods

Cash flow = Cash flows in the time period

If an investment has a positive NPV, it will have a return greater than the cost of capital.

- **Break-even analysis:** It is performed for comparing costs of the existing system with a proposed system. A new system will require a larger investment initially with benefits beginning to show over time. Meanwhile, operational costs are chief costs for the existing system. The cost per transaction for the new system will become lower than the existing system beyond a certain volume. This is known as the break-even point. The old system is less expensive below this volume while the new system is less expensive above this volume. For example, if the existing system has a fixed cost of ₹ 4 per

**NOTE**

Cost of capital is the opportunity cost of making a specific investment. It refers to the rate of return that could have been earned by putting the same money into a different investment with equal risk. Thus, the cost of capital is the rate of return required to persuade the investor to make a given investment.

transaction, whereas the new system has an initial cost of ₹ 15000 and a transaction processing cost of ₹ 1 per transaction after that, the break-even point is a transaction volume of 5000.

- **Cash flow analysis:** Cash flows in the outward direction when money is spent and inward direction when it is received from revenues and earnings. Charting the outflow and inflow of cash anticipated over a given time provides a clear picture of costs. The plot of the accumulated flow shows the payback period and a breakpoint and an indication of the amount of cash that will be required to keep the new system going.
- **Payback analysis:** This method helps to determine when an investment will pay for itself. For any project, most of the costs are incurred in the initial stages while it takes a while for the benefits to be realised. Payback analysis helps to determine the payback period, which is the time taken for the accumulated benefits to become equal to the initial investment. A smaller payback period means the profits of the new system will begin to show faster. The time value of money may or may not be taken into account in this analysis. The resulting payback periods will be different depending on whether or not the time value of money has been considered in the calculations.
- **Return on investment:** ROI is a financial profitability metric that is used to calculate the return from an investment. This analysis compares the profitability of a project or an investment option over its lifetime by applying a percentage rate that shows the correlation between the invested amount and the return. ROI is the ratio of the return from an investment relative to its cost. It is calculated as:

$$\text{ROI} = \frac{\text{Final Value of Investment} - \text{Initial Value of Investment}}{\text{Cost of Investment}} \times 100\%$$

- **Internal rate of return:** Internal Rate of Return (IRR) is a probability metric used for establishing the suitability and feasibility of a project or investment. The calculated result provides an idea of the degree of efficiency, returns or quality of investment. The IRR compares the maximum interest paid for cash outflows with cash inflows that still lets the investor break even. In other words, the present value of inflows equals the present value of outflows.

$$\text{or } \text{PV}(\text{Benefits}) - \text{PV}(\text{Costs}) = \text{Zero}$$

When IRR is greater than the project discount rate, the project is considered to be desirable.

Let us understand cost analysis techniques with the help of some examples.

Illustration 1: ABC Company is planning to invest in a project that generates the following cash flows:

Year	Cash Flow
0	50,000
1	15,000
2	17,000
3	18,000

**NOTE**

IRR calculation assumes that all inflows can be re-invested at the return from a particular investment.

Year	Cash Flow
4	10,000
5	10,000

The discounting rate is 10%. From the given information, calculate

- (i) NPV and
- (ii) IRR

Also, suggest whether the company should invest in the project or not.

Solution:

- (i) NPV Calculation

Using the formula, the NPV of the project is calculated as follows:

$$\begin{aligned} \text{NPV} &= \frac{15000}{(1.1)} + \frac{17000}{(1.1)^2} + \frac{18000}{(1.1)^3} + \frac{10000}{(1.1)^4} + \frac{10000}{(1.1)^5} - 50000 \\ &= ₹ (54248.94 - 50000) \\ &= ₹ 4248.94 \end{aligned}$$

- (ii) It should be noted that IRR is the rate at which the NPV of the costs of an investment equals the NPV of the expected future revenues of the investment. This implies that NPV should be equal to 0. However, in the given case, the NPV is ₹ 4248.94 at 10%. NPV be zero at 14%.

From the above calculation, it can be seen that the NPV generated by the project is positive and IRR is 14%, which is more than the required rate of return. Thus, the company can invest in the project.



**SELF
ASSESSMENT
QUESTIONS**

6. _____ is the process of examining each individual cost component that makes up the final cost.
7. The _____ period is the time taken for the accumulated benefits to become equal to the initial investment.

11.4 TOTAL COST OF OWNERSHIP

The Total Cost of Ownership (TCO) is the sum of the purchase price of an asset and the costs of its operation. TCO is a financial estimate that enables buyers and owners to determine both direct and indirect costs of an asset. Evaluating the TCO looks at what the asset is and assesses its value over time. It is important when comparing available alternatives in a purchasing decision to consider not only the short-term price of a product, i.e., the purchase price, but also its long-term price, i.e., the TCO. The product or system with lower TCO means better value in the long-term. TCO consideration is also important during the purchase of assets and making capital investments.

TCO analysis is more comprehensive and includes the initial purchase price plus all direct and indirect expenses associated with quality, delivery and service such

as service costs, inspection, rework and reject costs, maintenance, replacement, disposal, and life-cycle costs. A TCO analysis includes total cost of procuring and operating an asset, plus replacement or upgrades at the end of the life cycle. TCO is quite challenging as it is difficult to implement and maintain.

In manufacturing environment, apart from assessing the initial manufacturing cycle time and component costs, TCO also includes several cost-of-doing-business items, such as shipping and re-shipping, and opportunity costs, as it is also concerned with doing business overseas. There are three key components to TCO calculation as shown in Figure 4:

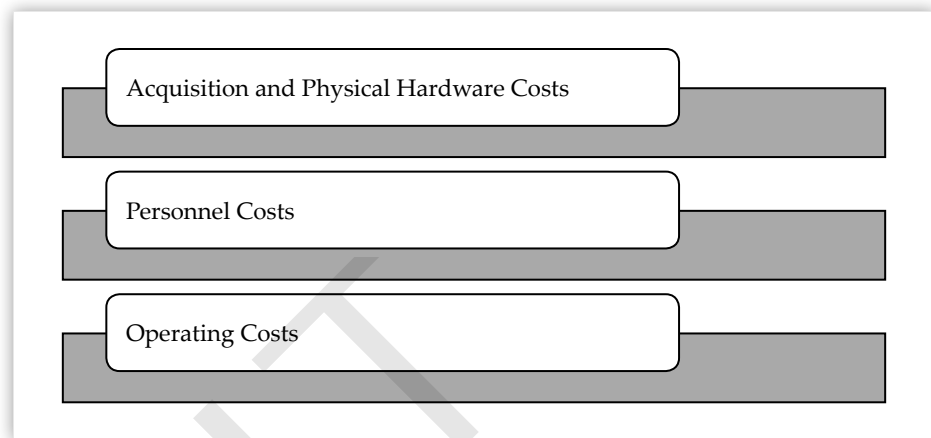


FIGURE 4: Three Components of TCO Calculations

Let us now understand each of these components.



NOTE

Actual TCO can include not only costs but also incremental savings or revenue flows generated by the investment of capital.

1. **Acquisition/physical hardware costs:** These costs include the cost of an asset after commissions, discounts, incentives and closing costs but before taxes. In some cases, these might include one-off supplementary equipment or required upgrades.
2. **Operating costs:** These include utility costs, direct labour and initial training costs for utilising the asset.
3. **Personnel costs:** These costs may include costs of administrative personnel, support staff, facility for holding the equipment and operators plus on-going training and troubleshooting workforce needed for maintenance.



SELF ASSESSMENT QUESTIONS

8. _____ is a financial estimate that enables buyers and owners determine both direct and indirect costs of an asset.
9. TCO comprises of acquisition/physical hardware costs, operating costs and _____ costs.

11.5 COLLABORATIVE APPROACH TO COST MANAGEMENT

Lack of initial involvement of the procurement department in the process of product design and development can create challenges in supplier selection and

price negotiation. Collaborative Cost Management (CCM) can help to overcome challenges related to cost. CCM has several applications across the product life cycle.

Collaboration between departments such as engineering, manufacturing, procurement and also suppliers from the beginning of product development, helps to bring down costs by offering continual visibility to total product cost and provides targeted initiatives to manage overall cost. CCM enables the coming together of various teams to bring forth creative ideas to decrease costs, much to the advantage of all the parties.

There are three phases in establishment of CCM using a structured approach, as given in Table 1:

TABLE 1: Three Phases in Establishment of CCM

Phase I Pre CCM	Phase II CCM	Phase III Post CCM
Identify part information (part family, category, etc.)	Cost Analysis, Supplier Analysis	Review cost drivers on an ongoing basis Run iterations to identify other cost drivers Take actions to manage product cost

Source: <https://www.cgnglobal.com/blog/node/730>

Pre-CCM activities include:

- Gathering information related to the family and category of components
- Determining target costs by subsystem/major component
- Determining baseline cost
- Establishing process for continual review
- Assessing scrap, Work-in-Progress (WIP) inventory

CCM activities include:

- Identifying potential suppliers
- Supplier assessment
- Determining supplier involvement
- Identifying cost levers

Post-CCM activities include:

- Several repetitions of the cost lever evaluation matrix to identify all the possibilities
- Documenting component data, should-cost analysis, supplier review
- Outlining and managing cost reduction activities

The framework of CCM is depicted in Figure 5:

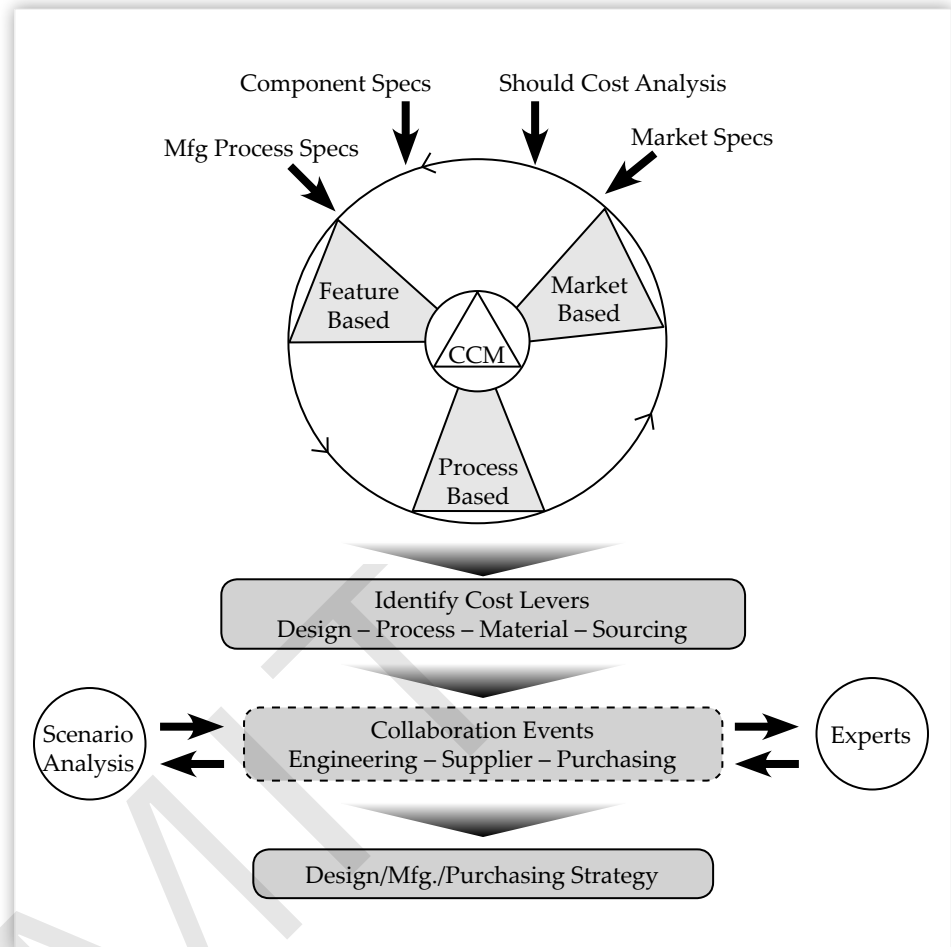


FIGURE 5: CCM Framework

Source: <https://www.cgnglobal.com/blog/node/730>

By focussing on cost at the initial stages, effective collaboration between cross-functional teams and capturing cost drivers throughout product value chain, CCM provides the following:

- It supports negotiations with suppliers and supplier collaboration
- It brings focus on strategic sourcing initiatives
- It increases cost efficiencies of product, optimises design and brings cost reduction savings while increasing quality

Quick TIP

At times, it is required to make radical changes to the budgetary practices and move beyond practices for significant cost reduction to occur. Rethinking your strategy and ensuring collaboration between various departments can bring about the change needed.



SELF ASSESSMENT QUESTIONS

10. CCM supports negotiations with suppliers and supplier collaboration. (True/False)
11. Identifying cost levers is a _____ activity.

11.6 SUMMARY



In materials management, cost reduction involves actual and permanent bringing down of unit cost of goods or services without impacting the quality, function and value. It involves various activities such as eliminating waste, improving operations and productivity, reducing costs of materials, standardising, and so on. Some important ways to reduce costs in materials management are optimisation of material flow, reduction in touch labour and prevention of damage. Cost reduction cannot be achieved casually, it has to be planned and followed up systematically. The five phases of the cost reduction procedure are analysis phase, examination phase, solution development phase, programme implementation phase and evaluation and control phase. Some popular approaches to cost reduction are value analysis, import substitution, standardisation and codification, JIT techniques, inventory management and EOQ, vendor rating, and negotiation.

Price analysis can be defined as the process of comparison of prices quoted by a supplier against external points of reference. It uses information from historical prices, market prices and published prices. Price analysis is applied when there are a number of appropriate and comparable alternatives in a purchase decision. Cost analysis is the process of examining each individual cost component that makes up the final cost. The widely used techniques for cost analysis are net present value, break-even analysis, cash flow analysis, payback analysis, return on investment, and internal rate of return. The Total Cost of Ownership (TCO) is the sum of purchase price of an asset and the costs of its operation. There are three key components to TCO calculations, namely: acquisition/physical hardware costs, operating costs and personnel costs. Collaborative Cost Management (CCM) can help to overcome challenges related to cost through collaboration between cross-functional departments. There are three phases in establishment of CCM using a structured approach such as: Pre-CCM, CCM and Post-CCM.

11.7 KEY WORDS



- **Should-cost analysis:** An assessment of the supplier's expenses in delivering a product/service based on materials, labour, overheads and profit margins that is conducted by a customer
- **Standardisation:** A process of maintaining uniformity in various materials, components and spare parts used in the production process
- **Time value of money:** A financial concept stating that money available at the present time is worth more than the same amount in the future

11.8 CASE STUDY: COST REDUCTION FOR HONDA ACCORD



Consider a scenario where a company has developed an exciting new product. But on running the figures, finance finds that the project is not desirable as it gives a negative NPV. This leaves the company with two options, i.e., either scrap the project or modify the cost equation so that the project is profitable. If the company goes with the latter option, costing may make it possible. This is what happened with Honda's newly redesigned 1998 model Accord. The results from finance

showed that Honda would lose money on each Accord sold. While this was disappointing news, there were two important considerations for Honda:

- Honda really needed the new model to compete in the market.
- Competitors were offering similar products for 25% lower prices.

The Honda team, therefore, launched a careful costing initiative to change its cost equation. The aim was to take 30% out of the costs of the new design. The purchasing team worked hard on the cost details. They determined the selling price upfront and subtracted their profit. The remainder was what should be the money available for the budget. This figure was then decomposed for the different components such as engine, chassis etc., establishing targets for each area and each component. Considering the emphasis that Honda laid on customer satisfaction, this detailed cost modelling was a highly challenging task.

Moreover, the suppliers' manufacturing processes were analysed to understand their cost structure. Suppliers were made a part of the whole process through cooperation, collaboration and sharing of information. This ensured that the targets will be achieved without compromising on quality.

Apart from simply determining the cost of different components, Honda's cost-modelling process was an integrated process that extended to every factor that might add to the total cost. For this, sales, manufacturing, purchasing and design worked closely together for collaborative cost management.

Honda invests in supplier development and to leverage the capabilities and technology of its suppliers in research and development programs, it has an initiative "Design In", which focuses on supplier involvement in the early stages. This is important to ensure that Honda will effectively integrate the latest innovations and technology into its new products. A significant part of the cost reduction from the 1998 Accord was a result of the suppliers' work with purchasing and engineering.

Successful cost management had a considerable effect on the profitability of Honda and its suppliers. Honda already knew about the details of the 1998 model, its cost and its price when it launched its 1994 model. It had already completed the front end of the process around two and a half years before the model actually hit the market and about 10% of these savings could be released onto the 1996 Civic which showed in their returns. The focus on cost efficiency via SCM resulted in a 5 per cent return on sales for Honda, turning it from a potential failure to a success.

Source: <https://www.autonews.com/article/19981109/ANA/811090765/how-honda-cuts-costs-satisfies-suppliers>

QUESTIONS

1. What were the considerations for Honda when launching the 1998 model of Honda Accord?

(Hint: Honda really needed the new model to compete in the market and competitors were offering similar products for 25% lower prices.)

2. What was Honda's plan to make the 1998 Honda Accord a profitable project?
(**Hint:** The Honda team launched a careful target-costing initiative to change its cost equation).

11.9 SHORT ANSWER QUESTIONS



1. At the _____ phase, the strengths and weaknesses, along with opportunities and risks should be considered and the issues should be prioritised according to their importance.
2. In _____, the most efficient supplier is selected according to the weightage received when the comparisons with other supplier is done.
3. As manufacturing involves various activities from the selection of raw materials to finishing, _____ of items reduces unnecessary repetition of work.
4. When the Internal Rate of Return is _____ than the project discount rate, the project is considered to be desirable.
5. _____ is a financial profitability metric that is used to calculate the return from an investment.
6. Documenting component data, should-cost analysis, supplier review come under _____ CCM activities.
7. Cost analysis is generally favoured for evaluating product options whenever possible. (True/False)
8. Economic Order Quantity (EOQ) refers to the number of units that an organisation should add to inventory with each order to minimise the total costs of inventory which may include holding costs, order costs and shortage costs. (True/False)
9. The cost per transaction for the new system will become lower than the existing system beyond a certain volume. This is known as the break-even point. (True/False)
10. The product or system with higher total cost of ownership means better value in the long-term. (True/False)
11. Which of the following is not considered a way to reduce costs in materials management?
 - a. Optimisation of material flow
 - b. Reduction in touch labour
 - c. Prevention of damage
 - d. Reduction in attrition level
12. At the _____ phase, actions are taken for reducing costs in all areas recognised at the first phase.
 - a. Solution development phase
 - b. Evaluation and control phase
 - c. Programme implementation phase
 - d. Examination phase

13. Which of the following is not answered under the solution development phase of the cost reduction procedure?
 - a. Will the organisation be able to achieve its objectives fully?
 - b. Is it practical to reduce costs?
 - c. Will the selected method help to reduce costs?
 - d. Will the employees participate in recreational activities?
14. Which of the following promotes industrialisation by protecting domestic producers from the competition of imports?
 - a. Import substitution
 - b. Value analysis
 - c. Standardisation and codification
 - d. JIT techniques
15. _____ is a practice of supervising the ordering, storage and use of components used in the production of the items sold by an organisation.
 - a. Standardisation and codification
 - b. JIT techniques
 - c. Vendor rating
 - d. Inventory management
16. At which stage of the cost reduction procedure existing resources of the organisation are identified?
 - a. Programme implementation phase
 - b. Analysis phase
 - c. Examination phase
 - d. Solution development phase
17. The benefit of _____ is that an organisation needs to hold only a minimum amount of inventory.
 - a. Standardisation and codification
 - b. JIT techniques
 - c. Vendor rating
 - d. Inventory management
18. By negotiating and receiving effective _____ from suppliers can add to profitability of the organisation and lead to reduced costs.
 - a. Value
 - b. Prices
 - c. Cost
 - d. Sale

19. _____ strives to achieve the maximum possible value for a given cost through a planned action and aims at cost reduction from the point of view of value.
- Standardisation and codification
 - JIT techniques
 - Value analysis
 - Inventory management
20. Another common pre-requisite for _____ is that the product or service is available on the open market and the available options are fairly equal in benefits.
- Price analysis
 - Cost analysis
 - Net present value
 - TQM
21. Price analysis is required in the case of which of the following?
- For new product development work
 - For internal development of a product
 - In case of unique patents or products
 - For comparison of competitive bids
22. Which of the following formula can be used to calculate NPV?
- $$\text{NPV} = \frac{\text{Cash flow}}{(1+r)^t} - \text{Initial investment}$$
 - $$\text{NPV} = \frac{\text{Cash flow}}{(1+r)^t} + \text{Initial investment}$$
 - $$\text{NPV} = \frac{\text{Cash flow}}{(1+r)^t} \times \text{Initial investment}$$
 - None of these
23. _____ analysis compares the profitability of a project or an investment option over its lifetime by applying a percentage rate that shows the correlation between the invested amount and the return.
- Break-even
 - Net present value
 - Return on investment
 - Payback
24. The _____ is the sum of purchase price of an asset and the costs of its operation.
- Total cost of ownership
 - Break-even point
 - Cash flow
 - Internal rate of return

25. Which of the following is not a pre-CCM activity?
- Gathering information related to the family and category of components
 - Determining target costs by subsystem/major component
 - Determining baseline cost
 - Supplier assessment

11.10 HIGHER ORDER THINKING SKILLS (HOTS)



- Being a purchase manager of an organisation, you need to adopt one of the techniques to compare costs of the existing system with a proposed system. Which of the following technique would you suggest for such a requirement?
 - Net Present Value
 - Cash flow analysis
 - Break-even analysis
 - None of these
- Match the following:

I. Operating Cost	i. Training Cost
II. Personnel Cost	ii. Machinery Value after discount
III. Acquisition Cost	iii. Utility Cost

 - I-I, II-ii, III-iii
 - I-iii, II-I, III-ii
 - I-ii, II-I, III-iii
 - None of these
- An example of strategic cost management is when differentiation is important for customers and the value addition provided to the customer go beyond the cost of providing differentiation. (True/False)

11.11 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Structured Approach to Cost Reduction	1.	cost reduction
	2.	True
	3.	storage procedures
	4.	c. Examination phase
Price Analysis	5.	Price analysis
Cost Analysis Techniques	6.	Cost analysis
	7.	Payback
Total Cost of Ownership	8.	Total cost of ownership
	9.	personnel

Topic	Q. No.	Answer
Collaborative Approach to Cost Management	10.	True
	11.	CCM

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	examination
2.	vendor rating
3.	Standardisation
4.	Greater
5.	Return on Investment
6.	post
7.	False
8.	True
9.	True
10.	False
11.	d. Reduction in attrition level
12.	c. programme implementation phase
13.	d. Will the employees participate in recreational activities?
14.	a. Import substitution
15.	d. Inventory management
16.	c. Examination phase
17.	b. JIT techniques
18.	b. Prices
19.	c. Value analysis
20.	a. Price analysis
21.	a. For new product development work
22.	a. $NPV = \frac{\text{Cash flow}}{(1+r)^t} - \text{Initial investment}$
23.	c. Return on Investment
24.	a. Total cost of ownership
25.	d. Supplier assessment

C. HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	c. Break-even analysis
2.	b. I-iii, II-I, III-ii
3.	True

11.12 SUGGESTED BOOKS AND E-REFERENCES**SUGGESTED BOOKS**

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TECHNOLOGY IN MATERIALS MANAGEMENT

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12.11 Suggested Books and e-References



CHAPTER OBJECTIVES

After studying this chapter, you will be able to:

- ▶ Describe the concept of Materials Management (MM) and its implementation in ERP
- ▶ Outline the functions of the MM module of SAP
- ▶ Explain the concept and process of e-sourcing
- ▶ Discuss the concept of Supplier Relationship Management (SRM)
- ▶ Discuss the functions and benefits of using SAP SRM
- ▶ Explain the concept of Collaborative Planning, Forecasting and Replenishment (CPFR)



INTRODUCTION

Read
Pre-read Connect

In the previous chapter, you studied about the various aspects of strategic cost management such as last reduction approach, price analysis, cost analysis techniques, total cost of ownership and collaborative approach to cost management.

Any industry, especially manufacturing remains heavily dependent upon its suppliers for the regular and uninterrupted supply of the materials that it uses for production purposes. Manufacturers are also dependent upon their logistics partners for ensuring safe, timely and smooth shipping and the delivery of products. The materials that are procured by an organisation and the materials (finished products) that leave the organisation must be handled and managed in a strict and sophisticated manner. This is necessary for ensuring that no damages are done to materials, which eventually leads to financial losses.

Earlier, in organisations, there used to be different departments for materials requisition and supply which took a lot of time. Now, owing to the advancement in technology, all the major processes of business are being done using sophisticated software. The procurement department still exists but its work has been made quite easier, accurate and swifter by using relevant technologies. For instance, SAP ERP is one such software that handles a wide array of processes and activities of an organisation. SAP ERP consists of various modules and each is dedicated for handling the tasks related to different functions. SAP ERP contains a dedicated module for Materials Management (MM). Various supply chain activities such as inventory management, purchasing, receiving goods, invoice verification, quality control, vendor evaluation, etc., can be handled using the SAP's MM module.

E-sourcing is the digital equivalent of sourcing and involves all the activities of sourcing such as generation of requisitions, seeking supplier information, evaluation of suppliers, making orders, receiving goods and generation of the invoice.

When an organisation is largely dependent upon its suppliers, it becomes essential to maintain cordial relations with them. This is specifically required so that the suppliers willingly help organisations in ensuring that the inventory needed by them can be maintained at an optimal level. For this purpose, organisations usually practice Supplier Relationship Management (SRM). The technology that enables SRM comes in the form of SRM software. One of the most widely used SRM software is SAP SRM. Another important concept in supply chain and materials management is the collaboration between suppliers and buyers which is called Collaborative Planning, Forecasting and Replenishment (CPFR).

In this chapter, you will study the significance of technology in materials management. You will also study about various concepts of Materials Management (MM) along with the importance of software such as SAP MM module, SRM and SAP SRM. The last section of the chapter will describe the concept of Collaborative Planning, Forecasting and Replenishment (CPFR).



LEARNING OUTCOMES

The content and assessments of this chapter have been developed to achieve the following learning outcomes:

- Justify the practice of Materials Management (MM) by an organisation
- Propose the use of the MM Module of SAP in different industries
- Examine the use of e-sourcing in different industries
- Examine the role of SAP SRM in manufacturing industries
- Suggest the use of Collaborative Planning, Forecasting and Replenishment (CPFR) in industries where it has not been used so far

12.1 MATERIALS MANAGEMENT IN ERP

Enterprise Resource Planning (ERP) is a software application that is used by organisations to manage all its resources. ERP software system is a collection of various modules that are seamlessly integrated with one another. ERP software systems are used to manage and track all the business processes and resources starting from a single screw to payment of employee salaries. Today, ERP is an essential part of most organisations because it is the single cross-functional software that supports all the business processes. It is a centralised system and can be used by different departments and functions. The management and other employees depend on the information provided by the ERP system to make their decisions.

ERP software systems are usually of two types, namely on-premise ERP software systems and cloud-based ERP systems. The difference between these two is that an on-premise ERP software is installed on a company's computers and servers, whereas the cloud-based ERP software is hosted on a cloud and is accessible through a Web browser.

Some of the prominent ERP software systems are as follows:

- Oracle NetSuite ERP
- Scoro ERP
- Sage Intacct ERP
- SAP ERP
- SYSPRO ERP
- Oracle ERP Cloud
- Odoo ERP
- Microsoft Dynamics GP ERP
- Epicor ERP
- Brightpearl ERP
- Sage 100 ERP
- FinancialForce ERP
- Microsoft Dynamics NAV ERP
- Marg ERP 9+
- Tally ERP 9

Different ERP software are developed by different IT vendors using different implementation technologies. However, there are certain basic modules that are present in all the ERP systems such as the following:

- Human Resource Module
- Inventory Management Module
- Sales and Marketing Module
- Materials Management/Purchase Management Module
- Finance and Accounting Module
- Customer Relationship Management (CRM) Module
- Supply Chain Management (SCM) Module
- Engineering/Production Module
- Project Management Module

It must be noted that each component module of the ERP software system contains various submodules. Each module is integrated with other modules and it handles all the tasks defined under that module. The Materials Management (MM) module is one of the modules. The MM module is responsible for the overall management of the materials required, processed and produced in an organisation. Various procurement processes are also managed using this module. Mostly, this module is linked with inventory and production submodules because the procured materials form the inventory, which is further used in the production process. Some of the important submodules of the MM module include the following:

- Consumption-based planning
- Inventory management
- Invoice verification
- Material Requirement Planning (MRP)
- Purchasing
- Vendor valuation
- Material master data
- Vendor master data
- Warehouse management

Let us discuss about the key functionalities of some of the important submodules of ERP MM. The Purchasing submodule is perhaps the most important submodule which manages all the processes required for the procurement of materials. Some of the important functionalities of this submodule include:

- Vendor listing
- Supplier and item linking
- Sending quotations to vendors
- Receiving and recording quotations
- Analysing quotations
- Preparing purchase orders
- Tracking purchased materials
- Preparing the Good Receipt Notes (GRNs)
- Updating stock list

The inventory management submodule is responsible for managing all the processes required for handling the materials received from vendors and ensuring that these materials are stored at their designated locations. Some of the important functionalities of this submodule include:

- Defining movement type
- Defining the path to reach movement type
- Creation of goods receipt
- Cancellation of goods receipt
- Reservation of stocks
- Goods issuance

The vendor master data submodule contains all the information related to vendors from whom a company can procure products.

Some of the important functionalities of this submodule include:

- Creation of vendor account group
- Vendor numbering
- Creation of vendor master

The material master data submodule contains all the information on materials that a company can procure, produce, store or sell. Some of the important functionalities of this submodule include:

- Classification of material types
- Classification of material groups
- Material numbering
- Creation of material master

Some of the important functionalities of the Consumption-Based Planning (CBP) submodule include:

- Automatic creation of planned orders
- Manual creation of planned orders
- Re-order point planning
- Forecast-based planning
- Time phased planning

12.1.1 | MM MODULE OF SAP

There are various leading IT organisations that provide ERP software systems. One of these organisations is Systems Analysis and Program Development (SAP). The MM module of SAP ERP is used to manage the overall supply chain process, which includes activities such as materials procurement, vendor management, inventory management and planning activities. Planning activities usually involve consumption-based planning and quality control. The MM module of SAP ERP is highly integrated with its other modules such as finance, production, quality management and sales and distribution modules. The SAP MM module supports activities such as inventory management, purchasing, receiving goods, invoice verification, quality control and vendor evaluation.

The procurement process is also handled using the MM module and under this process, a series of events takes place in a specific order. The events include creating Purchase Requisition (PR), PR authorisation, creating Purchase Order (PO), generating goods receipt after receiving the goods ordered, invoice verification, conduct of quality control activities and making payment to the vendors.

The main objective of using a MM module is to ensure that there is never a shortage of the materials or any other gaps in the supply chain of the organisation. All the materials required by the organisation must be available when needed. Efficient materials management is necessary in the rapidly changing environment characterised by changing customer demands. Using SAP MM, an organisation can

automate its procurement and materials management activities. An organisation using SAP MM usually gains the following benefits:

- Reduced unnecessary stocking of materials
- Reduced costs and time required for procurement
- Minimised inventory losses
- Reduced labour costs
- Reduced the costs incurred in storing unnecessary materials
- Reduced time to manufacture/cycle time
- Increased transparency
- Improved delivery time
- Improved and effective inventory management



SELF ASSESSMENT QUESTIONS

1. ERP is the single cross-functional software that supports all business processes. (True/False)
2. _____ submodule of the SAP MM is responsible for receiving and recording quotations.



ACTIVITY 1

List out the names of a few software applications, apart from SAP MM, which are most extensively used in India for materials management. Also, try to gather the relative numbers of the MM software used and present the data in the form of a pie chart.

12.2 E-SOURCING

Sourcing is defined as the process that involves searching for prospective suppliers, procuring materials from a selected supplier, maintaining supplier relationship management, managing invoices and managing payments. Similarly, when sourcing activities are conducted using the Internet or any other digital means, it is called as e-sourcing.

E-sourcing is the use of software system to automate the entire contract life cycle management. In other words, e-sourcing is the process of obtaining bids from various suppliers using a single online portal. All the collected bids are then compared to select one or more preferred suppliers. The software has functionalities for defining the criteria for selecting a supplier through Request for Information (RFI), inviting potential suppliers to send bids through Request for Proposal (RFP) and/or Request for Quotation (RFQ), evaluating and analysing the bids and awarding contracts to the suppliers.

The overall process of e-sourcing is completed in a step-wise manner as shown in Figure 1:

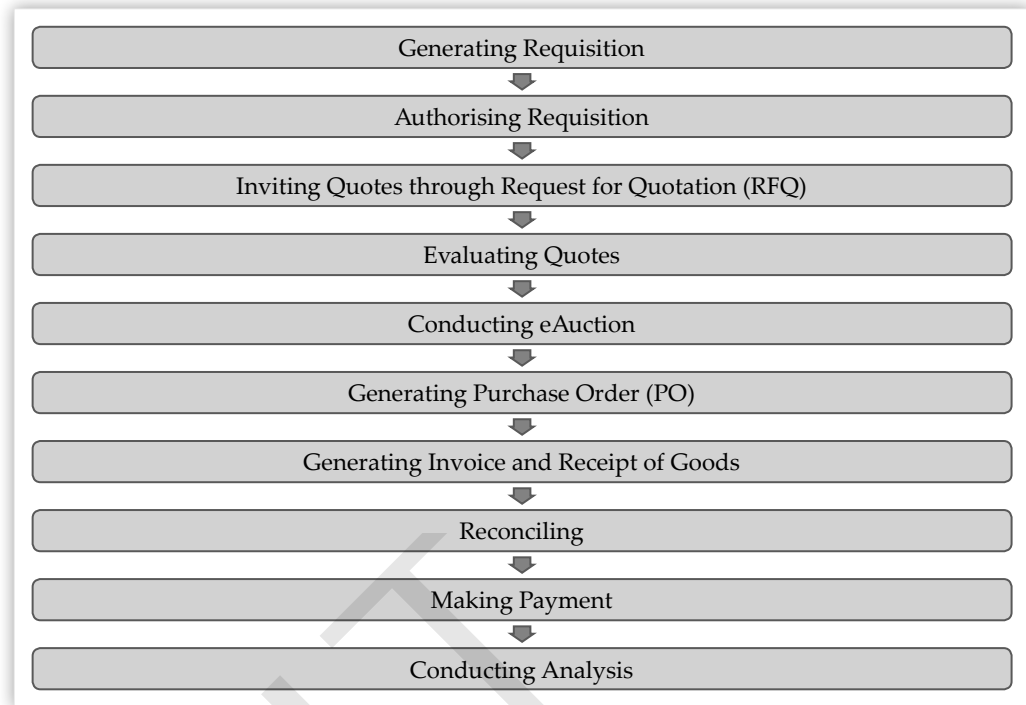



FIGURE 1: Process of e-sourcing

The steps in the e-sourcing process are explained as follows:

1. **Generating requisition:** In this step, one or more departments identify and send their requisitions for goods and services. All the requisition requests are routed to the procurement or purchase department.
2. **Authorising requisition:** The requisitions are approved by the purchase department, which also initiates the process for requisition of the said products and services by searching for suppliers and requesting for information using RFI.
3. **Inviting quotes through Request for Quotation (RFQ):** All the suppliers who meet the required criteria are invited for sending their quotations by means of RFQ.
4. **Evaluating quotes:** The entire process of the evaluation of quotes is automated as sophisticated dashboards and analytical tools, such as automated scoring, generate reports that can be used to choose suppliers based on various parameters.
5. **Conducting eAuction:** After selecting the suppliers, they are required to compete on their bids within the given time frame. Most e-sourcing software applications have the capacity to conduct various types of auctions such as English auction and Dutch auction. In auctions, usually, the lowest bidder is given the order.
6. **Generating Purchase Order (PO):** Once the supplier(s) has/have been selected, a PO is generated automatically and sent to the concerned supplier(s).

 STUDY HINT

An auction in which bidders bid openly against each other in attempts to purchase property, and the bids continue to increase (by increments) and the deal is finalised with the highest bidder is known as an English auction. On the other hand, an auction wherein the price is gradually decreased (by decrements) and the deal is finalised with the first bidder to accept that price is known as a Dutch auction.

7. **Generating invoice and receipt of goods:** After receiving the PO, the supplier organisation generates an invoice (bill) containing the details such as the individual goods (Stock Keeping Unit (SKU)) ordered by an organisation, the quantity ordered and the total amount of bill that has to be paid by the buyer organisation. After goods are received by the buyer organisation, it issues a confirmation of receipt of the goods.
8. **Reconciling:** Before making the payment to the supplier organisation and after receiving the goods, the purchase department has to reconcile the purchase order and goods receipt. The purchase executives need to ensure that the charges have been levied for the right goods and/or services, there is no discrepancy in the billed amount, the quantities are correct and the taxes or any other charges are valid.
9. **Making payment:** After reconciling the invoice and the PO, the payment is made or is scheduled after the given credit period and the payment method is decided. Payments are usually made using cheques and electronic funds transfers.
10. **Conducting analysis:** It is important to analyse the efficiency and accuracy of the procurement process using the given e-sourcing software so that any errors can be corrected in the future.

Some of the commonly observed benefits of e-sourcing are as follows:

- Smooth and uninterrupted sourcing process
- Reduced prices
- Increased competition among suppliers
- Gathers supplier information
- Creation of a sourcing information repository
- Import and export of information in CSV and Excel formats



EXHIBIT

SOME FAMOUS E-SOURCING SOFTWARE & PROCUREMENT TOOLS

eSourcing is basically sourcing by using technology, such as the Internet and software. This enables organisations keep track of their suppliers and have deep insight into procurement operations. Let us discuss some of the popular eSourcing software and their features:

Jaggaer

Jaggaer provides full digital transformation across the entire procurement spectrum for all sectors. The following are the features of the Jaggaer software:

- It offers an RFX tool, which allows users to automate many of the processes related to sourcing.
- It includes a portal for suppliers where they can fill out questionnaires to be automatically analysed by the system's scoring component.
- This product supports contract lifecycle management. Contracts can be easily accessed from a centralised location which facilitates

- collaboration and compliance. This feature also contains full and partial contract templates to speed up contract creation time. Updates can be configured to appear on a user's dashboard to alert them to metrics such as performance as well.

GEP

GEP offers a suite of different tools to help businesses manage their sourcing process. The following are the features of GEP software:

- It provides real-time data on spending, gathering information from all your sources.
- It provides businesses insight into metrics such as spend by region, spend by supplier, overall spending trends along with other important benchmarks.
- It allows users to configure alerts when spending reaches a certain limit and access the system on any Internet capable device.
- It can be configured to existing sourcing processes in just a couple of weeks before it's up and running; thereby allowing businesses to host sourcing events such as online auctions.
- Its interface is simple to use and understand but provides in-depth functionality.

Coupa Procurement

Coupa helps businesses to go from initial spend analysis to contract management using various applications. The following are the features of Coupa:

- Its spend analysis includes pre-built reports which enable users to keep a tab on metrics like savings, time to invoice and more.
- It allows users to create custom reports through an incredibly user-friendly interface.
- Coupa's sourcing management application helps users execute sourcing events, configure alerts for activities like increased spend and contract expirations.
- It provides RFP/RFQ templates to work with so that the once time-consuming process takes far fewer resources.
- It is accessible via mobile devices, so you can check in on your suppliers and their bids at any time.

Zycus iSource

Zycus iSource is a system that helps reduce costs for its users. The following are the features of Zycus iSource:

- It allows businesses to speed up the process of creating custom-built templates so that RFxs can be sent quickly.

- Interactive what-if evaluation capabilities help plan for the future so that supplier analysis is not only based on opinions, which can be biased one way or another.
- Automated supplier ranking further automates the supplier review process; thereby reducing time spent on decision making.
- It provides an entire suite of e-Sourcing software to help with other aspects of the procurement process, such as spend analysis, invoice management, contract management and supplier management.

Ivalua eSourcing

Ivalua provides one of the best collaborative eSourcing tools out there by utilising many features offered by project management software. The following are the features of Ivalua:

- It offers real-time reverse auction capabilities. Also, it provides multiple auction types, so you're not stuck with any one auction process. In addition, you can initiate an auction from RFQ bids as they come in. Users can receive alerts when suppliers have placed a bid or sent a message.
- Ivalua provides a BOM lifecycle manager tool to manage the sourcing process; thereby allowing users to see supplier performance in relationship with their product. This helps businesses in assessing partnerships.



SELF ASSESSMENT QUESTIONS

3. E-sourcing is the use of a software system to automate the _____.
4. In e-sourcing, quotes are invited using Request for Information (RFI). (True/False)



ACTIVITY 2

Using the Internet, find out the government departments that currently do not have the facility of e-sourcing. Present the statistics in terms of percentage.

12.3 SUPPLIER RELATIONSHIP MANAGEMENT (SRM)

According to the Institute for Supply Management (ISM), *the term Supplier Relationship Management (SRM) refers to the practice and process for interacting with suppliers. Most supply professionals view SRM as an organised approach to defining what they need and want from a supplier and establishing and managing the company-to-company (or procurement-to-sales) link to obtain these needs.* In case of supply relationships, there may or may not be conscious links between the procurement department and the supplier's sales link. The links and relationships between these might be formal or informal. In either case, an organisation can produce positive sourcing results to manage supply and suppliers by following an organised approach or engaging in SRM.

In 1983, a McKinsey consultant Peter Kraljic's 'Kraljic Portfolio Purchasing Model' was published in the Harvard Business Review. Kraljic laid emphasis that the business organisations must become more proactive in their supply management practices. Following this, the concept of Supplier Relationship Management (or SRM) first came into being.

Kraljic argued that the buyer organisations must segregate different categories of risks and the possible impact these risks can have in terms of profitability. After taking into account all these factors, the organisation should develop its supplier management strategies. As an example, an organisation may source stationery supplies from any supplier, and such amounts are usually low and do not affect the profitability of a company. On the contrary, there are certain organisations who have strategic supply partners on which they depend for procuring fair-priced supplies. For example, the Honda Motor Company has many strategic suppliers such as Alpha Omega Solutions, Inc. of Brea, California; Altura Associates, Inc. of Irvine, California; Brando, Inc. of Dana Point, California; Data Linkage Software of Torrance, California; Lithocraft Company of Anaheim, California; RPA of Santa Monica, California; etc.

Honda has a strategic supplier relationship with "K" Line America Inc. of Richmond, Virginia for providing integrated logistics support via ocean shipping. In such cases of strategic supply relations, if the key suppliers suffer any setback such as a shutdown, it usually affects its major customers.

In those cases where the buyer organisation wants to create strategic partnerships with major suppliers, it can achieve the same by adopting the following practices such as executive sponsorship and careful cross-planning. Managing supplier relationships is more difficult than managing other types of contracts.

Under SRM, the organisations need to determine the different supply categories in order to create effective strategies for managing the suppliers. Therefore, SRM can be implemented using the following three steps:

1. **Supplier segmentation:** All suppliers must be categorised into different categories on the basis of their profitability and associated risks.
2. **Supplier strategy development:** Develop a proper strategy for managing the supplier relationships and distribute the internal resources accordingly.
3. **Execute the supplier strategy:** Whatever strategy has been devised by the management for managing supplier relationships must be implemented properly.

Supplier segmentation plays an important role because the suppliers that are not significant must not be allocated significant resources.



NOTE

SAP SRM helps organisations in achieving procure-to-pay excellence.

12.3.1 | SAP SRM

SAP SRM is the software that helps an organisation in procuring goods using the Web-based platform and in managing relationship with suppliers. SAP SRM can be integrated with the modules of SAP ERP or any other non-SAP accounting and planning software.

SAP SRM ensures that an organisation can optimise its procurement process and attain greater benefits by working closely with suppliers. SAP SRM has forecasting functionalities. SAP SRM software supports the entire procurement cycle starting from the screening of suppliers and ending with the payment for the goods purchased. Using SAP SRM, the organisation can build long-term and effective relationships with suppliers. The software also offers functionalities for supplier performance management and helps in smoothly executing the procurement operations.

Nowadays, software applications are changed, updated and revised at tremendous speed. This is true for SAP products also. SAP keeps modifying the framework of SRM and introducing new concepts frequently. However, the following three key concepts of SRM remain stable irrespective of the revision in the software.

1. Core supply processes
2. Business scenarios within each core process
3. Underlying technology components that enable the business processes

The three core supply processes in SAP SRM are as follows:

1. Operational procurement
2. Strategic sourcing
3. Supplier enablement

Under **operational procurement**, multiple business scenarios are possible as follows:

- **Self-service procurement:** This is an example of indirect procurement wherein the employees of the buyer organisation can search for the product that they require by going through the multiple product catalogues available. They can then find and purchase the products in accordance with the procurement policy of the company. In this way, the employees can create and manage their own requirement requests. This lowers the administrative burden on the purchase department also. Using self-service procurement also makes the entire process faster and more responsive.
- **Plan-driven procurement:** This is an example of direct procurement wherein the ordering processes are automated and streamlined. The SAP SRM system can be integrated with planning, design and order processing systems. This ensures that the procurement processes are based on a sound plan or strategy so that the materials required for core business processes are available as and when needed. Plan driven procurement is usually integrated with enterprise planning and production systems.
- **Service procurement:** Now, most of the organisational purchases are made through e-procurement or e-sourcing. Procuring materials online helps organisations in saving costs. Despite knowing the fact that in most companies, more than 50% of the purchases are incurred on services, companies are not able to save costs related to services. Under SAP SRM, a wide variety of services such as temporary labour, consultancy and facility management - are covered.

**NOTE**

SAP SRM can be used to fulfil the supply needs, negotiate with suppliers and evaluate supplier performances.

In the entire procurement cycle, sourcing accounts for up to 75% of the cost saving opportunities within an enterprise. Within the SAP SRM framework, various business scenarios that help in **strategic sourcing** are as follows:

- **Catalog Content Management (CCM):** Using the CCM application, the suppliers can create, maintain and manage the catalogue content within the e-procurement application. SRM enables suppliers to conveniently manage their catalogue data by updating the products available for purchase and the prices at which they are offered. The buyer organisation can easily access this catalogue and purchase the products that they want. The product catalogues can also be integrated with business modules such as accounting, finance and planning.
- **Strategic sourcing and contract management:** Using this application, an Enterprise Buyer (EB) can source the required goods and services by availing information. Buyers can enter their requirements in the system and decide to buy from the supplier of their choice by creating a PO or contract. The PO and contract can be made directly from the sourcing application. The PO and contracts can be saved at the backend or locally. Under contract management, an organisation can manage its contractual relationships with customers, vendors and partners using a secure central repository. Contract management ensures that contract compliance violations are reduced.
- **Procure to pay optimisation:** Using the SAP SRP, the buyer organisation can optimise its entire life-cycle starting from shortlisting of suppliers to giving orders to making payments for the orders received. It also helps in improving communication with suppliers.
- **Reporting functionality:** SAP SRM has the capabilities for generating various reports related to various procurement activities such as compliance management, contract management and cost management.
- **Spend analysis:** The spend analysis application can be used by a buyer to determine how many purchases they have made in a time period. This data can also be analysed as purchases made from each supplier or for specific products. Such analysis is extremely helpful for decision support.

Supplier enablement is a core process within SAP SRM which enables the suppliers and buyers to collaborate along the supplier relationship life cycle. Suppliers can communicate with buyers through a customer-hosted portal. Within the SAP SRM framework, various business scenarios that help in **supplier enablement** are as follows:

- **Supplier self-registration:** SAP SRM provides functionality using which potential suppliers can register themselves over the Web-based portal. This helps the buyer organisation in identifying new suppliers for procuring supplies. Suppliers can be chosen from all the accepted suppliers who can then participate in strategic sourcing events such as bidding and auction events.
- **Design collaboration:** Using the SRM system, the suppliers and the buyer organisation can collaborate together for various purposes such as product design and product specifications in order to acquire speciality products and services.

- **Order collaboration:** Buyer organisations can collaborate with the suppliers using the supplier self-services component of the Web-based portal. This portal can be used to exchange business documents with their suppliers. Business documents usually include POs, PO acknowledgements and invoices. The Web-based portals are usually hosted by the customers and suppliers can log in to the application using Web browser. In this way, the suppliers and the buyers can collaborate for all procurement-related activities.
- **Collaborative replenishment:** At times, the buyer organisation makes the suppliers responsible for maintaining their inventory levels. The buyer authorises the supplier to access the customers' inventory data and maintain the inventory levels through exception-based replenishment. This practice also helps in optimising the supply chain performance.

The capabilities and functions of SAP SRM are depicted in Figure 2:

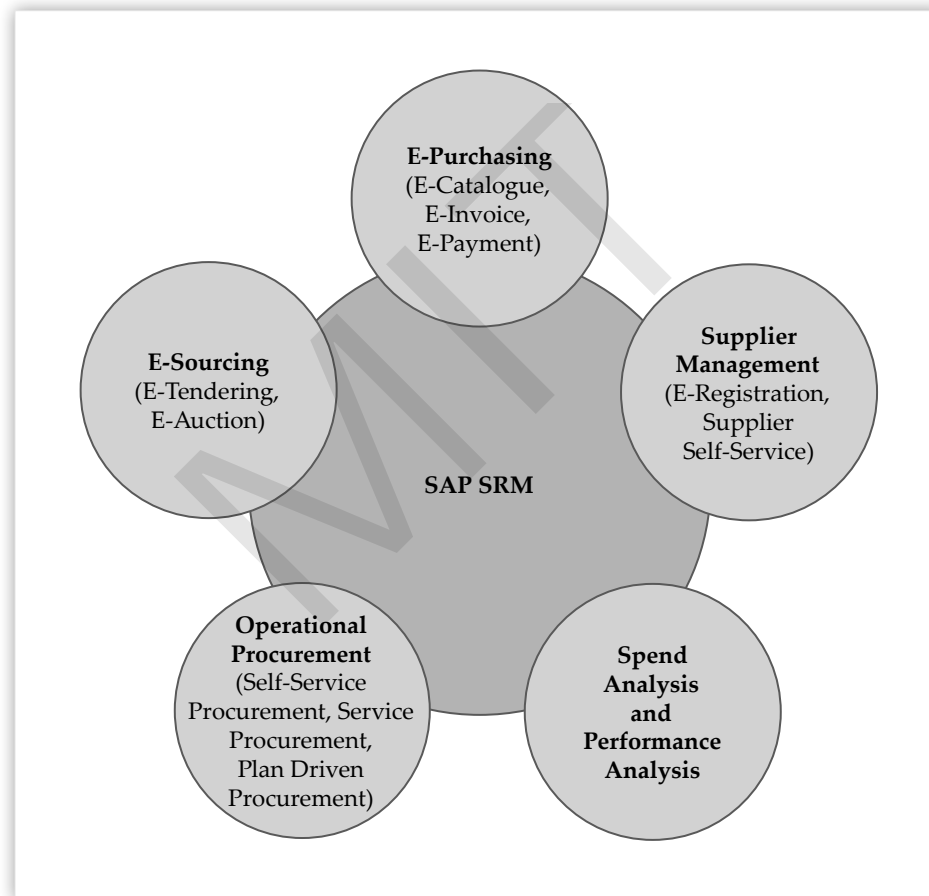


FIGURE 2: Capabilities and Functions of SAP SRM



**SELF
ASSESSMENT
QUESTIONS**

5. _____ was the first personality to emphasise that business organisations must become more proactive in their supply management practices.
6. _____ is the first step in SRM implementation.

12.4 COLLABORATIVE PLANNING, FORECASTING AND REPLENISHMENT (CPFR)

In 1998, the Voluntary Inter-Industry Commerce Standards (VICS) established a committee with an objective to identify the best practices and design guidelines for collaborative supply chain planning and forecasting. Various members of this committee were leading retailers, manufacturers, consultants and software providers. The Collaborative Planning, Forecasting and Replenishment (CPFR) was presented by this committee. The CPFR model represents voluntary guidelines meant for structuring the supply chain and for guiding the supply chain partners as to how they can set up their processes. CPFR helps in improving the product and information flow throughout the supply chain.

CPFR is extremely useful when the supplier and the buyer company want to collaborate. Figure 3 shows the evolution of supply chain solutions as follows:

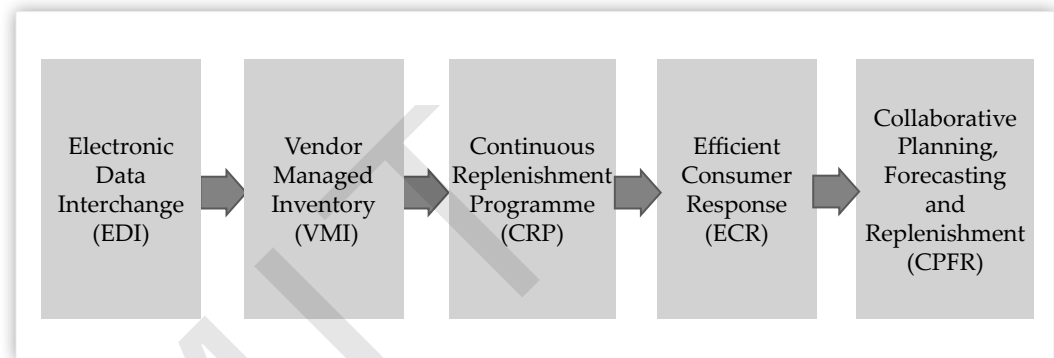


FIGURE 3: Evolution of Supply Chain Solutions

Supply chain collaboration first started after the development of **Electronic Data Interchange (EDI)** systems which were used by the suppliers and buyers to transmit and receive POs, invoices, material releases, shipping notices and product inquiries. EDI systems are based on the traditional client server technology. The sender needs to send the information in a specific format that can be understood by the receiver's application. The EDI is enabled by use of Value-Added Network (VAN). Nowadays, EDI transfers can be affected only with the use of a Web browser. Buyers can choose products from the online catalogues and place orders. Some of the major benefits of EDI include reduced paperwork, cost reduction and increased ease of use. However, EDI does not impact planning and scheduling of supply chain.

In 1992, Kurt Solomon introduced the concept of Vendor Managed Inventory (VMI). In VMI, the manufacturer or the distributor located upstream in the supply chain manages the replenishment decision for all the buyers (wholesaler/retailer) located downstream in the supply chain. The manufacturer or the distributor is responsible for the management of the inventories of the wholesaler or retailer. As a result of VMI, the amount of the stored inventories reduces and the replenishment rate increases tremendously.

In **Continuous Replenishment Programs (CRP)**, suppliers replenish the inventory at the retail level on the basis of the Point of Sale (POS) data.

Efficient Consumer Response (ECR) was the fourth type of collaboration established between the suppliers and buyers. ECR is based on the establishment

of effective channel relationships for cooperation among the supply chain partners. Industries can save a lot of money and see improvements in areas such as replenishment, product assortment, trade promotion and new product introductions. From the ECR, the concept of Collaborative Planning, Forecasting, & Replenishment (CPFR) was developed.

Collaborative Planning, Forecasting and Replenishment (CPFR) is the most advanced stage in the supply chain collaboration. CPFR is a business practice that enables communication and collaboration between the buyers and suppliers. CPFR is useful in developing successful and sustainable business operations.

The CPFR enables the supply chain partners to take stock of the inventory, demand and order forecast. This helps the suppliers in satisfying the future demands of the buyers. This involves systematic sharing of information and knowledge. CPFR helps in linking sales to marketing best practices. For instance, the supplier category management can be linked with supply chain planning and execution. This linking results in reduced inventory, and reduced transportation and logistics costs. The CPFR makes use of the existing systems such as the Warehouse Management Systems (WMS), ERP systems, Materials Requirements Planning (MRP), and Customer Relationship Management (CRM) systems.

Organisations can use the CPFR reference model developed by the Voluntary Interindustry Commerce Standards (VICS) Association to achieve greater collaboration between buyers and suppliers. The CPFR model is shown in Figure 4:



FIGURE 4: The CPFR model

Source: https://www.gs1us.org/DesktopModules/Bring2mind/DMX/Download.aspx?command=core_download&entryid=491&language=en-US&PortalId=0&TabId=134

This model can be applied to any industry. At the centre of this model is the end customer. The buyer organisation and the suppliers work in collaboration with each other to fulfil the needs of the customer. For the manufacturing segment, the buyer role is played by the retailers, the seller role is played by the manufacturer and the consumer is the end customer. These roles may change in case of different industries. Let us now discuss the steps involved in the CPFR model:

1. **Strategy and planning:** In the planning stage, the relationship between buyers and suppliers is planned. Various activities that take place under this stage include collaboration arrangement and joint business planning. Under collaboration arrangement, the roles, responsibilities, checkpoints and escalation rules are defined. Joint business planning involves identifying and planning promotions, events, inventory policy changes, etc.
2. **Demand and supply management:** Under this, the sales forecasts are made by taking into account the demand at the point of sale. On the basis of the sales forecasts, various decisions related to future product orders, delivery requirements, sales forecast, inventory positions, lead times, etc., can be taken.
3. **Execution:** Order generation and order fulfilment activities take place at this stage. Orders are generated on the basis of demand. The orders are fulfilled by producing, shipping, and delivering the required products to the consumer.
4. **Analysis:** At this stage, all the planning and execution activities are monitored. If the trading partners find out any exceptional situations or discrepancies, they can analyse the problem together and modify their plans to weed out the discrepancies.



**SELF
ASSESSMENT
QUESTIONS**

7. CPFR helps in improving the product and information flow throughout the supply chain. (True/False)
8. EDI stands for _____.

12.5 SUMMARY



Enterprise Resource Planning (ERP) is a software application that is used by organisations to manage all its resources. It is a collection of various modules that are seamlessly integrated with one another. ERP software systems are usually of two types, namely on-premise ERP software systems and cloud-based ERP systems. The Materials Management (MM) module is one of the modules of ERP. The MM module is responsible for the overall management of the materials required, processed and produced in an organisation. Various procurement processes are also managed using this module.

E-sourcing is the use of software system to automate the entire contract life cycle management. In other words, e-sourcing is the process of obtaining bids from various suppliers using a single online portal. The steps in the e-sourcing process are generating requisition, authorising requisition, inviting quotes through RFQ,

evaluating quotes, conducting eAuction, generating PO, invoice and receipt of goods, reconciling, making payment and conducting analysis.

Under SRM, the organisations need to determine the different supply categories in order to create effective strategies for managing the suppliers. SAP SRM is the software that helps an organisation in procuring goods using the Web-based platform and in managing relationship with suppliers. SAP SRM can be integrated with the modules of SAP ERP or any other non-SAP accounting and planning software. The CPFR enables the supply chain partners to take stock of the inventory, demand and order forecast. This helps the suppliers in satisfying the future demands of the buyers. This involves systematic sharing of information and knowledge. CPFR helps in linking sales to marketing best practices.

12.6 KEY WORDS



- **Vendor management:** The practice of working with vendors/suppliers in order to build a mutually beneficial relationship
- **Implementation technology:** Software and hardware technologies that are used to build and implement a system
- **Module:** An independent unit of software
- **Requisition:** A request created by an employee or a department for purchasing certain item(s)
- **Stock Keeping Unit (SKU):** The number assigned to a specific product or service so that each product or service can be identified uniquely

12.7 CASE STUDY: SMART ESOURCING SOLUTIONS BY TRADE INTERCHANGE



Trade Interchange, founded in the UK in 2000, is a provider of fully managed online eAuctions. Over the years, the company has added more modules. Its proprietary cloud-based ARCUS® platform supports a range of Supplier Management activities in many prestigious blue chip clients around the world.

The cloud-based platform is delivered in a modular format that can be used in any combination or stand alone. Fast to deploy and simple to use, the software is developed at its head office in Teesside, and supports many leading brands including Pizza Express, Morrisons, Domino's, Whitbread and Sodexo.

Implementation of eSourcing Solution in the Client Company

Macmillan Science and Education, a division of the German Holtzbrinck Publishing Group provides high-quality content and innovative digital products and services to customers in 120 countries around the world. It employs more than 5,700 people in more than 50 markets. The division unites all Macmillan's science, scholarly and education businesses by providing teaching and learning materials to students, teachers and researchers.

Macmillan implemented the Supplier Information Management (SIM) module, part of Trade Interchange's ARCUS Supplier Management Platform in 2012. The module helped Macmillan in tackling the on-boarding of suppliers and the

ongoing management of supplier information. Commenting on the introduction of SIM to Macmillan, Charlie Thelu, Head of Strategic Sourcing, said: "SIM was straightforward to roll out internationally for specific categories of vendors and Trade Interchange helped make it easy for us to collect important supplier information. The simplicity of the software design has really helped with supplier on-boarding."

For the past some years, Macmillan was facing various challenges. Some of them were:

- Limited visibility of tenders being managed by the business
- Procurement was largely approached in an operational, rather than a strategic.
- People across the organisation adopted whatever method suited them including using basic spreadsheets or simply email, to keep track of projects.

The company created a small central Indirect Procurement team under Charlie Thelu. With renewed emphasis on the importance of buying smartly and with limited human resources, technology, through eSourcing, was an obvious route to manage a growing workload. Charlie became the project's main sponsor and identified Macmillan UK's head office relocation to a new campus in London's Kings Cross as an excellent opportunity to introduce eSourcing to the business. Some in business can be a little sceptical about eSourcing in general and eAuctions in particular. They may have had bad experiences with early and poorly implemented systems.

Considering this, Trade Interchange provided flexible and accessible packages to allow for trial use, helping to demystify the technology and allowing prospective clients to overcome preconceptions. "I have to admit there were concerns about the introduction of e-sourcing," recalls Charlie Thelu. "Some internal stakeholders thought it wasn't appropriate for purchasing relatively sophisticated services and would lead to a purely price-driven, commodity approach. By trialling the system with Trade Interchange we were able to allay these fears." Macmillan is now using Trade Interchange's eRFx and eAuction modules, both part of the Arcus Supplier Management Platform. eRFx is a powerful online tool that helps Macmillan in:

- Issuing and managing requests for information, proposals and quotations.
- Carrying out a more accurate tendering process because supplier information is both comparable and consistent.
- Conduct comprehensive reporting with greater visibility and security.

The highly configurable eAuction module enables buyers to run a number of different types of auction with full support from Trade Interchange.

Implementation

The key to any successful implementation is high level support within the organisation. At Macmillan the initiative has the backing of the global head of procurement. "Although it's endorsed at the highest level, we don't mandate use of eRFx," says Charlie Thelu, "it's up to stakeholders. So far eSourcing has been used primarily in the UK, with the Science and Education divisions as pioneers.

We're now gradually increasing exposure to the module across other international offices, including Hong Kong and the USA." Charlie has become the subject matter expert within Macmillan, selling the concept internally and helping to train those who will need to use it. The company's shared services operation and in particular IT have become real advocates. "eRFX is so much better than our previous semi-manual systems. Information was gathered via emails across multiple people and as a result the whole process of tender analysis would take days," comments Charlie Thelu. "The eRFX module is actually very intuitive so our users don't need much hand-holding. The pre-loaded templates are great, we use them for all sorts of straightforward requests but it's also good for more complex categories." "The tabbed sections are like chapters of a book which helps people to focus, thinking carefully about the questions they ask and what they really need to know from suppliers. This ensures the responses are precise. It's very easy to navigate around the eRFX system and automated reminders encourage completion. We can easily compare supplier submissions with the 'side by side' reporting tool within minutes of final supplier submissions."

Source: <https://tradeinterchange.com/wp-content/uploads/2016/12/Case-Study-Macmillan-eSourcing.pdf>

QUESTIONS

1. What was the need for implementing eRFX in Macmillan?
(**Hint:** Limited visibility of tenders, operational approach to procurement and not strategic)
2. How did eRFX help Macmillan?
(**Hint:** Issuing and managing requests for information, proposals and quotations)

12.8 SHORT ANSWER QUESTIONS



1. Which of the following is not a functionality of the purchasing submodule?
 - a. Warehouse management
 - b. Supplier and item linking
 - c. Sending quotations to vendors
 - d. Vendor listing
2. Which of the following is not a core process in SAP SRM?

a. Operational procurement	b. Supplier enablement
c. Strategic sourcing	d. Plan-driven procurement
3. Which of the following is not a part of the ERP systems?
 - a. Learning and Development Module
 - b. Sales and Marketing Module
 - c. Materials Management/Purchase Management Module
 - d. Finance and Accounting Module

4. _____ are used to manage and track all the business processes and resources.
 - a. ERP systems
 - b. SRM systems
 - c. CRM systems
 - d. MM systems
5. The purchase department initiates the process for requisition by using _____.
 - a. RFI
 - b. RFQ
 - c. RFP
 - d. None of these
6. The buyer makes the payment after reconciling the _____ the _____.
 - a. Requisition and PO
 - b. PO and invoice
 - c. Invoice and requisition
 - d. Invoice, PO and requisition
7. Which of the following is the third step in the process of e-sourcing?
 - a. Inviting quotes
 - b. Evaluating quotes
 - c. Generating PO
 - d. Making payment
8. Which of the following is not correct with respect to ERP software?
 - a. Cross-functional
 - b. Supports business processes
 - c. Manages resources
 - d. Decentralised
9. Which of the following is not true with respect to SAP SRM?
 - a. Optimises procurement process
 - b. Forecasting functionality
 - c. Supplier performance management
 - d. Supplier development
10. Which of the following is not related to strategic sourcing?
 - a. Catalog Content Management (CCM)
 - b. Strategic sourcing and contract management

- c. Service procurement
 - d. Reporting functionality
11. _____ is a practice under which the buyer organisation makes the suppliers responsible for maintaining their inventory levels.
- a. Supplier self-registration
 - b. Design collaboration
 - c. Collaborative replenishment
 - d. Order collaboration
12. Material Requirement Planning (MRP) submodule is a part of _____.
- a. SAP MM
 - b. SAP CRM
 - c. SAP SRM
 - d. None of these
13. In the abbreviation SKU, 'S' stands for _____.
- a. System
 - b. Software
 - c. Stock
 - d. None of these
14. Which of the following is not a part of e-sourcing?
- a. RFI
 - b. RFD
 - c. RFP
 - d. RFQ
15. Which of the following is the most appropriate software module for automation of procurement?
- a. SAP ERP
 - b. SAP SRM
 - c. SAP MM
 - d. SAP CRM
16. ERP software hosted on a _____ can be accessed using a Web browser.
17. The main objective of using a MM module is to ensure that there is never a shortage of the _____ in the supply chain of the organisation.
18. _____ is based on the establishment of effective channel relationships for cooperation among supply chain partners.
19. Plan driven procurement is usually integrated with _____ systems.
20. _____ software is used by organisations to manage all the resources of an organisation.

21. In e-sourcing, once the supplier(s) has been selected, a _____ is generated automatically.
22. SAP MM helps in reducing the cycle time. (True/False)
23. SAP SRM cannot be integrated with the modules of the SAP ERP (True/False)
24. In Continuous Replenishment Programs (CRP), suppliers replenish the inventory at the retail level on the basis of the Point of Sale (POS) data. (True/False)
25. Using the service procurement application, suppliers can create, maintain and manage the catalogue content within the e-procurement application. (True/False)

12.9 HIGHER ORDER THINKING SKILLS (HOTS)



1. Choose the correct order of evolution:
 - a. Electronic Data Interchange (EDI) → Vendor Managed Inventory → Continuous Replenishment Program → Efficient Consumer Response (ECR) → Collaborative Planning, Forecasting and Replenishment (CPFR)
 - b. Collaborative Planning, Forecasting and Replenishment (CPFR) → Electronic Data Interchange (EDI) → Continuous Replenishment Program → Efficient Consumer Response (ECR) → Vendor Managed Inventory
 - c. Vendor Managed Inventory W Collaborative Planning, Forecasting and Replenishment (CPFR) W Electronic Data Interchange (EDI) W Continuous Replenishment Program W Efficient Consumer Response (ECR)
 - d. Vendor Managed Inventory W Electronic Data Interchange (EDI) W Continuous Replenishment Program W Efficient Consumer Response (ECR) W Collaborative Planning, Forecasting and Replenishment (CPFR)
2. A to Z is a small-scale organisation. From the past few months, it has been experiencing high employee turnover, especially in the purchase department. It has been using traditional manual systems for all purchase activities. It has a very small budget to implement any technology solution. What software it should select?
 - a. SAP MM
 - b. SAP ERP
 - c. SAP SRM
 - d. None of these
3. Who is at the centre of the CPFR model?
 - a. Supplier
 - b. Manufacturer
 - c. Retailer
 - d. Consumer

4. Choose the correct order:
- Purchase Requisition (PR) → PR authorisation → Creating Purchase Order (PO) → Receiving the goods ordered → Invoice verification → Generating goods receipt
 - Invoice verification → Purchase Requisition (PR) → PR authorisation → Receiving the goods ordered → Creating Purchase Order (PO) → Generating goods receipt
 - Purchase Requisition (PR) → PR authorisation → Creating Purchase Order (PO) → Receiving the goods ordered → Generating goods receipt → Invoice verification
 - Purchase Requisition (PR) → PR authorisation → Receiving the goods ordered → Creating Purchase Order (PO) → Generating goods receipt → Invoice verification
5. Match the following:

List 1	List 2
A. Vendor Managed Inventory	i. Peter Kraljic
B. Supplier Relationship Management	ii. VICS
C. Collaborative Planning, Forecasting and Replenishment	iii. Kurt Solomon

- A – i; B – ii; C – iii
- A – i; B – iii; C – ii
- A – ii; B – i; C – iii
- A – iii; B – i; C – ii

12.10 ANSWER KEY



A. SELF ASSESSMENT QUESTIONS

Topic	Q. No.	Answer
Materials Management (MM) in ERP	1.	True
	2.	Purchasing
E-Sourcing	3.	contract life cycle management
	4.	False
Supplier Relationship Management (SRM)	5.	Peter Kraljic
	6.	Supplier segmentation
Collaborative Planning & Forecasting (CPFR)	7.	True
	8.	Electronic Data Interchange

B. | SHORT ANSWER QUESTIONS

Q. No.	Answer
1.	a. Warehouse management
2.	d. Plan-driven procurement
3.	a. Learning and Development Module
4.	a. ERP systems
5.	a. RFI
6.	b. PO and invoice
7.	a. Inviting quotes
8.	d. Decentralised
9.	d. Supplier development
10.	c. Service procurement
11.	c. Collaborative replenishment
12.	a. SAP MM
13.	c. Stock
14.	b. RFD
15.	c. SAP MM
16.	cloud
17.	materials
18.	Efficient Consumer Response (ECR)
19.	enterprise planning and production
20.	Enterprise Resource Planning (ERP)
21.	PO
22.	True
23.	False
24.	True
25.	False

C. | HIGHER ORDER THINKING SKILLS (HOTS)

Q. No.	Answer
1.	a. Electronic Data Interchange (EDI) → Vendor Managed Inventory → Continuous Replenishment Program → Efficient Consumer Response (ECR) → Collaborative Planning, Forecasting and Replenishment (CPFR)

Q. No.	Answer
2.	c. SAP SRM
3.	d. Consumer
4.	c. Purchase Requisition (PR) → PR authorisation → Creating Purchase Order (PO) → Receiving the goods ordered → Generating goods receipt → Invoice verification
5.	d. A – iii; B – i; C – ii

12.11 SUGGESTED BOOKS AND E-REFERENCES



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MIT

ABBREVIATIONS

- **AMM:** Assistant Materials Manager
- **APQP:** Advanced Product Quality Planning
- **ASA:** The American Standards Association
- **ASTM:** The American Society for Testing Materials
- **BATNA:** Best Alternative to a Negotiated Agreement
- **BIS:** Bureau of Indian Standards
- **BS:** British Standard
- **CBP:** Consumption-Based Planning
- **CCBSA:** Coca-Cola Beverages South Africa
- **CCM:** Catalog Content Management
- **cGMP:** Current Good Manufacturing Practices
- **CIC-MHE:** The College-Industry Council on Material Handling Education
- **CIPS:** The Chartered Institute of Procurement & Supply
- **CPAF:** Cost plus Award Fee
- **CPIF:** Cost plus Incentive Fee
- **CPFF:** Cost plus Fixed Fee
- **CPFR:** Collaborative Planning, Forecasting and Replenishment
- **CPIF:** Cost plus Incentive Fee
- **CPPC:** Cost plus Percentage of Cost
- **CRM:** Customer Relationship Management
- **CRP:** Continuous Replenishment Programme
- **DCF:** Discounted Cash Flow
- **DLHL:** Direct Labour Handling Loss
- **EB:** Enterprise Buyer
- **ECR:** Efficient Consumer Response
- **EDI:** Electronic Data Interchange
- **EMS:** Environmental Management System
- **EOQ:** Economic Order Quantity
- **ERP:** Enterprise Resource Planning
- **FFP:** Firm-Fixed-Price
- **FMEA:** Failure Mode and Effect Analysis
- **FPIF:** Fixed-Price Incentive Fee
- **GRNs:** Good Receipt Notes
- **IDP:** Individual Development Plan
- **IFPMM:** International Federation of Purchasing and Materials Management
- **IRR:** Internal Rate of Return

Materials Management

- **ISI:** The Indian Standards Institute
- **ISM:** The Institute for Supply Management
- **ISO:** The International Standards Organization
- **JD:** Job Description
- **KPI:** Key Performance Indicator
- **MBE:** Minority Business Enterprise
- **MBNQA:** The Malcolm Baldrige National Quality Award
- **MHIA:** Material Handling Industry of America
- **MHL:** Material Handling Labour
- **MRP:** Material Requirements Planning
- **NPV:** Net Present Value
- **NTE:** Not-to-exceed
- **NTH:** National Test House
- **OEE:** Overall Equipment Effectiveness
- **PO:** Purchase Order
- **POS:** Point of Sale
- **PPM:** Parts Per Million
- **PR:** Purchase Requisition
- **PTA:** Point of Total Assumption
- **RFI:** Request for Information
- **RFID:** Radio Frequency Identification
- **RFP:** Request for Proposal
- **RFQ:** Request for Quotation
- **SAP:** Systems Analysis and Program Development
- **SCM:** Strategic Cost Management
- **SIM:** Supplier Information Management
- **SKU:** Stock Keeping Unit
- **SPC:** Statistical Process Control
- **SRM:** Supplier Relationship Management
- **TCO:** Total Cost of Ownership
- **TQM:** Total Quality Management
- **VA:** Value Analysis
- **VICS:** The Voluntary Inter-Industry Commerce Standards
- **VMI:** Vendor Managed Inventory
- **WIP:** Work-in-Progress
- **WMS:** Warehouse Management Systems

The logo features the letters 'MIT' in a bold, orange, sans-serif font. To the right of 'MIT' is a vertical line, followed by the text 'School of Distance Education' in a smaller, black, sans-serif font.

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