COURSE GUIDE

PSM 831
MATERIALS MANAGEMENT

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INTRODUCTION

Materials Management (**PSM831**) is a core course of two credit units. It is offered by students who are taking a masters programme with specialisation in Purchasing and Materials Management. It is a fundamental course for management students and it is useful for existing and potential managers and administrators.

WHAT YOU WILL LEARN IN THIS COURSE

The course consists of fifteen (15) units. The first section addresses the nature, objectives and importance of materials management as well as the organisational structure of Materials Management department. Also, purchasing process, policies, procedures, strategic decisions and types of purchasing would also be examined. Furthermore, supplies, information management system and how to manage quality materials to required processing units are not left out in our discussion. The section covers how qualified employees can be hired to issues related to materials management activities such as purchasing, materials forecasting, inventory determination and warehousing of materials procured for the future.

The last section focuses on the technicality involved in receiving and delivering materials to the right place(s) at the right time. Also, how to turn waste materials into money or profit for organisations and disposing scrap or unwanted waste according to environment regulations are integrated in the study.

COURSE GUIDE

The Course Guide is designed to provide you the necessary information about the study, the nature, the materials and how to optimally benefit from the use of the materials, towards successfully passing the examinations and completing your programme. It further directs and guides you on how to tackle the Tutor-Marked Assignment (TMA) questions and provides suggestions for further readings. There will be tutorial meetings during the programme and issues concerning the course will be explained by the facilitators. The details of the tutorial section in terms of timing and period of facilitating will be determined by the study centre.

COURSE AIMS

The aims of the course are to make you familiar, understand and realise the importance of effective materials management to an organisation’s survival and profitability. Also, you learn about the major activities of

materials management and linkages between one another. The study will expose you to the extent at which the huge investment on materials (raw materials, parts and components, work-in-process and finished goods) can be effectively and efficiently managed to improve the quality of product, reduce inventory order time, production cycle time and providing prompt and quality customers' services.

These aims shall be achieved through the following:

- explaining the nature and importance of materials management
- identifying the major activities of materials management
- describing the organisational structure of materials management
- discussing purchasing function;
- explaining supplies management information system
- discussing issues relating to employees selection, training and developments
- describing the forms of forecasting
- explaining inventory and warehousing functions of materials management
- identifying and explaining the types of materials handling equipment
- discussing recovering and recycling waste materials as well as disposing waste materials
- stating how public property can be disposed
- discussing Nigerian Public Procurement Act of 2007
- discussing the formation and functions of Due Process Office.

COURSE OBJECTIVES

Upon completion of this course (PSM 831) you should be able to:

- define materials management and state its relevance to firm's profit maximization objective
- explain and demonstrate the basic understanding of purchasing process, policies and procedures
- discuss the use of information technology in supply management
- explain the concept of quality as it relates to supply chain management
- discuss how competent personnel can be hired to better the functions of materials management
- explain forecasting methods and why materials forecast must be done
- explain the roles of inventory management, how to determine order quantity using inventory models
- discuss how materials can be transported to right place of usages

- identify and discuss the common types of materials handling equipment
- discuss how an organisation can make money from waste materials through investing in recovering and recycling of materials
- explain some of the provisions of Public Procurement Act of 2007 that relate to this study
- state how Public Property can be disposed; and
- explain the functions of Due Process Office.

WORKING THROUGH THIS COURSE

This course consists of the basics of materials management, nature of purchasing, purchasing policy and procedures, supplies management information system, supplier quality management, human resource management in purchasing and supply, materials forecasting, supply chain inventory management, basic inventory models, transportation management, warehousing management, materials handlings and computerisation, recovery, recycling and disposal of scraps, Public Procurement Act, disposal of public property and Due Process Office.

COURSE MATERIALS

The major components of the course are:

1. Course Guide
2. Study Units
3. Textbooks
4. Assignment Guide

STUDY UNITS

Module 1

Unit 1 Basics of Materials Management
Unit 2 Nature of Purchasing
Unit 3 Purchasing Policy and Procedures
Unit 4 Supplies Management Information System
Unit 5 Supplier Quality Management

Module 2

Unit 1 Human Resource Management in Purchasing and Supply
Unit 2 Materials Forecasting
Unit 3 Supply Chain Inventory Management
Unit 4 Basic Inventory Models
Unit 5 Transportation Management

Module 3

Unit 1	Warehouse Management
Unit 2	Materials Handlings Equipment and Computerisation
Unit 3	Recovery, Recycling and Disposal of Scraps
Unit 4	Public Procurement Act of 2007
Unit 5	Disposal of Public Property/ Due Process Office

The first unit of module one addresses the general background of materials management and its functions and positions within an organisational structure. The second and third units presented facts on purchasing process, policies and procedures. Units 4 and 5 expose you to how information technology is facilitating materials acquisition, receiving, storing and delivering to the right place(s) of usages.

The first two units (1and2) under module two discussed issues surrounding recruitment and selection of qualified employees that will effectively and efficiently perform all materials management functions. Also, reasons and methods of materials forecasting were treated. Unit 3, 4 and 5 are devoted to reasons of carrying inventory, types of inventory costs and how to use some models of inventory to determine optimum ordered quantity. This ordered quantity must be transported to the warehouses for storing in anticipation for future requirements using some materials handling equipment (units 1 and 2 of module three). Unit three of module three presents how organisations can make profit from materials recovering and recycling and how to dispose scraps. The last units (4 and 5 of module three) explain some provisions of Public Procurement Act of 2007 of Nigeria and, objectives and functions of the Due Process Office.

Each study unit will take at least two hours of intensive study. Each unit begins with introduction, objectives, main content, self-assessment exercises, conclusion and summary as well as references/further readings. Also, tutor-marked assignments questions are provided for you to further understand and have in-depth knowledge of the course. It is advisable that you study the units carefully and do all the self-assessment questions to get prepared before your contact with your facilitator.

There are recommended textbooks and references for further reading and for better understanding of the course. These texts are suggested to provide additional information on each unit. By following these steps, the stated learning objectives of the course will be achieved.

THE ASSIGNMENT FILE

Each unit presents at least three assignments and it is expected of you to do all of them by following the schedule prescribed in terms of when to attempt them and submit same for grading by your tutor.

TUTOR-MARKED ASSIGNMENT

You are expected to apply transfer knowledge and what you learnt in the study units to do the tutor-marked assignments. By doing these assignments, you are assessing your level of understanding the course and also preparing yourself for the final examinations. You are expected to submit these assignments to your tutor for grading.

FINAL EXAMINATION AND GRADING

At the end of the course, you will write the final examination. It will attract the remaining 70%. This makes the total final score to be 100%.

CONCLUSION

This course, Materials Management (PSM 831) seeks to expose you to major functions of materials management and how they are performed. On successful completion of this course, you would have been armed with the basic functions of materials management and their contributions to organisational productivity.

MAIN COURSE

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MODULE 1

UNIT 1 THE NATURE OF MATERIALS MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Organisations, whether private or public, exist to satisfy some needs and wants of the society by producing goods and services. The production process involves the use of organisational resources popularly referred to as 5M: men, machines, money, method and material. Management must plan, organise, and control the flow of these resources from point-of source to the point-of–consumption in order to produce want-satisfying products. An important part of the flow, referred to as materials management consists of organisation function responsible for the materials planning, material forecasting, sourcing, purchasing, inbound traffic, incoming quality control, inventory control, receiving, storing, production scheduling, manufacturing, control and distribution activities of materials used in the internal and external fulfillment of demand. It also involves the management of recovering and recycling of waste materials, scrap and surplus disposal. The basic function of any

production system is to transform raw materials into useful products. Materials must be managed in such a way that they will be available when and where needed. The intent of the organisation is to make the relationship between the suppliers and the users as simple as possible within the framework of stated polices. Effective materials management involves establishing a good relationship between the two complex operations of production and supply. The success of materials management at any activity depends largely on the success of this coordination between these two operations.

The term materials has a government or military connotation and over the years, growing management interest necessitates industrial technology evolution. The terms such as material, material management, purchasing, procurement, logistics management, supply management, supply chain management and purchasing, integrated logistics management and supply management are used almost interchangeably in literature and organisations. The rationale of materials management is the integration of related materials functions to provide cost-effective delivery of materials and services to the organisation (Leenders, et al., 2002).

The goal of materials management department is to develop and implement an optimum material availability plan that supports the company's daily operation and the overall strategic plan. Research reveals that in manufacturing companies, purchased materials cost accounts for 60% of the total product cost. In the retail and wholesale business, the cost of a purchased materials especially finished goods to sell can be higher than 60%. If these purchased material costs are added to the costs of other activities such as sourcing, purchasing and utilisation of materials, it will account for greater part of product costs.

In this first unit, issues on conceptual framework of materials management, types of materials used by organisations and importance of effective materials flows to operations are to be examined.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define materials management
- explain the components of materials management
- explain the types of materials used by organisations
- discuss the importance of materials management.

3.0 MAIN CONTENT

3.1 Nature of Materials Management

Materials management can be defined as the process of planning, organising, procuring, storing and providing the appropriate material of right quality, right quantity at right place in right time so as to co-ordinate and control production operations effectively and efficiently. Materials management, a subset of logistics management functions consist of management of raw materials, subassemblies, component parts, packing and labeling materials and work-in-process stocks. Generally, materials management deals with issues relating to materials requirements planning, purchasing, transporting, inventory planning and controlling, warehousing of required materials to produce goods and services. These functions of making materials available for production of goods and services require various types of materials to manage and control their storage, flow and supply at various places. It is only possible by efficient materials management.

The relevance of materials management to the total production operation cannot be overestimated. Materials management activities actually start before the production begins by providing optimum materials required for production and its supply at the various production centres. Forecasting of company's sales and purchasing of various materials required for production is needed at the planning stage. Purchasing, procurement of materials, transportation, storage, inventory control, quality control and inspection of materials, materials handling, packaging, warehouse planning, accounting, scrap, surplus and obsolete materials disposal, finished goods safety and care are the functions performed by materials management. Also the department has the responsibility of selecting and training eligible personnel for purchasing, inventory control, stores management and materials handling.

The effectiveness and efficiency of materials management department decision concerning material flow has direct effect on product quality, profit level, company's market share, profit and position in the industry. Inefficient and ineffective managerial decisions concerning materials management activities will hinder an organisation from producing products at the right time and costs. According to Stock et al (2001), materials management activities can basically be categorised into four activities:

i. anticipating materials requirements
ii. sourcing and obtaining materials
iii. introducing materials into the organisation
iv. monitoring the status of materials as a current asset.

The objectives and functions of materials management as asserted by Sadiwala and Sadiwala, (2007) can be categorised in two ways as follows:

(i) primary objectives
(ii) secondary objectives

3.1.1 Primary Objectives

(*i*) Efficient materials planning
(*ii*) Buying or purchasing
(*iii*) Procuring and receiving
(*iv*) Storing and inventory control
(*v*) Supply and distribution of materials
(*vi*) Quality assurance
(*vii*) Good supplier and customer relationship
(*viii*) Improved departmental efficiency

3.1.2 Secondary Objectives

There can be several secondary objectives of materials management. Some of them are given below:

(*i*) efficient production scheduling
(*ii*) to take make or buy decisions
(*iii*) prepare specifications and standisation of materials
(*iv*) to assist in product design and development
(*v*) forecasting demand and quantity of materials requirements
(*vi*) quality control of materials purchased
(*vii*) material handling
(*viii*) use of value analysis and value engineering
(*ix*) developing skills of workers in materials management
(*x*) smooth flow of materials in and out of the organisation

To fulfill all these objectives, it is necessary to establish harmony and good co-ordination among all the employees of materials management department. This department should have good co-ordination with the other departments of the organisation to serve all production centres.

The basic objectives of management in an organisation are:

(1) sales increase through sales promotion
(2) profit maximisation
(3) improvement in customer services
(4) globalisation of its product sales
(5) meet the technological changes

(6) good employer - employee relationship
(7) selection of alternative materials
(8) reduction in manufacturing and other cost
(9) social objectives

In order to fulfill these basic objectives, materials management should be set in such a way that they should totally help to meet ultimate goals.

SELF-ASSESSMENT EXERCISE 1

Define materials management and its basic objectives.

3.2.0 Types of Materials

Producing goods and services involves the use of various types of materials. The type of materials to be used depends on the production operations, volume of system output, and the overall complexity of jobs. Materials can be classified into the following:

3.2.1 Purchased Materials

These are stocks or materials purchased from other organisations for production process. They form part of the product being produced. They are classified as raw materials, fabricated materials and parts, installations (capital items), accessory equipment, operating supplies, etc.

1. **Raw materials**: raw materials are the unprocessed items that are broken down, processed or combined with other materials to create an end product. Raw materials are purchased according to production requirements. Sometimes raw material inventories in excess of production requirements can result from speculative purchases made to take advantage of quantity discount and future price increase. They are materials or substances used in the primary production or manufacturing of a finished good. Raw materials are converted into semi finished/work-in-process and finished products depending on the objective of the organisations. Raw materials can be categorised into two:

    i. **Agricultural Products:** agricultural products are obtained from farms and most are highly perishable. Agricultural products are seasonal in nature and there is fluctuation in supply. Most are graded and standardised before usage. Examples are cocoa, rubber, rice, cotton, livestock, etc.
    ii. **Mineral Resources:** these are the natural resources which cannot be renewed. They are extracted in their natural

state and supply is limited in nature. They are also graded and standardised before usage.

2. **Fabricated Materials and Parts:** These are purchased materials that become part of another finished product after undergoing further processes. These materials are not processed further but fixed as part of final product. Tyres, nuts and seats used in automobile, computer parts, zips and buttons used in cloths are examples of fabricated materials and parts.
3. **Installations (Capital materials):** These types of materials do not become part of any finished products and are not used up in production process. They are capital intensive items that affect the scale of operations and they are depreciated over time. Examples are machines and major equipment, factory building, vehicles, big generators, etc. Capital materials are always acquired by organisations according to product and production process specifications. They require both pre and post installation service which must be handled by qualified technical persons.
4. **Accessory Equipment**: these materials are consumed during production process but do not become part of any finished products. Compared to capital materials they have shorter life span. Examples are hand tools and office equipment and material handling devices, etc.
5. **Operating Supplies**: these materials are industrial convenience materials in which the purchasing process is less cumbersome and the time spent in procuring them is limited. They are consumed as operating activities but do not form part of any finished products. Examples of operating supplies are petrol, diesel, lubricating oil, grease, broom, staplers, and pens, etc.

3.2.2 Work-in-Progress Materials

These are semi-finished and finished parts and components required for production operation. These types of materials must be made available at floor of production to avoid a shutdown if a critical piece of machines were to break down. These work-in-progress materials include items, which enter into final production. They can be single component, sub-assembly, assembly, sub-system and system that form part of the products. The inventory of work-in-process materials enhances the scale of economies of production without work stoppage. The computer manufacturers or engineers purchase motherboards, central processing unit and monitors to assemble a desktop computer system.

3.3.3 Finished Goods

These are the final products either waiting to be assembled, packaged or in stores which are stocked for final delivery waiting for customers. Finished goods are products an organisation sends to society for consumption. Finished goods inventory is a means of enhancing customer service levels by making provision for unanticipated demands and managing the challenge of stock out. Organisations can purchase the finished parts either for their internal use or resale. Many wholesale companies purchase the finished goods of different companies and sell to their customers.

Inventory management is vital to successful production processes because inadequate availability of raw material and work-in-process materials can lead to loss of production hours, shut down in the production line and could as well lead to an adjustment in production schedule. These occurrences can increase production costs and result into shortage of finished goods. As shortage of materials can disrupt planned production processes, excessive materials can increase costs and reduce profitability. The different costs involved in these materials acquisition and inventory are basic price, purchasing costs, transportation cost, warehousing cost, materials handling cost, office cost, packing cost, marketing cost, obsolescence and wastages.

SELF-ASSESSMENT EXERCISE 2

Mention and discuss the various types of materials.

3.3 Materials Management Organisation

One of the major tasks in any organisation is how to manage materials effectively and efficiently to run smooth production operations. The objective of materials management department in any organisation is to plan the materials requirements for the production operations. The operations of any organisation must be structured in such a way as to have the efficient management of materials flow from materials research and planning, purchasing, storing controlling, to materials conservation and utilisation with other organisation functions. All these activities must be efficiently integrated within the materials management department and other organisation functional departments so as to regulate the supply and use of material to create stable production operations. Figures 1.0 and 1.1 present the typical organisational structure and the position of materials management department within the overall organisational structure. Figure 1.2 shows the major activities performed by material managers. These activities must be effectively and efficiently coordinated and integrated with one and another and

other departmental activities to achieve individual departmental objectives and corporate goals.

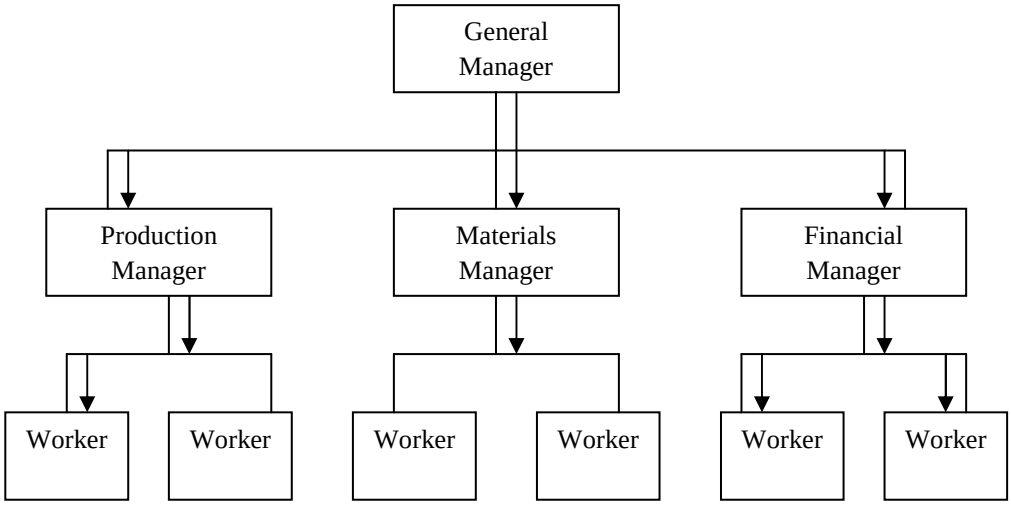

Figure 1.0: A Simple Organisation Structure (Source: adapted from Obamiro, 2008)

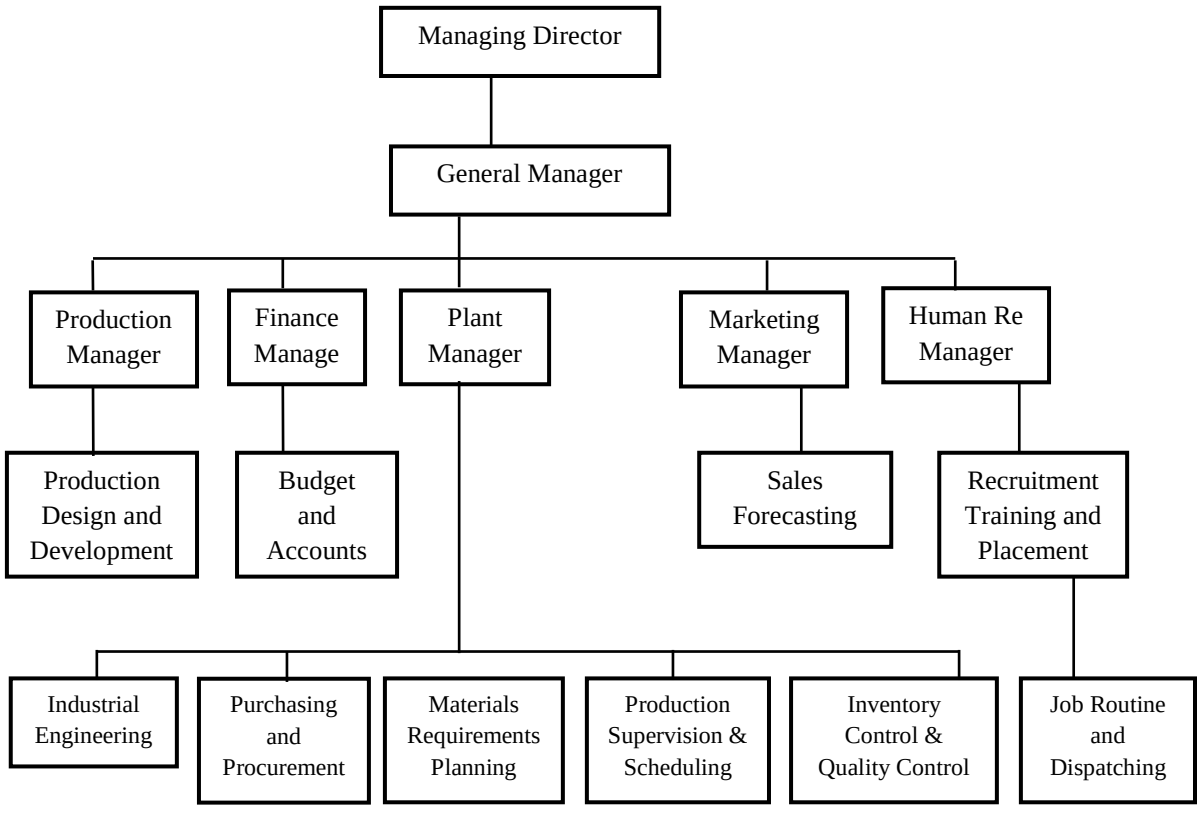

Figure 1.1: Structure of Materials Management Department (Source: adapted from Sadiwala and Sadiwala, 2007)

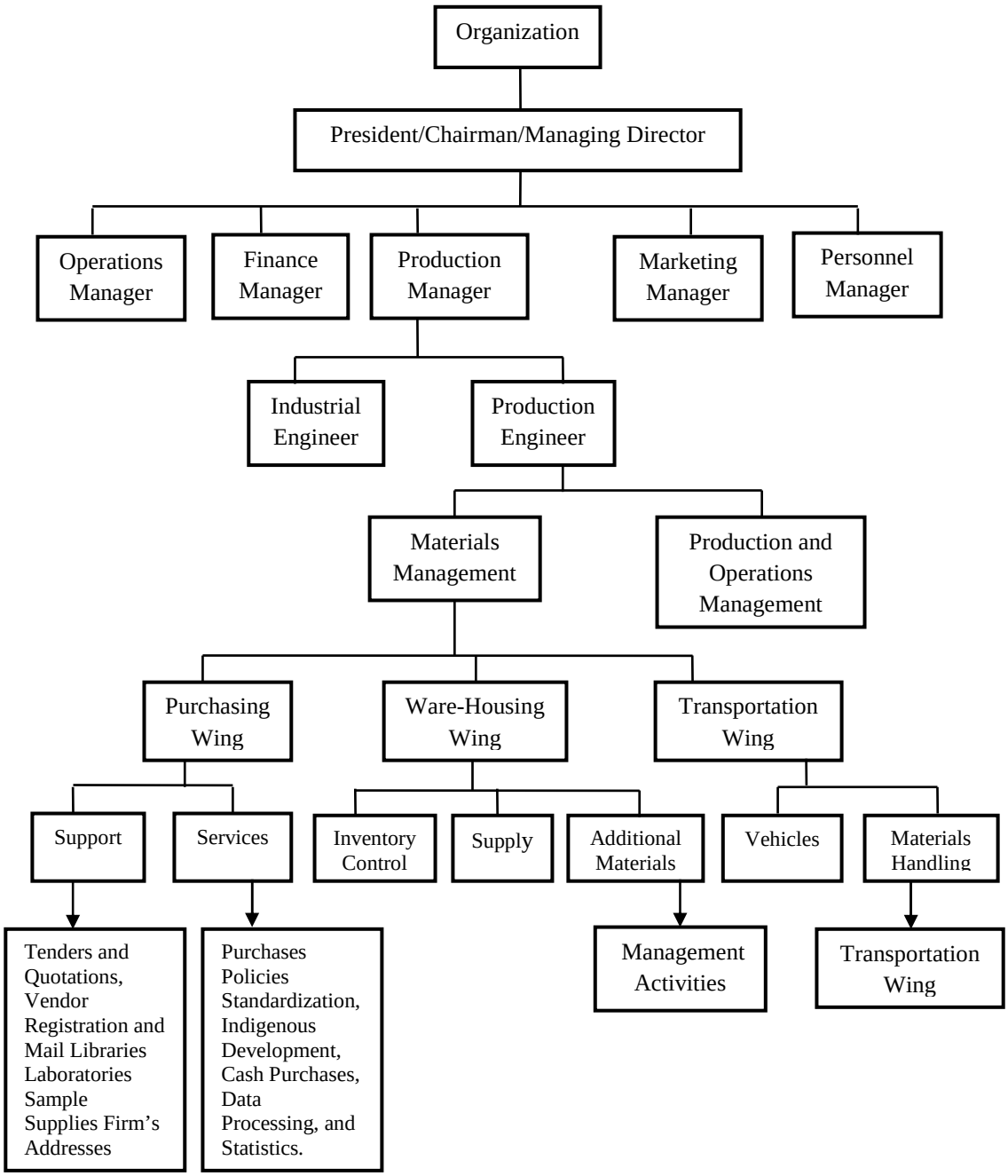

Figure 1.2: Materials Management Activities in an Organisation (Source: Sadiwala and Sadiwala, 2007)

SELF-ASSESSMENT EXERCISE 3

Identify the various activities of Materials Management?

4.0 CONCLUSION

We have been able to situate the position of materials management and its relevance to achieving an organisation's objectives. It has been demonstrated that for an organisation to have competitive edge over competitors it must produce quality products at right prices and make

them available for customers at the right time. These objectives can only be achieved if the production department receives quality materials at the right prices, right quantities and right places of usage; and these are the responsibilities of materials management department.

5.0 SUMMARY

Materials management, is a managerial function defined as a process of planning, organising, procuring, storing and providing the appropriate material of right quality, right quantity at right place in right time so as to co-ordinate and control the production operation effectively and efficiently. This function is fundamental to the survival of any organisation (especially manufacturing companies).

Today's competitive organisations have made materials management activities central to the organisation because of the inherent importance and problems if not properly managed. Top managers and other relevant level managers must embark on strategic materials planning to ensure optimum availability to avoid stock out of materials (either raw materials, work-in-process, components and parts) required for production and shortage of finished goods for existing and potential customers.

In the next study unit, we shall discuss purchasing as a function of materials management.

6.0 TUTOR-MARKED ASSIGNMENT

i. Discuss the objectives of materials management.
ii. Explain the types of materials commonly used in organisations.
iii. Draw and discuss a typical organisation structure of materials management department.
iv. What is material management and how does it contribute to the success of organisations.
v. What do you understand by purchased materials?

7.0 REFERENCES/ FUTHER READING

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UNIT 2 THE NATURE OF PURCHASING

CONTENTS

1.0 INTRODUCTION

In production operation, acquisition of materials, services, and equipment at the right qualities, at the right quantities, at the right prices, at the right time, on a continuing basis has long been an important aspect of materials management and has occupied the attention of many managers in both private and public sectors. Dynamism in supply environments in terms of abundance and shortages of materials, price fluctuations, and lead-time variability all provide ongoing challenges to effective and efficient material flows. A major goal of purchasing and procurement management is the acquisition of materials, supplies, equipment, and services that will add value to the acquisition process and entire production operations in achieving strategic goals and objectives. In some manufacturing organisations, materials acquisitions may account for over half of overall organisation costs annually. Therefore, sound and effective purchasing and materials management policies and procedures are required to reduce cost of operations and maximize profit to owners. Because organisations spend hugely on materials of any kind, purchasing is clearly a potential area for cost savings. This fact encouraged organisations that want to remain competitive to establish a good relationship with suppliers and develope several concepts (such as Economic Order Quantity (EOQ), Just-in-Time management (JIT), Lean management, Materials Requirement Planning (MRP), ABC Analysis, etc.) of materials management.

Effective purchasing and supply management has a significant impact on quality product and entire organisation process. Materials can promote or destroy a company, in terms of providing products and services that satisfy regulatory requirement and exceed customers' expectations. Also, poor or wrong materials can fail miserably to meet

the set targets. A poor or wrong quality product can shut down a company's operations. In today's competitive business operations, organisations place more attention in meeting their numerous customer expectations and therefore the buying of quality raw materials, parts, components and services they consume which are mostly outsourced. This further increases the relevance of purchasing function to the organisation.

Purchasing and procurement functions are intertwined and therefore often used interchangeably, although the activities differ in scope. Purchasing function refers to the actual buying of materials and those activities associated with the buying process. Procurement is wider in scope and includes purchasing, traffic, receiving, and storing materials.

This second unit covers activities that are central to acquisition of materials, services, and equipment at the right qualities, at the right quantities, at the right prices, at the right time, on a continuing basis and importance of effective purchasing management to production operations.

2.0 OBJECTIVES

The aim of the unit is to make you appreciate the relevance of purchasing function in any competitive organisation. At the end of this unit, you should be able to:

- define purchasing management
- explain the objectives and importance of purchasing
- discuss types of purchasing.

3.0 MAIN CONTENT

3.1 Element of Purchasing

Purchasing as an activity of materials management can be defined as the process that consists of all activities that lead to effective buying of raw materials, parts, components, equipments, spare parts, tools and supporting items required by any organisation to deliver quality products to meet customer requirements at competitive prices. Effective purchasing can also be described as buying of materials at the right quality, in the right quantity, at the right price, at the right time, from the right source. The emphasis of effective purchasing is doing what is "right" at all stages as discussed below:

a. **Right Quality:** right materials means buying materials that meet organisation set standard, fulfill all necessary requirements to

meet the final user's needs for a particular item at the lowest overall cost. It is pertinent to mention that right quality does not always connote the best or highest quality or most expensive, nor is it always the lowest or cheapest. The most important fact is that buying the materials that satisfy the company expectation in terms of increasing product quality, reducing product cost and overall cost.

b. **Right Quantity**: this means that the purchasing agent should ensure that there is adequate inventory of raw materials, parts, components, equipments, spare parts, tools and supporting items as required by the organisation at all times. Materials should be ordered at the right quantity because a too small order repeatedly can lead to higher price per unit and stock out i.e. the risk of running out of critical materials. When materials orders are too large than what is required at a period, inventory "carrying and holding costs" are higher, extra warehouse space and staff may be needed, and expensive stock may become "spoiled" or obsolete in the store.

c. **Right Price**: in some organisations, prices of materials are determined through competitive bidding or inviting suppliers to submit price quotations or other procedures designed to permit cost comparisons and hold costs to reasonable levels. The prices of materials must be fair and reasonable to both the buyer and seller. The goal of every purchasing officer, whether competitive or not, should be that his/her organisation and suppliers both realise a "win" or "satisfy" as a result of the transaction.

d. **Right Time**: the materials management department should ensure that required materials are available where they are needed at the right time. Effective planning helps in buying optimum materials at right time while poor planning may result into rushed buying at a premium, or the quality specified does not meet the organisation's specifications; or, even worse, both.

e. **Right Source:** purchasing department must select a responsible and responsive supplier who has a good record of performance and who can provide the best combination of quality, quantity, and price, at the right time. Failure of delivery, delays in delivery and delivery of low quality materials and inadequate service can all contribute to higher product costs.

Basically, purchasing is to obtain raw materials, components, parts, as well as information that are required for the production of goods or providing services. This purchasing process involves the following:

(1) to receive materials requirements and requisitions from various departments
(2) to determine the materials to be purchased on priority of usage

(3) to formulate the purchasing policy and procedures
(4) to conduct supplier market analysis
(5) to determine the source of supply
(6) to prepare specifications and request for tenders and quotations of materials
(7) to purchase the optimum materials in terms of quantity, quality, and price at the right time
(8) to get deliveries at the right time where needed
(9) to check and inspect the materials and determine whether they meet prepared specifications
(10) to make necessary arrangement for storage where applicable
(11) to effect prompt payments and make necessary co-operation

SELF-ASSESSMENT EXERCISE 1

Discuss the attribute of effective purchasing

3.2.1 Objectives of Purchasing

The aims of a competitive purchasing unit or departmentt go far beyond the traditional belief that purchasing's primary role is to buy materials in response to internal needs. The primary objective of purchasing is to buy materials of right quantity and quality at the right time and at the cheapest cost. Besides, there are some objectives of purchasing:

1. Support Operational Requirements

Purchasing supports the requirements of organisations through the buying of raw materials, components, sub-assemblies, repair and maintenance items and services from the right source at the required specification and, delivery of the right quality at the right time and place. It also expects to facilitate the requirements of physical distribution, warehousing the materials and delivering materials required for effective operations or finished goods to the customers. Purchasing unit also assists engineering and technical teams in designing and new product development.

In today's competitive business environment, many organisations outsource required materials against the past business practice of vertical integration as a means of sourcing materials and selling finished products to final customers. Vertical integration which is either backward or forward means that an organisation controls and owns the units that support the supply chain. Today attention has shifted to external suppliers, purchasing must support this movement by providing an uninterrupted materials flow for both internal and external customers requirements. Uninterrupted flow of materials is achieved only when

materials are purchased at the appropriate right price, from the right sources as well as taking into consideration the factors such as specifications, quantity, quality and delivery of materials at the right time to the right place.

2. **Effective and Efficient Purchasing Process**

Management of internal purchasing operations is paramount to the smooth running of production process regarding production of want-satisfying products at the cheapest costs. Investment in the materials should be optimal and judicious utilisation is important. To perform purchasing related activities efficiently, the following must be done: -

(i) determining the qualified purchasing staff
(ii) developing and adhering to budget allocation
(iii) providing training and developing opportunities for purchasing employees
(iv) making better decisions of purchases after evaluating other alternatives

3. **Determining Source of supply Decision**

The main objective of the purchasing unit is to select, develop and maintain the supply base of materials that is capable of providing performance advantages in product cost, quality, and efficient delivery, development of technology or new product development. The selection of the right source of supply is always necessary to achieve organisation objectives. Purchasing department must select a supply base that improves their scheduling processes, reduces setup times, reduces order entry errors and do whatever programme that can improve their delivery performance. Efficient purchasing is a function of developing better relationship with suppliers and select reliable and high quality suppliers that have the potential for excellent performance and high reputation in prompt delivery of goods. Many companies have improved on-time delivery, reduced lead time and cycle times by working closely with suppliers in sharing production schedules and forecasts and helping them in improving the scheduling of deliveries.

4. Develop and Maintain Strong Relationships with other Functional Departments

Purchasing department must communicate clearly with marketing, manufacturing, store, engineering, office and finance, security, etc., who are regarded as internal customers. Developing and maintaining a positive close relationship with them will reduce complaints, conflicts,

and duplication of orders and buying sub-standard or wrong materials at highest costs.

5. Conform with Organisation Goals and Objectives

To have a competitive edge, organisations' purchasing department should develop and implement purchasing policies to promote the goals and objectives of the company and establish its reputation. This means purchasing has direct effect (positively/negatively) on the overall productivity of the organisation. Purchasing can no longer be a support but must be recognised as a strategic function that can provide a powerful competitive advantage in the marketplace. Therefore, purchasing policies and procedures should be coordinated to deliver timely results that contribute to organisation goals and objectives.

6. **Develop Purchase Strategies that Support Organisation Strategies**

Purchasing department should adopt strategies that align or integrate with organisation strategies. The purchasing department may sometimes fail due to insufficiency in the integration of its plans and strategies with overall plans; strategies due to improper selection and training of purchase personnel; slow recognition of the benefits that a progressive procurement function can provide and not participating in the corporate planning process. Therefore, efficient purchasing department should actively participate in corporate planning process and abide by the following strategies:

(i) observe supply markets and trends and determine the implications on companies' objectives
(ii) identify major materials and services that are required to support companies' strategies
(iii) develop supply plans that support company plans.

3.2.2 Importance of Purchasing

Despite the complexity of managing world-class organisations, organisations are exploiting their purchasing for competitive advantages. Organisations have discovered that focusing on purchasing and supply chain management will help to increase customer value by improving performance while simultaneously reducing costs. The following benefits are what organisations can derive from effective purchasing:

1. improved quality of materials supplies
2. enhanced prompt material delivery
3. improved performance of their products

4. operational cost reduction or improvement
5. shorter production cycle time, including product development cycle times
6. continuous quality improvement
7. promote the development of new technology for production process
8. establish good buyer-supplier relationship

SELF-ASSESSMENT EXERCISE 2

Mention the importance of effective purchasing

3.3 Types of Purchases

Organisations purchase different materials depending on what they produce and sell. All purchases are the outcome of a strategic decision on make or buy approach which determines what materials the purchase department has to source externally or manufacture internally by the production department. If a company is to purchase its materials externally, the issue is which suppliers offer the optimum opportunity for required materials. The following section discusses the types of purchases commonly made.

1. Raw Materials

Raw materials consist of both extracting and agricultural products such as petroleum products, coal, rice, bean, copper, lead, irons, cotton, cocoa, coffee and soybeans. These materials most time undergo further processing to semi finished and finished saleable products. Also, raw materials are not of equal quality. They are classified in grade according to their qualities. For example crude oil, cocoa and coffee are in different grades, by various firms. Purchasing department buys based on the required grade. It is the duties of purchasing department to understand clearly; buy and receive the quality of raw materials that is required for operations, because effectiveness and efficiency of production operations to a large extent is determined by the quality of raw materials that go into production.

2. Semi-finished Products, Parts and Components

Semi-finished products, parts and components include processed products purchased from suppliers that will be used in the later stage of production process and physically present in the final production. They consist of single component, sub assembly, and assembly that do not need any physical changes but can be incorporated into the final products. Semi-finished products, parts and components purchased by

automobile manufacturer are tyres, mirrors, car frames, seat assemblies, head lamp, bulbs etc. The computer producers purchase motherboards, central processing unit, mouse, monitors, etc. Managing the purchase of these items is critical as the quality and cost of the final product is also a function of these items.

3. Finished Products

These are products that are not manufactured by the organisation but can be purchased from external suppliers for internal use or resale. Finished products are obtained after the final processing stage mostly from reputable suppliers. Some well known companies or brand names are used to buy the finished products from small manufacturers and market under brand names. Organisations adopt this strategy to offer a full range of products outside their production capacity and to take advantage of their excellent design capacity despite lacking production capability and capacity. Purchasing and technical departments must relate closely with the producer of a finished product to use specified materials and produce to meet technical and customer specification in terms of quality at the lowest costs.

4. Maintenance, Repair and Operating Items

These are materials or products that do not enter production line but are essential for running the business. They are required regularly for continuous functioning. These materials include computers, printers, spare machine parts, cleaning and maintenance supplies. Maintenance, repair and operating materials are required in every unit of the organisation and this makes the monitoring and buying of these materials difficult. It is advisable for purchasing department to adopt Just-in-Time technique of inventory to reduce the challenges of large inventories of these items.

5. Production Support Items

These materials such as pallets, boxes, containers, tape, bags, wrapping, and handling items are required for packing and shipping the final products either for internal users or external customers. Production support materials go directly with the products and support the production operations. Sometimes, large inventories of these materials are purchased because of frequent usages and they constitute the major source of inventory investment. It is advisable that purchasing department should adopt a creative approach to control the buying of these items.

6. Services

All organisations outsource certain services externally based on contract. The services can range from office cleaning, repair, maintenance, housekeeping, building repairs, cafeteria, heating, cooling, and safety services to setting up a new production facility. Effective and efficient strategy of contracting these services will reduce operational costs.

7. Capital Equipment

These types of materials are purchased for use over one year. Purchasing capital equipment involves huge investments and they depreciate and become obsolete after a period of time. Capital equipment purchases can be categorised as general purpose material that requires no special design requirements. Examples include general purpose handling equipments, computer systems and furniture. Another categorised is special equipment designed specifically to suit the requirements of the purchaser. Specialised production machinery, new machine tools and power generating equipments are called capital equipments. Purchasing department should select qualified capital equipment suppliers who can supply, install and service these items as and when required.

SELF-ASSESSMENT EXERCISE 3

Discuss the types of materials purchasing.

4.0 CONCLUSION

For the smooth flow of materials in an organisation, effective buying of raw materials, parts, components, equipments, spare parts, tools and supporting items required to produce and deliver quality products to meet customer requirements at the competitive prices should be the concern of management. Effective purchasing occurs when materials are procured at the right quality, in the right quantity, at the right price, at the right time, from the right source. The emphasis of competitive purchasing is doing what is “right” at all stages.

5.0 SUMMARY

The aims of a competitive purchasing unit or department go far beyond the traditional belief that purchasing’s primary role is to buy materials in response to internal needs. The primary objective of purchasing is not to just buy but to buy materials of right quantity and quality at the right time and at the cheapest cost. Nowadays, organisations have discovered that focusing on purchasing and supply chain management will help to increase customer value by improving performance while

simultaneously reducing costs. So all purchases is the outcome of strategic decision on make or buy approach which determine what materials the purchase department should source externally or manufacture internally by the production department.

In the next study unit, we shall discuss issues on purchasing policy and procedure.

6.0 TUTOR-MARKED ASSIGNMENT

i. What is effective purchasing and explain its features?
ii. Discuss the objectives of effective purchasing.
iii. State the importance of purchasing.
iv. Explain the types of purchases in organisations.

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UNIT 3 PURCHASING POLICIES AND PROCEDURES

CONTENTS

1.0 INTRODUCTION

Once organisations have set clearly defined corporate objectives as well as purchasing objectives, the next step is to determine the manner it intends to achieve them. Purchasing policy statement is formulated to show the stakeholders what the organisation and purchasing department will, and will not do in achieving their goals and objectives.

Policies are both written and unwritten statements that reflect a plan's basic values and provide guidelines for managers' decisions toward the accomplishment of the stated objectives. Policies are general or broad statements that guide managers' thinking which facilitate objective accomplishment. Policies help organisations in objective-setting and attainment process. Policies can be implied and expressed. Implied policies refer to unwritten statements which are understood over time and eventually become part of an organisation. Expressed policies are written statements that guide manager's actions or decisions. Strategy and policy are directives to plans and affect all areas of management. They harness the daily activities in various departments along with what an enterprise intends to do.

Purchasing department having written and implied policies create an opportunity to define and clarify corporate objectives as related to purchasing. Another advantage is that it ensures purchasing personnel act uniformly and consistently with departmental objectives. Adhering strictly to set policies may discourage innovativeness, creativity and flexibility in handling issues relating to purchasing.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define policy and explain its various types
- explain purchasing policy and procedure
- explain the types of materials used by organisations

3.0 MAIN CONTENT

3.1.1 Purchasing Policy and Procedures

Purchasing Policy refers to general or broad statements that guide purchasing agents' thinking which facilitate objective accomplishment. Purchasing department develops policies to provide rules of actions, guidance and general support for its staff. Most existing purchasing policy provides the guidelines and direction in the following categories.

(i) It defines roles of purchasing
(ii) It claries conduct of purchasing personnel
(iii) It defines minority business objectives
(iv) It defines purchasing department-supplier relationship
(v) It states operational issues

- **Policies Defining the Role of Purchasing**

The purchasing department must set policies that define purchasing authority. The policies define the objectives of purchasing and responsibilities of various buying levels. These policies address the following areas:

(*i*) the limit of purchasing authority of personnel.
(*ii*) duties and responsibilities of the corporate purchasing office.
(*iii*) process of analysing make or buy decision across functional departments.
(*v*) personnel operating guidelines to negotiate with suppliers.

- **Policies Clarifying the Conduct of Purchasing Personnel**

Policies should clarify management's commitment toward purchasing personnel ethical behaviour in relating to suppliers. Purchasing department must develop policies for its personnel to cultivate highest standard as stated by top management. This policy must address purchasing personnel and other department that have direct communication contacts with existing and potential suppliers. These policies must consider issues concerning employee leaving to work for a

supplier and developing a means of reporting any irregular business dealings. Former employees working for a supplier is a serious concern to the management because he/she may reveal confidential information that can give the current supplier some leverage over other suppliers. The policy that handles reporting irregular business activities (such as accepting gifts or bribes, releasing vital information to a supplier, accepting late bids) must specify the right office and formal of reporting. Whistle blowing concept of reporting illegal business dealings can be encouraged and they should be arrangement to safeguard whistle blowers.

- **Policies Defining Social Business Objectives**

This policy statement addresses the purchasing position as related to environmental issues. Policies must be formulated to handle issues of waste materials, recycled materials, disposal of hazardous wastes, reducing pollution as required by Federal, State and Local government regulations. Policy should regulate companies to cleanse up the environments where they operate and make them safe and harmless.

- **Policies Defining Purchasing Department-Supplier Relationship**

These policies contain the guidelines that promote positive relationships between the buyer and seller. The relationships should be based on honesty, mutual trust and respect for purchasing process. Some rules that support these positive relationships are:

(i) fairness and integrity should be the watchword when dealing with suppliers
(ii) adopt a fair suppliers' selection process and purchase contract award.
(iii) necessary support should be given to suppliers of high reputation in quality improvement, prompt delivery, cost minimization, etc.
(iv) have stated and open communication channels
(v) effect prompt payment to suppliers.

Purchasing department's position concerning the performance criteria of evaluating the suppliers on both traditional and non-traditional materials will guide staff in rating the suppliers. According to Monczka et al. (2002), some supplier selection criteria include:

(i) price/cost competitiveness
(ii) product quality
(iii) delivery performance
(iv) financial condition

(v) engineering and manufacturing competence
(vi) management of its own suppliers
(vii) ability to work with the customer
(viii) potential for innovation.

After suppliers' evaluation, policies concerning principles and guidelines of selecting and awarding purchase contracts must be clearly known. These policies address of issues who have the authority to award a purchasing contract and within what limit, process of competitive bids, conditions of accepting or rejecting competitive bid, and situations prompting a rebid, etc.

- **Policies Stating Operational Issues**

As required by Federal, State and Local laws, organisations must have means of disposing their waste especially hazardous or toxic waste. Waste disposal services are responsibilities of purchasing departments, so organisations must have policies that state clearly the legal requirements and conditions for handling waste products. Also, these policies outline in detail how to manage issues of supplying defective or non-performing materials. Other operational issues that need policy guide are: compliance with general laws and requirement of government agencies, and proper disposal of material assets, etc.

3.1.2 Purchasing Procedures

Purchasing procedure describes appropriate steps and instructions in written form required for the acquisition of various materials needed by organisations for production operations. This procedure provides information on purchasing process to achieve successful strategies. It is important to know that this document varies according to organisations but in spite of this it serves as a guide or provides routine method to follow by employees, purchasing persons, etc. Purchasing process includes various steps to be followed for routine purchase of materials starting from passing the material requisitions information of the user to the purchaser and later to the supplier. In summary, the steps involved in the purchasing process are listed below:

(i) need for materials to be purchased.
(ii) define materials requisitions and specifications
(iii) obtain information and evaluate suppliers relating to interest of providing the materials.
(iv) select supplier (s) based on qualifications to provide the materials
(v) determine the prices and availability of materials.
(vi) award a purchase order based on price quotation
(viii) receipt of materials and inspection

(x) inventory of material

Summarised steps of purchasing process are given below.

Step 1: Recognition of Need– purchase process begins with identification and definition of individual or department needs in the company. The request should state materials specification in terms of quantity, quality, delivery time and place.

Step 2: Supplier Evaluation and Selection– supplier selection is a strategic decision to a purchasing department and the organisation. This is done after analysing the suppliers in terms of past supplies, financial positions, price trend, supplier availability, market condition, material quality, prompt delivery, services, etc.

Step 3: Contract Negotiations – this step starts with inviting suppliers to submit quotations after the purchasing personnel summarised the items they want to purchase into various categories using commodity characteristics in terms of importance and urgency.

Step 4: Place Purchase Order– purchase order is placed after the buyer and supplier have signed the purchasing contract. The purchase order document contains information on required product specifications such as product quantity, quality, unit price, total cost, time and place of delivery, payment arrangement and other required information. Once the document is delivered to the supplier, the purchase order form becomes an effective legal document.

Step 5: Monitor Purchase – the purchasing department should monitor order status after the supplier receives the order document and ensures materials are supplied promptly. The supplier should be contacted immediately if there is need for adjustment.

Step 6: Order Receipt and Processing – when the materials are supplied they should be inspected and verified in terms of quantity and quality. If variation in terms of quantity and/or quality occurs, the differences should be corrected before final acceptance.

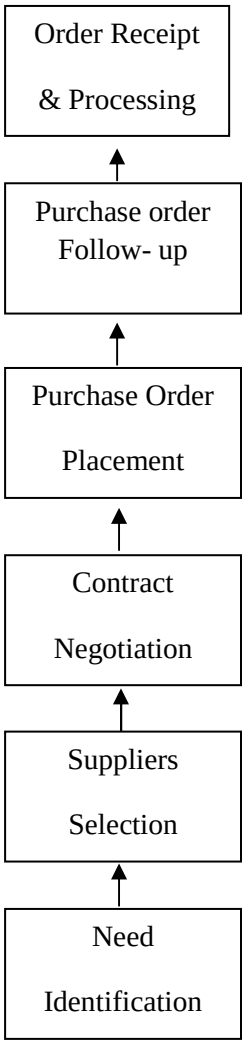

Figure 3.0: Purchasing Process

SELF-ASSESSMENT EXERCISE 2

Discuss the purchasing procedures

3.1.3 Methods of Purchasing

- **Centralised Purchasing**

Centralisation refers to retaining authority or strategic decision at or near the top echelon of the organisation hierarchy, department or in the hands of top-level managers. Centralised purchasing allows all types of materials purchases of the entire organisations to be handled by the purchasing department or its single authority. All purchases of stores shall be made by the purchase department and not by the administration section. Materials requisitions are supplied from all the departments to a centralised purchase system. Centralised purchasing is suitable to

organisations having single branch/ plant or various branches/plants producing the same or similar products.

Advantages of Centralised Purchasing

(i) Since centralisation of purchasing authority withholds delegated authority, it makes for uniformity of activities such as actions, policies and procedures of purchasing
(ii) It encourages proper co-ordination of purchasing and organisation resources
(iii) It reduces the duplication in purchasing and avoids excessive purchasing since different units do not do similar activities
(iv) It reduces conflict and unhealthy rivalry between purchasing department and other units /in an organisation
(v) Centralising purchasing decision making activities at one location or department minimises the overhead costs of Decentralised locations or departments
(vi) Central purchasing allows bulk purchase and enjoys discounts and cost reduction.
(vii) The method relieves engineering, technical and production departments of purchasing related activities to focus on core areas of competences
(viii) It enhances greater purchasing specialisation, buyer's influence, and better service.

Disadvantages of Centralised Purchasing

(i) Total centralisation of purchasing means that the future of the company is put in the hands of few
(ii) Engaging only a few purchasing employees in making strategic decision disallows the richness of decisions obtainable by allowing contributions from relevant people
(iii) The concept of centralised purchasing authority does not provide training opportunity for middle and lower-level managers.
(iv) Centralised purchasing policy may cause delays as various departments send their materials requisitions to one department for necessary actions and this may take time
(v) Centrally controlled purchasing sometimes disallows priority or flexibility in departmental purchase of their materials requirements.

- **Decentralised Purchasing**

Decentralised purchasing is a process whereby purchasing decision making authority is distributed through all levels of an organisation. It gives the business unit more power to evaluate and choose the best

suppliers and award purchasing contract. Decentralised purchasing allows disperse authority to every individual department to make purchases of its own requirements of materials and is responsible to make its deliveries. Organisation that operates decentralised purchasing policy allows (1) authority for most departmental purchasing decisions be taken by the departmental heads, while (2) control for major companywide purchasing decisions are situated at the top or headquarters if the company has different plants and product lines. In a decentralised purchasing organisation, a relative amount of purchasing authority and accountability are delegated to different units. This method of purchasing is widely used in large organisations that have different product lines and plants. These companies' plants and product lines require different types of materials and experience frequent changes in purchasing policies and procedures.

Advantages of Decentralised Purchasing

1. It promotes initiative and enriches other departmental employees' jobs by offering them the opportunity of making important decisions concerning departmental needs to be purchased
2. It relieves purchasing department of some duties and workload which in turn allows them to concentrate on more strategic issues
3. It increases job satisfaction and employee morale because of the sense of belonging derived as a result of their involvement in materials purchasing decision making process
4. Decentralised purchasing places decision making authority in the hands of people familiar with or who want to use the materials
5. It provides opportunity to react quickly to changes in materials specifications.
6. Decentralised purchasing leads to faster decision making by user's department because most purchasing decisions do not need to go to central purchasing department
7. It enhances better understanding of user's needs and material specifications, easier communication and coordination.

Disadvantages of Decentralisation

1. The extent of purchasing decentralisation can be constrained by the availability of qualified employees in each department
2. It involves expensive management training and orientation to bring up some employees to the state of making effective purchasing decisions
3. Decentralised purchasing leads to non-uniformity of purchasing policy because of individualistic factor in performing daily responsibilities

4. Difficulty of control arises since more units become purchasing independent
5. Decentralised purchasing leads to duplication of activities in different departments, hence, increases the cost of production
6. Purchasing decentralisation may result in loss of some controls in terms of when and what materials to buy, at what price and who to supply.

Considering the merits and demerits of centralised and decentralised purchasing, no method is best. Application depends on existing situation. Big organisations nowadays adopt a hybrid purchasing system that integrates both centralised and decentralised purchasing for organisations that have different plants and product lines to take advantage of the two methods.

4.0 CONCLUSION

The objective of purchasing policies is to guide management's commitment toward purchasing personnel ethical behaviour in relating with suppliers. The unit has demonstrated how to develop policies and why purchasing department must develop policies for its personnel to cultivate highest standard as stated by top management. This policy must address purchasing personnel and other department that have direct visits or communication contacts with existing and potential suppliers. These policies must centralise and decentralise purchasing, consider issues concerning employee leaving to work for a supplier and developing a method of reporting any irregular business dealings.

5.0 SUMMARY

This unit was devoted to the understanding of the fundamental principles behind the purchasing manager's actions and decisions-policies which can either be expressed or implied. This was followed by the categories where purchasing policy provides the guidelines and directions in any organisation. (i) It defines roles of purchasing, (ii) It clarifies conduct of purchasing personnel, (iii) It defines minority business objectives, (iv) It defines purchasing department-supplier relationship, (v) It states operational issues.

Two methods of purchasing-centralised and decentralised purchasing were discussed. The unit concluded with the advantages and disadvantages of the methods to the organisation.

In the next unit we shall discuss supplies management information system.

6.0 TUTOR-MARKED ASSIGNMENT

i. Define purchasing policy and explain why organisations have a set of policies that direct the actions and decisions of purchasing officers?
ii. Discuss the categories where purchasing policies provide guidelines and direction.
iii. Differentiate between centralised and decentralised purchasing polices and which of the two methods is considered best?
iv. With diagram discuss purchasing procedures.

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UNIT 4 SUPPLIES MANAGEMENT INFORMATION SYSTEM

CONTENTS

1.0 INTRODUCTION

Information may be seen as the lifeblood or one of the major intangible assets of any organisation. Business operations thrive on information. Information must be properly harnessed with other resources for the purpose of effectiveness and efficiency of business operations. Effective materials management is practically impossible without reliable, current, and accurate information. Regardless of the types of organisation (large or small, profit-oriented or non profit-oriented), and the sizes of materials management department, quality information is needed by managers to harness internal resources, obtain and process necessary information concerning organisation materials. Materials managers use the information to tap opportunities and manage threats in the logistics external environment. The usefulness of information is determined by its positive effect on decision making, especially, as it relates to materials management.

As a result of its indispensability and utmost importance, information must be managed effectively by understanding the skills of designing, implementing and controlling the information system by materials management department in particular and the entire organisation in general. Therefore, different departments within the organisation gather

necessary data about materials requirement in terms of characteristics, time and place(s) of usage. This information must be processed and stored in an organised manner in order to facilitate easy accessibility any time it will be needed for decision making. Nowadays, the cost of providing quality information throughout the supply chain has dropped dramatically, whereas the costs of labour and materials have risen. This is as a result of utilisation of computer and information technology to support logistics systems.

In this particular unit of the course, the discussion will be on the conceptual clarification of supplies management information system, different forms of supplies management information system as well as order processing and information system.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning of Supplies Management Information System
- identity major sub-systems in Supplies Management Information System
- discuss the applications of materials Supplies Management Information
- explain how information system aids order processing

3.0 MAIN CONTENT

3.1 Supplies Management Information System (SMIS)

A Supplies management information system can be described as a computer-based information system that transforms internal and external sourced materials data into information needed by employees of materials management department and other relevant departments to enable them to make appropriate decisions for materials planning, forecasting, purchasing, transporting, inventory and warehousing. The SMIS can also be defined in terms of its functionality and its internal operation. The major purpose of collecting, retaining and manipulating data concerning materials requirements is to make decisions ranging from strategic to operational and to facilitate logistics system.
Recently, the availability of modern information technology such as powerful computer memory space, internet, intranets, computer analysis software, and increased access to information throughout the organisation through intranets and company website has improved platforms for transmitting information. Also, it has created the opportunity for firms to share information conveniently and

inexpensively throughout the supply chain. More efficient materials management activities are made possible from the benefits that timely and comprehensive information provide within the firm, as well as from the benefits of sharing appropriate information among other supply chain members.

A supplies management information system should be comprehensive and capable to allow free communication within materials management department, between the functional areas of the firm (marketing, production, finance, production, etc) and also between the members of the supply chain (vendors, materials handler, carrier and customers). Sharing selected information about sales, demand forecasts, purchasing, transportation, inventory warehousing, materials handling devices, production schedules, stock availability, etc. with sellers can improve performance and reduce uncertainties throughout the supply chain as users find ways of benefiting from information availability. Of course, we should realise that there is need to manage priority information that can jeopardise a firm's competitive position from the general public. Even though the benefits of free information sharing across the organisations are being recognised, there is likely to be a limit to how much information firms are willing to share with others outside their control.

3.1.1 Supplies Management Information Processing System

A system approach to generating the information required by materials management department for various purposes requires organisations to develop materials information system. An information system consists of inter-related parts working together in a holistic way to provide required information for managers.

Information processing system as illustrated in figure 1, obtains input resources from both internal (organisation's material requirements) and external (supply chain) environment. These resources include materials characteristics, prices, purchasing policy and procedures, inventory, transportation, warehousing, materials handling equipment, personnel, financial, etc. The inputs are put through a conversion or transformation process (technology) which manipulates and analyses the data into output. The output can be in form of reports, documents, queries, etc.
An information-processing system has data storage and feedback loop which help in storing data or information for use at a later time. The feedback loop serves as a control mechanism that helps the materials management department obtain feedback information on the quality of materials delivered to various departments and the relationship with other members of logistics system.

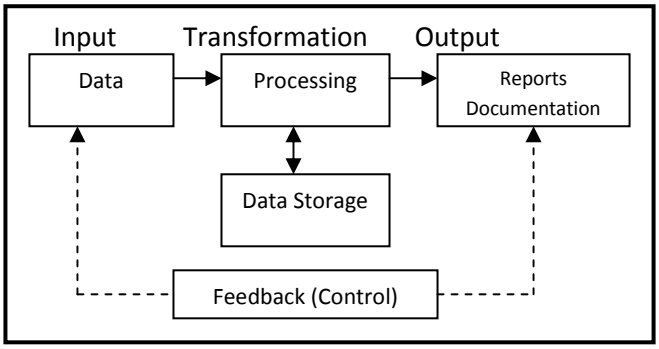

Figure 4.0: Basic Components of Information System (Source: Bartol and Martin ,1998)

3.1.2 Characteristics of Useful Information

The usefulness of information is determined by it positive effects or changes on decision making. In order for information to be useful in decision making, it must have the following characteristics as illustrated below:

Relevance: information is said to be relevant if it is appropriate or pertinent to the decision making situation or problem at hand. Relevant information is directly related to solving the problem or situation facing the organisation.

Accuracy: accuracy of information is needed for the quality of information. Accurate information is error free i.e. correct enough to form the platform for sound decision making. Accurate information must be precise, concise, verifiable, and applicable to the problem at hand.

Timely: information is useful when it is timely. Timeliness refers to the availability of information when needed. To make effective decision and react to today's complex and dynamic business environment, managers need updated and current information. However, with today's information technology-based business operations, computer has the ability to process, analyse, store, retrieve and disseminate needed information within a very short period of time.

Comprehensive: information is comprehensive if it contains the complete ingredients necessary to make decisions, exercise control, influence, co-ordinate or when it covers all required areas. Therefore, the comprehensiveness of information is measured in terms of coverage and appropriateness. It is important to know that because of the dynamism and uncertainty of the environment, managers rarely have access to complete information.

Conciseness: conciseness of information refers to the extent at which the present information is summarised to the level that is useful to the decision making process.

Understandability: quality information is the one that has every bit of it understood by the user(s). Therefore, information preparation and presentation should take into consideration the perception and background of the user(s). For instance, information meant for human resource or marketing officers should not be encoded in scientific jargons.

SELF ASSESSMENT EXERCISE 1

Explain the meaning and the need for supplies management information system.

3.2 Sub-Systems of Supplies Management Information System

There are major subsystems within the supplies' management information system that work together to achieve a set of goals. These major subsystems are (i) order management system (OMS), (ii) warehouse management system (WMS) and (iii) transportation management system (TMS). Each of the subsystems operate together and provide information required to improve materials transaction purposes but also serve as decision support tools that assist in planning the particular activity.

3.2.1 The Order Management System

The order management subsystem (OMS) begins with materials order placement and ends when they are delivered into point of usage or warehouse. It manages the initial contact with the materials department or customer at the time of materials inquiries and order placement. The OMS make contact electronically with the warehouse management system to check materials availability, either from inventories or from the production schedules. This provides necessary information about materials availability, location on the supply network, quantity available and the expected time of delivery. Once materials availability is confirmed, communicated and accepted by the customer, OMS communicates with the company's financial information system to check customer status and verify credit standing. If customer financial information is satisfactory and order is accepted, the OMS will allocate the product to the customer order, get the product from warehouse or production line and when shipping has been confirmed prepare an invoice. However, some companies make the mistake of planning and

controlling only the portion of the order cycle that is internal to their operations. That is, they monitor only the activities and time between receipt of customer order and shipment of the materials, but over look the monitoring of the order quantity on transit.

The OMS does not operate in isolation from the other information systems of the firm. If the customer is to be served effectively and efficiently, information must be shared. For example, if the OMS is to provide order tracking, the warehouse and transportation management system will be integrated. A typical materials order cycle comprises the following steps: (1) order preparation (2) order receipt and record, (3) order processing, (4) warehouse receiving order, (5) order transportation, and (6) customer delivery.

It is pertinent to mention that besides OMS orders being received by a firm, there is a similar OMS that handles company purchase orders. Whereas a customer-based OMS obtains information on firm's customers, the purchase-based OMS concentrates on the company's suppliers, showing their delivery performance ratings, costs and terms of sale, capabilities, availabilities and financial strength. Frequency monitoring and evaluation of suppliers is necessary in optimising selection process.

3.2.2 The Warehouse Management System

The warehouse management system (WMS) can operate as a separate subsystem of logistics system or contain the OMS. The WMS performs based on the information obtained from OMS so that materials/sales department knows the available materials. It is a management information subsystem that updates management with information on materials movement. WMS functions consist of the following activities (i) receiving; (ii) put away (iii) inventory management (iv) order processing and retrieving and (v) shipment preparation.

1. Receiving

Receiving is the starting point of loading information into the WMS. Materials are off-loaded from the receiving carrier at the warehouse's inbound dock and identified by product code and quantity data. Products are entered into the WMS using bar code scanners, radio frequency (RF) data communication terminals or manual keyboards. Materials characteristics such as size, weight and package configuration are determined by matching the product code against an internal product file.

2. Putaway

The materials need to be temporarily or permanently stored within the warehouse. The WMS has information on the available space and its layout rules within the building and the inventory stores in other locations. Then WMS assigns the received materials to a specific location for later retrieval. If multiple materials are received and they are to be stored in multiple locations at the time, the WMS can specify the putaway sequence and route to minimize travel time.

3. Inventory Management

The WMS obtains information and manages the inventory levels at all the stores. In organisations where managing inventory levels is under the control of the warehouse, then the materials replenishment in terms of quality, quantity and timing is suggested according to specified rules. This material replenishment request is wired to the higher authority for approval, then to purchasing department or directly to suppliers through Electronic Data Interchange (EDI) or the internet.

4. Order Processing and Retrieving

Receiving and retrieving materials from stores are major and most valuable activities of WMS. Stock retrieval is the most labour intensive and usually the most expensive part of warehouse operations because it results to huge capital investments in personnel and, semi-automated and automated materials handling equipment.

Based on internal guidelines, WMS decomposes the received order into material groups that require different types of processing and picking based on location where inventory is stored. Materials with similar picking characteristics are grouped together. For instance, materials that require picking in small, split case quantities, and others that require picked in full-case or pallet-load quantities are grouped separately. The WMS organises the order splitting for efficient order picking and schedules the order flow through the various areas of the warehouse so that the complete materials are prepared for shipping.

5. Shipment Preparations

Once materials orders are successfully splitted and picked in the warehouse, the size of this order subsets is selected based on shipment considerations. Customers located within the same areas get their orders picked and processed for shipping almost at the same time.

WMS aids managing warehouse operations in the form of order processing; labour planning, inventory management, space utilization and picker processing. All the subsystems- MWS, OMS and TMS share information with one another to achieve integrated performance.

3.2.3 Transport Management System (TMS)

TMS coordinates materials shipment and freight bill payment. Ascertaining freight charges for shipments can be complex and complicated because of the many exceptions that can be placed on the freight rates. A computer-based TMS helps in solving the complicated problems of freight billing and auditing which always involves a large number of routes and rate combinations.

SELF-ASSESSMENT EXERCISE 2

Identify and describe various subsystems of supplies' management information system.

3.3 Applications of Information System

Information system assists supply chain planning and operations in a number of ways as stated below:

1. **Retail System:** companies with extensive retail options had developed integrated information systems to speed up customer services and increase the efficiency of inventory management. The high volume daily routine sales and inventory turnover that retailers experience had forced them to imbibe the use of computers and the latest order-handling technology to realize their goals.
2. **Vendor-Managed Inventory:** information technology permits suppliers to manage the inventory level of their clients on continuous replenishment. With electronic data interchange and point-of-sale data, vendors can be aware of retailer's sales and inventory levels. Some retailers allow vendor inventory, deciding what and when to buy and ship. The growing information technology is allowing emerging ways for managing the materials flow of goods in a logistics system.
   For the method to be successful, retailers must furnish the vendors with required information about product sales, current inventory levels, dates for receipts of goods and dead stock and returns. This Information flows to the vendor through an EDI or other electronic network.

3. **E-Commerce:** e-commerce uses the internet to facilitate business transactions. It is a modern way of organising purchasing, delivering and warehousing materials through websites.
4. **Decision Support System:** supplies management information system makes available quality information to management for better managerial decisions. A well-designed supplies management information system can obtain and analyse logistics related data as well as organise and present it to support the user in making important decisions.

SELF-ASSESSMENT EXERCISE 3

Give practical examples of how information system has helped in facilitating supply chain management.

4.0 CONCLUSION

The materials manager needs direct access to a firm's information system in order to properly coordinate materials flow within and outside the organisation. The types of information often needed by the materials manager include demand forecast, production schedules, profiles of suppliers and suppliers characteristics, materials prices, inventory levels, transportation routing, and various other financial and marketing facts. With the proliferation of computerised information systems, including electronic databases, this facet of materials management will become more significant in the future.

5.0 SUMMARY

The initial unit of this course discussed the meaning of suppliers' management information system. The scope of suppliers' management information system in terms of its various subsystems was discussed. Practical applications of suppliers' management system were also identified and discussed. In the next study unit, you will be taken through discussion on suppliers quality management.

6.0 TUTOR-MARKED ASSIGNMENT

i. Highlight the relevance of supplies management information system to material management.
ii. With the aid of diagram discuss the supplies management information system.
iii. Discuss the characteristics of useful information.
iv. Give account of the different subsystems of supplies management information system.

7.0 REFERENCES/ FUTHER READING

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UNIT 5 SUPPLIERS QUALITY MANAGEMENT

CONTENTS

1.0 INTRODUCTION

One of the primary roles of management should be to make its daily operations as effective as possible. Being 'effective' in production enhances daily operation and maintains the organisation as a viable enterprise. Quality has become an important factor in effectiveness. Thus, quality management becomes customer oriented i.e. customers are now the centre or source of standard for defining quality.

Effective quality management helps build differentiation, low cost and response strategies. For instance, producing quality product and delivering quality service have differentiated these companies from their competition. Improvement in quality helps increase market share and reduce cost both of which can increase profitability. Increase in market share often occurs from lower selling prices as a result of economies of scale and improve their reputation for quality products. Similarly, improved quality allows cost to drop as firms increase productivity and lower rework, scrap and warranty cost (Heizer and Pender, 1999).

The quality management philosophy led to the introduction of a concept called Total Quality Management (TQM). Total quality management is based on the assumption that continuous quality improvement in materials acquisition lowers materials defects, product failure and less wastage and reduces total cost of operation. This unit defines quality

and explains the dimension of quality. Thereafter the concept of total quality management as it relates to materials management will be discussed.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning and importance of Suppliers quality Management
- describe the roles of buyers in managing suppliers' quality
- identify the dimensions of quality management
- highlight the guidelines for quality improvement
- describe different types of TQM techniques you are familiar with.

3.0 MAIN CONTENT

3.1.0 Nature of Suppliers Quality Management

3.1.1 Defining Quality Management

Quality is a relative term with various definitions by different people. This is not surprising for a concept that is the determinant of organisation success and survival. For our present purposes, quality refers to the ability of materials to satisfy the departmental needs of consumer based on inherent features and characteristics.

Quality can also be described as a measure of the degree at which materials satisfy the expectation of users with respect to certain tangible and intangible characteristics inherent to the design of the product and its performance under normal use.

In general terms, quality refers to production of defect free, totally reliable goods or services that do what they are intended to do. It is believed that quality may exist in the eyes of the beholder, but the materials manager should have materials to meet what the beholder (the consumer) expects. These definitions recognise that quality is an inherent value of product and service which has the ability to satisfy the clearly stated and implied needs of users.

3.1.2 Managing Supplier Quality- The Role of the Buyer

Buyers play an important role in managing supplier quality. According to Monezka, Trent and Handfield (2001) buyers can be actively involved in managing supplier's quality through the following means:

1. Clearly Communicate Specifications and Expectations

Specifications are characteristics that are detailed by performance, drawings, commercial standards, or a combination of these. Providing clear, meaningful and mutually acceptable specifications that define requirements or expectations is an important part of supplier quality management. The buyer must carefully and clearly define the level of quality required.

2. Be a Good Customer

Supplier's quality performance requires that a buyer be a good customer by understanding the supplier's needs and expectations. Some of the expectations that suppliers have of buyers within a supply chain relationship include:

- minimal product design changes once production begins
- visibility to future purchase volume requirements to assist in planning
- early visibility to future new-product requirements
- adequate production lead time
- ethical treatment
- payment in reasonable time
- clear understanding of physical product specifications and delivery requirements.

3. Provide Feedback

One of the primary responsibilities of buyers is to provide supplier performance feedback. It is difficult to provide the highest levels of quality when a supplier is unaware of a buyer's current perception of supplier performance. The supplier feedback is expected to be timely, specific and accurate in order to be effective.

3.1.3 Factors that Influence Buying Firm Commitment towards Managing Supplier Quality

It must be noted that there are some factors and constraints that influence how much attention a buying firm commits to managing supplier quality performance. Some of them are:

i. the ability of a supplier to affect a buying firm's total quality
ii. the resources available to support supplier quality management and improvement
iii. the ability of a buying firm to practice world class quality practices

iv. a supplier's willingness to work jointly with a buying firm to improve quality.
v. a supplier's current quality levels
vi. a buying firm's ability to collect and analyze quality-related data
vii. a buyer's ability to quantify quality expectations and requirements.

SELF-ASSESSMENT EXERCISE 1

In what ways can buying firms affect supplier's quality management?

3.2.1 Need for Quality Management

The significant impact of quality product and service on organisation is examined in these four basic areas.

1. **Competition**: producing quality goods and services is the only way a company can be customer-driven in today's stiff competition. The Japanese captures a greater share of the world market through its new waves of quality products especially the automobiles and electronic appliances.

2. **Productivity**: there is a strong relationship between quality operation and productivity as proved by the Japanese. As a result of this, the industrial world now knows that quality should be the watch word of their operations because of the following potential benefits. Firstly, if the defect rates are reduced, there will be a reduction in product returns. Secondly, if the defect rates are decreased, fewer resources (such as personnel, materials, time, etc.) will be devoted to defect correction. Lastly, setting quality control at all levels reduces the need for quality inspectors.

3. **Costs**: cost of production increases, most times as a result of wastage due to defect rate. Error-free products save organisations from customers' high return rate, high warranty cost, high compensation, expensive law suits. These actions have implications on the total costs.

4. **Profit**: business operation is more profitable if the organisation is customer-driven by providing error free goods and services, by avoiding costly mistakes through inbuilt quality control in all operations. This leads to cost reduction, lower selling prices and increased sales and profit.

3.4 Dimensions of Product Quality

According to Garvin (1987), organisations having chosen appropriate strategies, quality can be used strategically to gain competitive advantage. He measures or evaluates product quality on the following dimensions:

1. **Performance** – this refers to the main operating characteristics of goods and services. For examples, cream and a house have the primary performances to provide beauty and shelter respectively.

2. **Special Features**– these are supplements to product's main characteristics. For examples airbags, electronic windows and alloy wheel for cars are secondary to the basic operating functions.

3. **Conformance**– conformance is the measurement of the extent to which the product's basic operating characteristics meet established performance standard. For example, if Peugeot Assembly of Nigeria (PAN) claims that a particular brand (406) of its products can travel from Kaduna to Lagos with a full tank of fuel. And if the car traveled down to Lagos and does not consume more than that, you then say the actual performance conforms to predetermined standard.

4. **Reliability**– this measures the degree of product working properly, consistently or performing adequately over a period of time.

5. **Durability** – this refers to the measurement of the product useful life or what benefits people derive from the product before malfunctioning, deteriorating to where replacement is a better option than repair or failure. Although repair and maintenance are not applicable to items that work to a particular time and fail without notice, e.g. electric bulbs, fuses, fan belt, etc.

6. **Serviceability**- this refers to the case of promptness, proficiency and speed of handling repairs. It also involves the availability of genuine serviceable parts. For example, most cars' major distributors in Nigeria (such as Elizade Motors, Dana Motors, Shittu Motors and Okocha Motors) have maintenance and service centres that handle repairs of their products (vehicles).

7. **Aesthetics-** this measures the appeal of product in terms of products' looks, smells, sounds feels and tastes. This dimension

is technical and sometimes difficult to evaluate because the issues depend on personal judgment and preference.

8. **Perceived Quality**- perceived quality means evaluation or subjective assessment of product quality by customers.

SELF-ASSESSMENT EXERCISE 2

Enumerate the dimensions of product quality.

3.3.1 Quality Improvement

Although, specific approaches to quality improvement depend on the situation at hand, certain guidelines can be of assistance (Dreyfuss, 1988).

1. Quality improvement must be a long term, continuous effort; must not be a fad. There is always room for improvement.
2. Quality improvement should be a priority of all employees, from top-downward. All employees must be committed to quality.
3. All the functional departments: production, information technology, manufacturing, marketing, finance, etc., must be integrated and coordinated to solve some pertinent quality problems.
4. Management should allow quality improvement initiative from many sources such as distributors, consumers, workers and suppliers.
5. Quality control programs should be built into the production system i.e. there should be quality criteria for each major step of the operation. This solves deviation problem immediately it is identified (than waiting to test the product at the finished stage).
6. A well formulated quality improvement is not only the answer. They must be properly implemented to achieve the stated objectives.

3.3.2 Deming's 14 Points or Implementing Quality Improvement

1. *Create constant purpose*: strive for the consistency of purpose in improvement of products and services to become competitive.
2. *New Philosophy*: in this current new economic age, western managers need to be awakening to the realities of demand for wiser use of all resources.
3. Quality should be built into the product from the designing stage to final production. Stop inspection to detect faulty product at the end of production.

4. Build long time relationships of loyalty and trust with one single supplier instead of awarding businesses based on lowest price.
5. Continuously improve production system to improve product and service quality for greater productivity.
6. *Continuous training*: there should be constant training of people to have a clear understanding of what to do and how to do their jobs.
7. *Emphasize effective leadership*: institute leadership that will provide individualized help for people to do their jobs better.
8. Drive out fear in employees so that they put in their best performance for the company. No one can work effectively if he's fearful. Job insecurity is a serious challenge for implementing total quality management in organisation.
9. *Encourage group work and teamwork:* remove communication barriers between functional units or departments. Workers in different departments (such as marketing, finance, research and development, production and human resource) should work together to satisfy customers.
10. Avoid slogans, targets and exhortations for the workforce. Instead learn and institute ways for improvement.
11. Get rid of work standards (quotas) for production. Instead support and help workers for continuous improvement.
12. Eliminate barriers that rob people of pride of workmanship.
13. Vigorous program of education and self-improvement is essential for people to acquire greater knowledge.
14. Everybody in the organisation should be part of the transformation

3.3.3 Total Quality Management Techniques

The implementation of total quality management (TQM) involves the use of different approaches. Some of the approaches include the following:

1. **Quality Improvement Team**: this is also known as quality circle, which consists of small groups of cross-functional employees who meet regularly to solve specific problems in their work areas with stated targets for improvement. The team meets once in a week to tackle the problems identified by either management or workers themselves, and compare the output with the specific improvement standard. A quality focus team is highly productive in terms of cost reduction and improvement of quality.

2. **Continuous Improvement**: continuous improvement concept requires unending improvement of all activities involving acquisition of raw materials, transformation of inputs into outputs

and delivery of goods and services. The continuous improvement covers people, methods, equipment, materials, suppliers and distributors to make improvements in every part of the organisation in relation to products and services.
For TQM system to be successful, the entire employees must initiate change in their jobs by improving things a little at a time. The belief is that no improvement is too small to implement, and an aggregate of several little improvements lead to innovation.

3. **Just-In-Time (JIT)**: Just-In-Time is a philosophy of continuous improvement designed to produce or deliver goods just as they are needed. Successfully implemented JIT system coordinates production in such a way that inventory is acquired just in time for use. There are two ways in which JIT is related to quality:
   i. JIT reduces the cost of quality through reduction in inventory at hand at all times
   ii. JIT enhances quality by reducing lead time and potential sources of error.

4. **Outsourcing**: outsourcing is a fastest growing trend in today's modern business. Outsourcing means engaging an outside hand or organisation to perform a task that is normally carried out in the organisation. That is, contracting out a company's in-house operation to an outsider who will do better than insiders. This strategy is popular among multinational companies such as Shell petroleum and banks in Nigeria.

5. **Statistical Process Control:** statistical process control is a statistical technique using periodic random samples taken during actual production to determine whether acceptable quality levels are being met or production should be stopped for remedial action (Bartol et al, 2004). In other words, it is a TQM technique that examines production process to confirm whether the set quality standard is achieved or identify the poor output or product during the process and make the necessary adjustment. This process is called concurrent control.

6 **Empowerment**: empowerment refers to involving employees, suppliers and customers in all steps of production process.
Empowering employees who do the job, design the process and acquire materials reduce or eradicate mistakes, thus, produce the desired quality. Ways of empowering employees are (i) include employees in communication network (ii) operate open policies and encourage superiors-subordinates interaction (iii) enlarge employee's jobs and (iv) build committed, motivated and high morale employees.

Customer empowerment involves customers ordering for customized products with features designed to meet their specifications and life styles. This concept is called customisation and commonly used in automobile industry, fashion industry, construction industry, etc.

7 **Benchmarking**: benchmarking is another major TQM technique. Benchmarking involves identifying and studying other companies recognised as market leaders that are best in their operations and copy how they do it to improve your operation. The idea of benchmarking means studying a better organisation in a particular area, measuring how it is being done, compare yourself and make adjustments to perfect your operation. The key to effective benchmarking lies in the following steps:

i. identifying what to benchmark (i.e. operations that need improvement)
ii. incorporating a benchmark team
iii. determining benchmark companies i.e. competitors worthy of copying.
iv. collecting and analysing benchmarking information, i.e. comparing the internal operation of your company with that of benchmark companies
v. implementing formulated strategy to match or exceed the benchmark companies.

SELF-ASSESSMENT EXERCISE 3

Identify different TQM techniques that you are familiar with.

4.0 CONCLUSION

Every organisation that wants to be competitive and remain relevant in the marketplace takes the issue of quality management seriously. Both product and service quality remains the primary focus of management of every organisation. As earlier discussed, organisations employ various techniques in order to promote quality which will in turn enhance effectiveness and efficiency. Quality must be continuously improved upon if quality must be sustained and maintained. Buying firms must also strive to remain committed to improving its supplier's quality management.

5.0 SUMMARY

This particular section of the study material provides vivid explanation on the meaning of quality and why quality management is important. The material provides guidelines that must be followed for quality

improvement. The relevance of TQM was discussed and various techniques of TQM were identified and discussed.

6.0 TUTOR-MARKED ASSIGNMENT

i. TQM is found to be very essential to organisations from four different perspectives. Discuss.
ii. Define quality and quality management.
iii. Of what relevance is quality management to the success of suppliers' organisation?
iv. Identify 14 points for implementation of quality improvement

7.0 REFERENCES/FUTHER READING

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MODULE 2

UNIT 1 HUMAN RESOURCE MANAGEMENT IN PURCHASING AND SUPPLY

CONTENTS

1.0 INTRODUCTION

Just like any other organisation and department, materials management section is expected to be manned by personnel who are competent and conversant with modern methods in materials management. The obvious importance of human resource towards accomplishment of organisation goals especially in the area of materials management places a serious task on management. In the search of the contributions or importance of human resources to make quality happen and to provide the organisation a competitive advantage, Peter and Waterman (1982) suggested that workers must be treated as the important asset for the purpose of productivity and financial reward that will accrue to the organisation. If the five basic functions of management are planning, organising, staffing, leading, and controlling, then human resource management (HRM) is concerned with the staffing function (Bartol et al, 2005). That is, Human Resource Management is a management function that recruits, selects, trains and develops people in the employment relationship.

People are the main resource in a customer driven organisation. The acquisition of other resources does not produce goods and services. It is the human resources in right number and quality that transform the other resources such as machine, money, information and materials to want satisfying goods and services. Materials, as part of the essential resources for productivity, must be manned by right persons and these persons must be adequately trained for effective and efficient delivery of their duties.

This section of the study material exposes the reader to the meaning of human resources management process, human resource planning and, training and development.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning of Human Resources Management Process
- identity different sources of recruitment
- explain the selection process
- distinguish between training and development
- explain why and how employees are appraised.

3.0 MAIN CONTENT

3.1 Human Resource Management in Purchasing and Supply

Human Resource Management process is an ongoing activity that is performed by Human Resource (HR) departments in most large organisations with help from other units' managers. All managers in the organisation are involved in recruiting, selecting, training and developing employees. The basic activities of HRM process include human resource planning, staffing (recruitment and selection), orientation, training and development, performance appraisal, and promotions, transfers, demotions, and separation. Attempt will be made to discuss some of these basic activities in human resource management.

SELF-ASSESSMENT EXERCISE 1

Identify the basic activities that are involved in human resources management process.

3.2 Staffing

3.2.1 Recruitment

Recruitment is a process of seeking and attracting job applicants that have the required education, skills and knowledge, to apply for jobs in an organisation. Recruitment creates a pool of applicants or candidates from which human resource manager can select to fill vacant positions.

Sources of Recruitment

After a thorough knowledge of the job content and specifications, recruiters should be able to identify sources of viable job applicants. The pool of viable job applicants (people with relevant skills and knowledge) to fill open positions is referred to as labour market. Since labour market is dynamic, human resource specialists of organisations must constantly study and monitor the labour market to know where, when and what type of strategies and tactics to use to attract job applicants in a competitive industry.

Sources of recruitment open to human resource specialists depend on the availability of right people, the number of people needed and the nature of the position to be filled. Sources of recruitment available to fill a position are categorised into two broad areas, namely:

a) internal sources
b) external sources

Internal Recruitment: internal source of recruitment is the filling of vacancies or positions from existing employees in an organisation. Using internal recruitment policy, management appoints or promotes individual who is already working for the organisation and qualified for the open position. Where a manager decides to fill vacancies internally, the personal records of the employees such as education, skills, experience and commitment need to be evaluated. The internal source of recruitment makes use of the following media to inform the workers: notice boards, e-mail, bulletin, newspaper and internal memo.

External Recruitment: external recruitment is a method that fills job vacancies from sources outside the organisation. Some organisations especially the small ones prefer internal recruitment except the position that cannot be filled by existing employees. Most big enterprises operate an open-door policy that gives equal opportunity to sources inside and outside the organisation. Some companies make use of internal source of recruitment for key positions and fill the entry-level positions using external sources of recruitment.

3.2.2 Selection

Having got enough suitable applicants to fill vacant positions, the next stage is the selection process. *Selection* is the process of choosing the most appropriate applicants from the pool of applicants. Ivancevich (1994) defines selection "as the process by which an organisation chooses from a list of applicants the person or persons who best meet the criteria for the position available, considering current environmental conditions". The selection process helps human resource specialist to thoroughly evaluate applicants' characteristics and select the one(s) who can effectively and efficiently contribute to the attainment of organisation goals.

A Selection Process

The selection process consists of a series of logical procedure through which job applicants are examined in order to be selected. At each stage, the number of applicants is reduced until finally, the needed one(s) are hired.

1. **Application Blank**: completing application form of companies either electronically or in hard copy is required for prospective applicants seeking employment. Application form and curriculum vitae provide historical information about applicants such as, name, sex, educational background, work experience, state of origin, professional qualification, and the like. The application form provides information for interview and final selection. A detailed analysis of the information obtained can be used to determine the applicant's skills, abilities and subsequent performance on the job.

2. **Employment Tests**: this is commonly used to measure and identify the applicant with the greatest potential required to perform the job. A test is a sample of a person's behaviour. Employment test measures the applicant's job skills and ability to learn on the job. Test is another standardised means of screening and obtaining information about the applicant. The major advantages of employment test are: (1) it is highly objective and less biased than other forms of screening, (2) it improves accuracy in selection process and, (3) it provides information about the applicants' needs which is useful for counseling, training and development.

3. **Employment Interviews:** interviews are the most popular and commonly used screening device. Interview involves face to face interaction between the interviewers and interviewee with the

intention of gathering information about the interviewee's skills, interests and abilities. During the interview, interviewee is allowed to ask questions about the job and the organisation. The nature and number of interviews depend on individual organisation. Usually, there is more than one interview i.e. a successful candidate at first interview is invited for a follow-up interview. The final interview is often conducted with the Managing Director (MD) or she/her representative.

4. **Supervisor's Approval**: most employment interviews are conducted by human resource specialists with representatives (supervisor) from the department where vacancy is declared. This is necessary because the supervisor is most familiar with job conditions, the kind of skills and abilities required. Therefore, the approval of the supervisor of the candidate's application gives him or her opportunity to proceed to the next stage of selection process.

5. **Reference Checks**: this is designed to obtain additional information and to ascertain the truthfulness of the information with respect to the applicant's work performance, skills, education, and professional status previously supplied. Reference check is more of ensuring the truthfulness or confirming the information provided in the application blank by applicant(s).

6. **Physical Examination**: most corporate organisations ask candidates to take medical examinations either before or immediately after offer of employment. The aim of this is to determine the physical fitness and employees' health status and to know if there are any medical limitations the company should take into account.

7. **Offer of Employment:** here, the final selection is done and qualified applicant(s) are given letter of employment. All applicants who were issued letter of employment have a time limit to accept or reject the offer. If accepted, on resumption, employee(s) are taken through orientation/induction programme. Applicants who are not employed should also be communicated; this helps to promote the public image and reputation of the company.

SELF-ASSESSMENT EXERCISE 2

Identify and explain series of logical procedures that are involved in the selection of applicants into an organisation.

3.3 Training and Development

Training is the process of developing employees' skills and learning new concepts, rules or attitudes in order to increase effectiveness on a particular job. Ubeku (1975) in his contribution, defines management training as the process of developing managers' knowledge, skills and attitude through instruction, demonstration, practice, and planned experience to meet the present and future needs of the business. In other words, training refers to teaching employees required skills and knowledge to perform the assigned tasks effectively and efficiently.

Development refers to the process of teaching managers and professional employees the knowledge, skills needed for present and future task accomplishment. Anao, (1993) defines management training and development as "management development whose major concern is to ensure the continuing availability of component and highly motivated managers that possess the required positive and innovative outlook for a successful prosecution of organisation's mission against the background of the challenges, uncertainties, hostilities and threats posed by the environment".

In summary, training and development involve the systematic and continuous development of skills, learning concepts, attitudes and knowledge needed by employees to perform effectively and efficiently at work.

3.3.1 Training and Development Methods

Few among the most commonly used training and development methods by management are:

1. **On-the-Job Training**: this takes place as employees perform their regular jobs during working hours. The greatest disadvantage of this method is that mistake committed while learning can be very costly.

2. **Off-the-Job Training**: this occurs when trainees or employees have to seek for more knowledge or widen their job experiences outside their workplace. Off-the-job training techniques include seminar, films and television conferences, case studies etc.

3. **Apprenticeship**: apprenticeship is a common means of learning trades. It is a formal assignment to serve in an understudy capacity to a skilled worker until a certain skill or trade is learnt.

4. **Vestibule Training**: this is a form of off-the-job training where the trainees use equipment or machines and procedures similar to those he would use in on-the-job training but the equipment is set up in a separate area from the work place. The emphasis is on safely, learning, and feedback rather than productivity.

5. **Simulation**: simulation is advance training program mainly designed for executive officers. It involves carefully developed exercises, modeled on life practicable situations, in which trainees participate and receive feedback. It could be inform of paper simulation (such as in-basket exercises) and computer based business 'games' to teach management.

6. **Case Studies**: these comprise the discussion and proffering practical solutions to real-life or hypothetical cases to demonstrate the reality in the business world.

7. **Business Games**: this method allows participants to be trained in handling situation or event that involves competition between two equally strong opposing groups. The aim of the method is to enable managers to appreciate the fact that today's modern business is competitive and a business thrives better depending on the tactical capability of its managers in developing and implementing strategic decisions.

SELF-ASSESSMENT EXERCISE 3

Identify and discuss various methods of training and development

4.0 CONCLUSION

Human resource management is sequential in its process. It begins with human resource planning. Human resource (manpower) planning is the process that identifies the right quality and the right number of people to fill vacant positions. It is the forecasting of future human resource needs and planning appropriate programs to provide and manage these needs. Manpower planning involves four main activities:

1) to collect information on current employees such as level of education, age, sex, skill, ability and commitment.
2) to forecast demand for labour in line with the requirements of the long and short term plans.
3) forecast internal and external supply of labour.
4) plan programmes to deal with shortages or surpluses of human resource.

Human resource planning has the following benefits:

1) it establishes a framework where personnel decisions such as recruitment and selection, orientation, training and compensation are taken
2) it forecasts the organisation's human resource needs in the light of organisation's objectives
3) effective manpower planning solves the problem of unnecessary labour shortage and surplus
4) the success of organisation's expansion schemes depends on effective manpower planning by ensuring a steady supply of experienced and qualified employees
5) it helps in managing labour turnover and morale challenges
6) it provides the basis for training and development of employees to acquire the right skills and abilities.

However, other HRM activities as earlier discussed include staffing (recruitment and selection), orientation, training and development, performance appraisal, and promotions, transfers, demotions, and separation.

5.0 SUMMARY

This second module of the course has exposed you to human resource management process. Each stage of the process was discussed. For example, recruitment and selection were discussed. The need for training and development as well as performance appraisal was also emphasised in the course of the discussion.

In the next study unit, you will be taken through discussion on warehousing management.

6.0 TUTOR-MARKED ASSIGNMENT

i. What are the procedures involved in recruiting and selecting competent materials manager in a multinational organisation?
ii. Define recruitment and identify different sources of recruitment.
iii. Explain the selection process.
iv. Identify and discuss the types of training and development

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UNIT 2 MATERIALS FORECASTING

CONTENTS

1.0 INTRODUCTION

Forecasting is one basic area of materials management that must not be underrated because business operations are dynamic and full of uncertainties. Managers make decisions to predict what the future holds for their products. They buy materials, design products, employ personnel and produce goods and service to sell to both existing and potential customers. Sales of firms' products depend on demand. The demand for a goods or services is a function of customer requirements and needs and it fluctuates. The organisation has to plan its operations along the dynamism in customer demands. The estimate of market demand of a product or service is based on past sales record and current business trend. Materials managers are also trying to make better estimates of some major materials in anticipation for future in the face of uncertainty. Management would not like to have excess inventory or leftover of finished goods at the end of a lucrative season since it could lead to selling out stock at a loss nor would it like potential drop in revenue from sales due to shortfalls in stock. There is need to make

good estimates and prediction of future in order to provide required materials at the right prices and right place to produce goods and services that meet customer demands and organisation's profits target. Ability to make good estimates is the main purpose of forecasting.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define forecasting and types of forecasting
- explain the reason for carrying inventory
- discuss the various inventory management models
- discuss the concept of Just-In- Time Philosophy.

3.0 MAIN CONTENT

3.1 Nature of Forecasting

3.1.1 Definition of Forecasting

Forecasting can be defined as the process of accurately predicting future sales or events by examining historical data or past experiences etc. and projecting them into the future by using qualitative and quantitative means. It may involve using subjective or intuitive prediction or managers' good judgment or past and present data. After detailed analysis, management will be able to forecast the future requirements and decides the quantity and capacity of production and operations. Materials plan and purchasing are done based on forecast capacity of production process. Therefore materials forecasting can be described as anticipation of materials requirement for the planned production capacity. The method of forecasting materials must consider the previous sales and materials and anticipated demands of the organisations to give accurate materials required for proposed period. It is therefore necessary to mention that forecasting not only plans the capacity of production and sales but also is necessary to plan material requirements, production schedule, manpower requirements, etc.

3.1.2 Reasons for Materials Forecasting

Forecasting is central to the planning process which is a perquisite for materials management. Material planning is greatly required if the materials manager wishes to keep operations running smoothly, to adequately prepare for and meet future market conditions, and to minimise potential problems that can occur in materials acquisition.

Also, materials forecasting is required if management want to predict the future concerning material availability with some degree of accuracy. Forecasting can render near accurate information of the future, hence provides useful information for material planning. Some of the other reasons why competitive organisations engage in materials forecasting are listed below:

1. to produce quality product
2. to reduce production cost and unit price
3. to take decisions on production capacity (volume)
4. to Meet the needs of customer, hence, increasing customer satisfaction
5. to reduce the problem of shortage or stock out of materials for production and finished good for customers
6. to schedules production process more efficiently
7. to enable the adoption of JIT philosophy in purchasing, transportation and production
8. to reduce material waste and product obsolescence costs
9. to foster buyer and seller relationship
10. it is a starting point for budgeting.

3.1.3 Types of Forecasting

A forecast is usually classified by the future period of time it intends to cover. This classification is given as follows:

Short-Term Forecast

This forecast has a time frame of three months to one year. It is used for materials planning, purchasing and supply, job assignment for short period operational logistics planning process. It is usually used at operational level for mostly daily and perishable materials, vegetables, eggs, food products and some of the materials are forecasted monthly or weekly. This is required to be done by all units to know the actual materials to be purchased and transported for short finite periods. There is always fluctuation and variability in demands and prices of these products.

Medium-Term forecast

Materials manager also carries forecast for duration spans, one year to three years. It is useful in planning for materials that go into operation within these periods and mostly suitable for seasonal goods such sweaters, rain coats and bouts, students' bags, shoes and clothing, etc. It addresses budgeting issues concerning materials and sales.

Benefits of Short-Term and Medium-Term Forecasting

(*i*) The fluctuation in demands and variability in prices of inventories are envisaged and necessary steps will be taken to purchase the materials to meet future requirements
(*ii*) It helps to manage investment of perishable materials
(*iii*) It ensures production for consumer product.

Long-Term forecasting

This forecasting usually covers more than three years and it is useful for long run planning and strategic issue concerning fundamental materials requirements of strategic projects. When management does sales forecasting for long period of time such as three years or more, it must be supported by material forecast for same period and this affects the strategic decisions of an organisation. It is useful in new product development, facility location and research and development, constructing big buildings and plants. It would mostly be done for product lines or division throughput capacity.

Benefits of Long-term Forecasting

(*i*) It provides the materials required for new product design and development
(*ii*) For economic, social and technology development of less industrial areas long-term planning and forecasting is necessary
(*iii*) To predict long-term financial requirements for materials acquisition and entire operations
(iv) Long-term sales and materials forecasting is a management tool used for development expansion, diversification and profit maximisation.

3.2 Characteristics of Sound Forecasts

Despite the distinction of forecasting methods, certain features are peculiar, namely:

1. short-term material forecasts are more accurate in terms of predict than long-term material forecast
2. forecasts for groups of materials tend to be more accurate than forecast for individual material because forecasting errors among items in group have a cancelling effect
3. forecasts are never perfect but a guide for managerial decisions; hence actual results usually differ from predetermined values

4. most quantitative forecasting techniques assume that the same underlying business environmental variables that existed in the past will repeat themselves in the future.

3.2.1 Components of a Good Forecast

A sound forecast should meet the following requirements:

1. the forecasting technique should be simple, comprehensive, easy to understand
2. forecast should be timely and current
3. forecast should be accurate and able to predict the future
4. forecast should be reliable; it should be able to provide same or similar results over time
5. forecast process should be documented for objectivity of evaluating forecasting outcomes
6. forecasting should be cost-effective. The gains or benefits should outweigh the costs.

3.2.2 Factors Affecting Accuracy of Forecast

1. **Quality of Data:** past sales and material data must be accurate, current, detailed, complete, error free, and relevant to the objective of forecast. The higher the quality and quantity of data used for forecasting materials and sales, the better the accuracy of forecast.

2. **High Technology Change:** the frequent changes of information technology for better quality improve the accuracy of sales and materials forecast, hence, leading to error free prediction. In highly automated companies, forecasting is easier and reliable because past sales and materials data required for forecasting are available electronically.

3. **Period of the Forecast:** the shorter the time of forecast, the more accurate it can predict future materials need of the organisations, while the longer the period, the less the accuracy of such forecast.

4. **Dynamism:** some of the assumptions of forecasting are stability and reliability of results over the planned period. This is not always achieved as unplanned or unforeseen changes could affect the accuracy, stability and reliability.

5. **Elasticity of Demand:** accuracy in prediction of demands and materials requirement of goods (food items, shelter items, etc.) that are elastically demanded is high than accuracy for demands

for inelastic goods such travelling abroad for summer or shopping.

3.2.3 Procedures of Sales and Materials Forecasting Process

To arrive at accurate, reliable and up-date forecasting, managers must consider the following steps among others:

1. clearly define the objective(s) of forecasting. This means what do want you to achieve; materials or sales forecast
2. determine and select the materials to be used in the forecast.
3. determine the time frame of forecast; whether short, medium and long-term forecasting?
4. select the forecasting techniques. Management should determine the method(s) of forecasting to be adopted. Is it qualitative or quantitative forecasting or combination of two methods? This depends on the nature of the materials or products. For instance, a new material or product may require qualitative forecasting because of lack of past records
5. gather, process and analyse data: analyst collect, process and analyse the required data to achieve the predetermined objective(s) of the forecast
6. make the forecast based on the analysis
7. validate the process and implement the results to meet the demands of production units and customers.

3.3 Methods of Forecasting

As earlier mentioned, forecasting is fundamental to sales, materials, production planning processes and future expansion of the business. There are different methods of predicting the materials requirement and demand of various products in the market. Management can use different methods or combination of two or more methods of forecasting to analyse the past records and current trends and predict future forecast**.** Basically, approaches available for managers, namely**, qualitative and quantitative.**

3.3.1 Qualitative Forecast Methods

Qualitative forecast methods involve the use of soft data such as decision maker's intuition, emotions, value system, personal experiences and good judgment of market and business trend to predict the future. Any of the approaches of qualitative can be used for forecasting. In practice, a combination of two with quantitative method (s) is usually most effective. A qualitative forecast may or may not consider previous events. A sound qualitative forecast can be supplemented with the

scientific and mathematical quantitative method of forecasting techniques. Modern organisations use computers and the relevant software such as Excel, Lindo, Tora, etc, of forecasting methods to generate results quickly and accurately to predict the future sales. Qualitative forecasting methods are mostly where little historical data and much personal experiences and managerial judgment are required. They use input from the sales force as the basis for forecast and suitable to forecast new region or building new plant and new product for a company.

3.3.2 Types of Qualitative Forecasting Methods

1. Delphi Method

This method usually involves the use of questionnaire to obtain the required information from a panel of experts; individuals who possess the knowledge and ability to contribute meaningfully to forecasting process. Individual responses are obtained and kept on anonymous which tends to encourage honest responses and reduce the possibility that one person's opinion will prevail. All the experts use their intuitions, emotions, value systems, personal experiences and good judgments to respond to an initial questionnaire relating to the area of investigation. A summary of their responses is then given to each expert who then revises his response in the light of other people's view. This process is repeated until an agreed consensus is reached. This method thus gives a narrow range of forecast of the future and involves few persons although knowledgeable in the forecast area.

2. Sales Force Composite

Company sales representatives serve as a good source of information required for forecasting because of direct contact with customers. They have first hand information on consumers' needs and wants and their opinions about company's products. Each sales representative estimates expected sales in his or her region. The figures or forecasts are checked to ensure that they are realistic and attainable. These forecasts are combined at the district and national levels to reach an overall forecast and the summation of the estimates are used to project production and materials requirements. The major disadvantages of using this method are: it is most difficult to predict customers' behaviours accurately. Also, sales representatives may make optimistic and pessimistic forecast when past sales performances are high and low respectively.

3. Jury of Executive Opinions (Panel Consensus)

This method is similar to the Delphi method. A panel of executive consists a group of higher and medium-level managers (i.e. marketing manager, operations manager, finance manager, research and development manager, information technology manager, etc.) to develop panel consensus forecast by sharing expertise information, judgments, opinions and assumptions and is particularly useful where an organisation has no or little comparable historical data especially when developing and launching new products. A facilitator is appointed to coordinate the process of arriving at a consensus. The method has the benefit of bringing together the rich opinions of various experienced managers. However, the major danger is that of the view of one person who has the high reputation dominating by force and persuasion to prevail over the view of others. It is commonly used as part of long-term planning for expansion, facility location and diversification.

4. Customers Surveys

Since market constitutes both existing and potential customers, it seems necessary to solicit information directly from customers to know what they want to buy in the nearest future, how they want them and how much. The survey of customers is done from different areas of the target people to know their purchasing plans. The obvious advantages of customer survey are (i) buyers purchasing habits which change regularly are studied; (ii) the customers may provide information about alternative products that might not be available elsewhere. However, customers' survey is time-consuming and very expensive. There are two types of customers' surveys, namely:

(i) **Direct Survey Method:** in direct survey method, the customers are directly contacted to solicit for information on purchase behaviour regarding future expectations

(ii) **Indirect Survey Method*:*** using this method, customers' purchasing habits and behaviours will be obtained indirectly from the market, retail and wholesale shops, sales representatives and agent.

3.3.3 Quantitative Forecasting Methods

Quantitative forecast methods make use of past data or rely on historical data by studying the pattern of customers purchase habits and demands as they changes with respect to time to project future trend using a quantitative technique. They use refined and specific data regarding variables to develop a relationship that can predict forecast. Quantitative

forecast can be categorised into two, namely; casual model and trend projections using time series model. Trend projection can be divided into smoothing methods (moving average forecast and exponential smoothing) and time series decomposition. There is naive method which may not always yield accurate forecast.

3.3.4 Types of Quantitative Forecasting Methods

1. Naïve Forecasting Methods

This is the simplest, oldest and widely used method of forecasting. The method makes use of a single previous value of a time series as the forecast. The model assumes that immediate previous demand is a good determinant of most recent period. The immediate previous demand and material consumed will be equal to the demand in most recent period. Thus, if 1 million crates of Pos drink were sold this year the next year sales will be million crates of Pos drink. Naïve approach is most used by small organisations. It is cost effective, quick and easy to prepare and easily understood. The argument against this method is its ability to provide highly accurate and reliable forecasts.

2. Moving Averages Forecasting Method

This method of forecasting assumes that forecast for a particular period mostly depends on some near past sales or materials consumed. It uses an average of the most recent period's sales and material requirements. The orientation is that the old data mostly do not reflect and predict the proper forecast for n+1. This method helps to smooth out the peaks and valleys in the data. For instance, a two-month moving average uses the average of the last two months. When a new month of actual data becomes available, it replaces the oldest time month data. Moving averages are useful in a relatively stable industry and or if market demands for products will stay fairly steady over time. The advantages of the method are: it is easy to calculate and understand but unresponsive to change and cannot be used to forecast a relatively new product. Also, if actual sales variations are large, average becomes unreliable for forecast.

The moving average forecast can be calculated using the following

$$\text{Moving average} = \frac{\sum \text{demand in previous } \mathbf{n} \text{ periods}}{\mathbf{n}}$$

where **n** is the number of periods in the moving average

Example 1

You are given the information about the sales of shoes for 12 months as shown in the table below; compute a two- month moving average forecast.

Month	**Actual Sales**	**Two-month Moving Average**
January	30	
February	34	
March	33	(30+34)/2 = 32
April	40	(34+33)/2 =33.5
May	38	(33+40)/2 = 36.5
June	37	(40+38)/2 = 39
July	41	(38+37)/2 = 37.5
August	46	(37+41)/2 = 39
September	50	(41+46)/2 =43.5
October	25	(46+50)/2 = 48
November	28	(50 +25)/2 = 27.5
December	20	(25+28)/2 = 26.5

Solution: We used the two-month moving average to make forecast. That is, to forecast for March = January (actual sales) + Feb (actual sales)/2 = (30+34)/2 = 32 (see the third column of the table above).

Example 2

Using the above example, compute a three-month moving average forecast for sales of shoes for the 12 months in the table above.

Solution

Using the moving average formula = = $\frac{\sum \text{demand in previous } \mathbf{n} \text{ periods}}{\mathbf{n}}$

where **n** is the number of periods in the moving average

The forecast for the four month is the average of the sales in the first, second and third months i.e. (30+34+33)/3= 32.3. Similarly, the forecast for May is the average of the actual sales of February, March and April so on through the months.

3. Weighted Moving Average Forecast Method

In weighted moving average method, all the previous relevant data (actual sales) are used for forecast. This method tries to partially overcome the challenges of ordinary moving average. In using this method, different weights are assigned to each period but emphasis is on

recent observations. For examples, the most recent observation or data can be assigned .40, the next most recent data can be assigned .30 and subsequent data may be assigned .15, .10 and .50 respectively. The sum of the all weights must be equal = 1. Therefore, weighted moving average = $\frac{\sum \text{(weight for given period n) (demand for period n)}}{\sum \text{(weights)}}$

Example 3

Calculate a four- month weighted moving average for the following sales data of Motorcycle for six months.

Month	Weight	Sales
January	-	4,000
February	-	5,000
March	-	6.000
April	.18	3,000
May	.20	2,700
June	.27	5,200
July	.35	3,500

Solution

Weighted Moving Average

$$= \frac{\sum \text{(weight for given period n) (demand for period n)}}{\sum \text{(weights)}}$$

= .18(3000) + .20(2700) + .27(5,200) +.35(3500) = 540 + 540 + 1404 + 1225 = 3709

Example 4

Johnny Rite Departmental Store wants to forecast sales by weighting the previous four (4) years as follows; 4, 3, 2 and 1 for the more recent year and subsequent years respectively. Find the four-year weighted moving average for other years using the data below:

Year	**Actual Sales**	**Four Year Weighted Average**
1	30	
2	34	
3	36	
4	40	
5	44	[(4×40)+(3×36)+(2×34)+(1×30)]/10
6	42	[(4×44)+(3×40)+(2×36)+(1×34)]/10
7	38	[(4×42)+(3×44)+(2×40)+(1×36)]/10
8	28	[(4×38)+(3×42)+(2×44)+(1×40)]/10

Solution

The forecast can be calculated by multiplying each year by the corresponding weight and dividing by total weights of 4 + 3 + 2 + 1 =10 (see the table above).

1. Exponential Smoothing

Exponential smoothing is a better form of weighted moving average. In moving average, there is a challenge of what moving periods to use and each item having equal weight is not justifiable. Also, assigning weight to data based on currency (i.e. more recent events having higher weights than older ones because they may be less relevant in predicting the future). Exponential smoothing estimates future sales using current forecast as the weighted average of the last forecast and the current actual sales. Although the method is a sophisticated weighted moving average, it is easy to use and understand, and it overcomes the limitations of moving averages

Mathematically, exponential smoothing is expressed as

New forecast= previous forecast + α (actual-+ previous forecast).

$$F_{t+1} = \alpha O_t + (1- \alpha) F_t$$
$$F_{t+1} = {}_{+} F_t + \alpha(O_t - F_t)$$

Where Ft_{+1} = New forecast

F_t = Old or previous forecast

α = Alpha factor or smoothing constant and takes value between 0 and 1

$O_{t\ =}$ Actual demand for the previous period

The alpha factor (α) is the percentage of the forecast affected by the most recent actual sales. For example, if α = 0.6 it means the most previous data had 60% effect on the new forecast and 40% will be affected by earliest sales data.

Example 6

Assuming the forecast for the most recent month was 200 units and actual sales was 250 units. Assume the smoothing constant is 0.3 then forecast for next period.

Solution

$F_{t+1} = {}_{+} F_t + \alpha (O_t - F_t)$

$= 200 + 0.4(250-200) = 200 + 0.4(50) = 220$

$= 220$ units

Example 7

Given the data below, use exponential smoothing to forecast for the month of February to July using alpha factor $\alpha = 0.2$.

Month	**Actual Demand**	**Forecast**
January	850	770
February	800	786
March	750	788.8
April	700	781.04
May	770	778.83
June	670	757.06
July	600	736.65

Solution

Exponential smoothing Formula: $F_{t+1} = F_1 + \alpha (O_t - F_t)$. To get started, we assume January forecast to be 770 units

Forecast **(**Feb) = January forecast + α (January demand – January forecast)

F Feb = 770 + 0.2(850 - 770)

= 770 + 16 = 786

F March = February forecast + α (February demand – February forecast)

= 786 + 0.2(800 – 786)

= 786 + 2.8

= 788.8

F April = March forecast + α (March demand – March forecast)

= 788.8 + 0.2(750 – 788.8)

= 788.8 + 0. 2(-38.8)

= 788.8 -7.76 = 781.04

F May = April forecast + α (April demand – April forecast

= 781.04 + 0.2 (770 – 781.04)

= 781.04 + 0.2(- 11.04) =

= 781.04 – 2.208= 778.83

F June = May forecast + α (May demand – May forecast)

= 778.83 + 0.2 (670 – 778.83)

= 778.83 + 0.2 (-108.83)

= 778.83 - 21.77

= 757.06

F July = June forecast + α (June demand – June forecast)
= 757.06 + 0.2 (650 – 757.06)
= 757.06 +0.2 (-107.06)
= 757.06 - 21.41
= 735.65

3.3.5 Forecast Errors

This section addresses some of the errors made in forecasting that can affect the overall accuracy and reliability of the forecasting method. These errors can be corrected by finding differences between the original data and the forecast figure. The formula is as follows:

$$E_{t+1} = O_{t+1} - F_{t+1}$$

- Where E_{t+1} is the error
- O_{t+1} is the original data
- F_{t+1} is the forecast data.

There are different methods of accessing the accuracy of the forecast over the entire period, namely:

1. **Mean Absolute Deviation (MAD):** This entails finding the average of the absolute value of each error
2. **Mean Squared Error (MSE):** This involves finding the average of the square of each error
3. **Mean Absolute Percentage Error (MAPE):** To find MAPE, divide each absolute error by its corresponding original value, then multiply by 100 and average the result. That is;

Formulas

MAD = $(\sum |E|) / T$ where T is the total number of forecast errors
MSE = $(\sum |E|^2)/ T$
MAPE = $\sum [|E| \times 100]$ where O_t is the original data that corresponds to error E_t
$\frac{}{O_t}$

Example 1

Compute the forecast error for the two-month using the Mean Absolute Deviation (MAD) and the Mean Squared Error (MSE). Comment on your results.

TWO MONTHLY MOVING AVERAGES

MONTHS	SALES	M/AVE	E	|E|	$\|E\|^2$
Jan	21	-		-	-
Feb	25	-	-		-
Mar	24	23	1	1	1
April	31	24.5	6.5	6.5	42.25
May	29	27.5	1.5	1.5	2.25
June	28	30	-2	2	4
July	32	28.5	3.5	3.5	12.25
Aug	37	30	7	7	49
Sept	41	34.5	0.5	0.5	42.25
Oct	16	39	-23	23	52.9
Nov	19	28.5	-9.5	9.5	90.25
Dec	11	17.5	-6.5	6.5	42.25
∑				67	814.5

Therefore, for two monthly forecast

Mean Absolute Deviation = 67.0/10 = 6.7
Mean Squared Error for two month forecast = 814.5/10 = 81.45

4.0 CONCLUSION

The discussion above has shown that materials and demand forecasting is fundamental activity of materials management as well as marketing department. Therefore material forecasting is required to predict materials requirement for the planned production capacity. The method(s) of forecasting materials must consider the previous sales and materials and anticipated demands of the organisation to give accurate materials required for the proposed period. Forecasting can render near accurate information of the future, hence provides useful information for materials planning.

5.0 SUMMARY

This unit of the course exposes you to the basis of material and demand forecasting methods. Also, reasons and importance of forecasting were discussed. The forecasting has been explained along with various materials management activities such as purchasing, transportation, inventory, and warehouse. In the next study unit, we shall examine inventory management and reasons why organisations carry inventory despite that it ties up invested funds.

6.0 TUTOR-MARKED ASSIGNMENT

i. What are the reasons for organisations involvement in materials forecasting?
ii. Discuss the types of qualitative forecasting methods.
iii. 'Quantitative forecast produces reliable and scientific results than qualitative forecast' discuss.
iv. Given the data below, find the two-year weighted moving average for other years.

Year	Actual Sales
1	40
2	44
3	46
4	50
5	54
6	52
7	48
8	38

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UNIT 3 INVENTORY MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Many organisations have been under pressure to effectively and efficiently handle their supply chain, minimise large inventories, and cut carrying costs on inventory. In the past, the aim of inventory management was not to run out of materials (stock out). This caused manufacturers to stockpile large amounts of raw materials, work in process, and finished goods. The extra materials would be to protect them from going out of stock for smooth production and meeting the demands of customers. Inventories tie up money and the success of the organisation if it is negatively managed. As having too much inventory is problematic to the organisations likewise having too little inventory is a serious issue. Having extra inventory results to unnecessary costs related to issues of storage, and obsolescence, theft, damages while too little inventory causes stock outs or disrupted production. Therefore the major reason for managing inventory is to maximise purchasing process, materials supply, production process, customer service, minimising inventory investment, maximising efficiency and effectiveness of factory operations and thus increase profit.

Inventory management can help the organisation to reduce the total cost drastically. There are two classifications of inventory, namely direct inventory and indirect inventory. Direct inventory refers to the raw materials or the goods that are on the verge of production whereas

indirect inventories consist of the materials that are required to run the production process. Other than the items, inventory consists of the machines that are under repair. Inventory is part of doing business and its importance must be recognised at all stages of manufacturing, marketing, financing, etc. Proper control of inventory ensures that effective management of stock is maintained.

Research shows that inventory control model was propounded in 1915 with the development of the Economic Lot Size Equation but later expanded by Raymond in the early 1930s. Though only little work was done on inventory model until 1950 when Moses Abramvitz published his research findings on inventories and economic cycles.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the concept of Inventory management
- explain the reason for carrying inventory
- discuss the objectives of inventory management
- discuss types of costs associated with inventory.

3.0 MAIN CONTENT

3.1 The Nature of Inventory Management

3.1.1 Meaning of Inventory Management

Inventory is stock of resources that are set aside or which a company has on hand for future use. It consists of things, especially items of materials, property, assets or other resources. Inventory is a record of a business' current assets including property, raw materials, and the value of work-in-progress and finished goods not sold. They are those stocks or materials used to support production process (raw materials and semi-finished goods), supporting activities (maintenance, repair, and operating supplies), and customer service (finished goods and spare parts). Inventory is an idle resource of any kind held for a time in a relatively unproductive state, which has some economic value but do not bring in any earning when static. It can also be said to be the material held in an idle or incomplete state awaiting its intended use, transformation or sale.

There are two important questions usually asked in inventory management namely; "when" and "how much". For instance, it is important to know when an order should be placed for any materials or how much is the required quantity. To answer these questions

effectively there are quantitative approaches in operations management that enhance efficient management of inventory.

3.1.2 Classification of Inventory

Inventory classification is essential to reveal the multipurpose roles played by inventories. The classifications below are according to their functions.

1. Pipeline Inventory

This inventory is used to stock the supply and distribution of pipelines materials linking an organisation to its processing outlets or suppliers and customers. Pipeline inventory starts at one point and ends at the other point of the entire material flow of the process.

2. Cycle Inventory

This stock arises because of management's decision to purchase, produce or sell with respect to lot size rather than individual units or continuously.

3. Safety Stock Inventory

It is defined as stock that exists as a result of uncertainties in demand or supply. Safety stock inventory caters for the time between the order placement and the delivery. Management holds inventory to overcome the uncertainties.

4. Anticipation or Certainty Inventory

This inventory is accumulated for a well-defined future need in anticipation of demand which is due to the uncertainties. They differ from safety stock inventory in that they are committed in the face of certainty and therefore have less risk attached to them.

3.1.3 Types of Inventory

Inventory can also be presented in five primary categories based on the following:

(*i*). inventories of direct materials consist of raw materials and production inventories, parts, components, subassemblies, assemblies and finished goods.

(*ii*). inventories of indirect materials are spares parts, tools, general supplies, stationeries, fuels, , oil, lubricants and maintenance materials.

1. Raw Materials

These are materials purchased from outside either from a manufacturer or suppliers directly to support production requirements. These items enter into the product. They are mostly purchased in bulk and stocked according to their functions. Examples of raw materials are maize, starch, chemicals, petroleum, sugar, etc.

2. Work-in Progress Inventories

These inventories are produced internally or purchased from external suppliers. These materials are incomplete (i.e. they have not yet been converted to final product or saleable finished goods). They are parts, components and other materials that are currently being worked upon at a work centre, used as input or waiting to be assembled during final production process. For example, automobile companies purchase, tyres, mirrors, glass, several parts of engine, gear assembly, wheels, sheet metal parts, etc. These materials are manufactured at different centers or different companies and they are purchased, stored as semi-finished inventories and supplied to production floor according to the requirements of assembly shop.

3. Maintenance, Repair, and Operating Supplies Inventories

MRO are the maintenance, repair and operating supplies materials used to support production and operations. These materials are consumed for production operation but not physically part of product but are major for the continuous operation of equipment, plant, vehicles, etc. Examples of MRO inventories are grease, spare parts, tools, oil, lubricant, cutting fluids, and chemical.

4. Finished Goods

Finished goods inventories are final finished products or items ready for customer orders, transporting for sale or temporarily stocked before demand. For example, finished goods inventories of companies are laptops, shoes, shirts, cars, buses, machines, etc. Finished goods inventory should be effectively and efficiently monitored in respect to customers' demands fluctuations.

SELF-ASSESSMENT EXERCISE 1

Explain the concept of inventory management and its classification.

3.2 Fundamentals of Inventory Management

3.2.1 Goals of Inventory Planning and Control

Inventory planning and control must be put in place to ensure that adequate inventories exist since failure to do so can lead to over-stocking or under-stocking of inventories. If stock out exists, there will be lost of production hours, customers and revenue from sales. If overstocking occurs, it will lead to incurring costs on storage, theft, damages or obsolescence or selling goods at give away prices. The goals of inventory planning and control are as follows:

(i) Ensure Availability of Optimum Materials

The long term goal of inventory management is to maintain stock of all material supplies to production operations at the right quantity, right time, right prices and place thereby enhancing customers' satisfaction. The materials requirements planning is an important method materials managers use for planning inventory of materials required for production.

(ii) **Optimising Supply and Demand of Inventory**

Materials manager should keep a balance between quantity of inventory purchased and stored with production requirement so that overstocking and under stocking will not occur.

(iii) Minimising Costs of Ordering and Carrying Inventory

The cost of ordering and carrying inventories should be minimised and maintained within reasonable limit so that organisation can minimise production cost and maximise profit.

(iv) Minimising the Wastage of Materials

Another major objective of inventory management is to achieve minimum materials wastage or operate at zero tolerance for materials waste. Materials wastages may occur as result of leakages, mishandling of materials, spoilages, purchasing substandard materials, deterioration, obsolescence, theft, etc. This challenge can be managed through effective inspection, cleaning and protection.

(v) Enhancing Customers Satisfaction

Inventory planning and control aims at enhancing customers' satisfaction by storing materials in line with anticipated demands.

Effective inventory serves the customers better to fulfill their demands by providing required product to satisfy their needs and wants. It is worth to mention that appropriate finished goods inventory is determined through sales forecast and production capacity planning. This implies finished goods inventory is the responsibility of sales department, production and materials management departments.

3.2.2 Inventory Reduction Techniques

1. Sales forecasts help to anticipate the customer demand. This can help to overcome overstocking and under stocking of inventories
2. Management should have a policy that reduces lead time on purchase order. This would reduce the uncertainties of customers' demand
3. The managers should choose efficient and effective suppliers and means of transportation of goods
4. Organisations should consider adopting Just-in-Time concept in purchasing, transportation and production. This will help in the elimination of lead time or any delay in operations
5. Sales department should embark on detailed analysis of customer demand characteristics
6. Management should reduce or eliminate low turnover and /or obsolete materials.

1.2.3 Advantages and Disadvantages of Carrying Inventory

Advantages of Carrying Inventory

Inventory is vital to doing business and its importance must be recognised. Without some levels of inventory, organisations cannot produce goods and services to meet customers' needs and wants. It is pertinent to know that organisations should carry inventory only when the benefit of holding inventory exceeds the cost of holding the inventory. The right reasons of carrying inventory are as follows:

(i) to support production requirements by ensuring continuous supplies of materials thus preventing a stock out situation
(ii) to support operational requirements by providing maintenance, repair and operating supplies for keeping the plant functioning.
(iii) it helps in providing goods to meet customer service requirement
(iv) storing extra goods enables a company to receive higher discounts for larger or bulk orders, hence, increasing their net profit margin.
(v) purchasing large quantities of goods at once enhances saving on price negotiation especially in international trade where purchasing of goods needs intense negotiation.

(vi) inventory helps against marketplace uncertainty. Inventories are sensitive to changes in markets especially the availability of quality material as well as price changes.

Disadvantages of Carrying Inventory

(*i*) The carrying cost of inventories can increase production cost especially when they are stored for longer time.
(*ii*) Inventory ties up capital if large inventories are purchased and stored. The capital is idle and cannot generate income.
(*iii*) The storage, safety and handlings of materials may be costly.
(*iv*) The risk of wastage, pilferages, deterioration and obsolescence of materials and parts could occur and it will affect customers' demands.
(*v*) In case of depression where there is sharp reduction in cost of materials, it will have negative impact on company profitability.

3.2.4 Types of Inventory Costs

Inventory related costs are very fundamental to total production costs so they can be critically managed so that funds that can productively be used elsewhere will not be tied up unnecessarily. Therefore, it is important to identify these costs so they will be given necessary consideration.

Purchase Cost: this is the cost of buying a unit of materials, generally known as unit cost. It is the basic and the simplest of inventory costs to ascertain. Purchased cost can be determined from supplier sales price and finished product total cost. Finished product total cost comprises of direct material cost, labour cost and allocated overhead cost.

Ordering Cost: this is a cost of generating, sending and receiving goods and. This cost is associated with calling, paper work, data processing, placing purchase orders, purchasing, follow up costs, transporting, receiving, inspecting, verification and other costs connected with acquiring materials. When the item is produced internally, the costs include machine setup costs. Ordering cost is generally expressed as a fixed amount per order, regardless of the size of order. Graphically, ordering cost is presented in figure 3.0.

Holding or Carrying Cost: this is the cost of warehousing manufactured items or purchased materials in store for a specific time and this depends on the size of the materials. This cost consists (*i*) cost of storage space, (*iii*) sudden drop in prices of materials, (*iv*) cost of damages, spoilage, obsolescence, theft, leakage, deterioration and depreciation of materials during storage, (*v*) salaries of inventory

officers, (*vi*) insurances, (*vii*) opportunity cost of tied up funds, (*viii*) any other costs related to storage and materials handling. Holding or carrying cost is expressed as a given percentage of the stock value. For instance, if a stock costs # 400 and it costs 50% to carry the stock so holding cost per unit of stock is 50% of #400 = #200.

Shortage or Stock-out Cost: this cost is incurred when there is shortage of materials for production and finished goods for sales. Shortage or stock-out cost is incurred when there is loss of sales, delay in supply, goodwill and opportunity cost of not making sales, loss of customers patronage, etc. The cost is expressed in Naira cost per unit of materials per time, although stock out cost estimation is subjective.

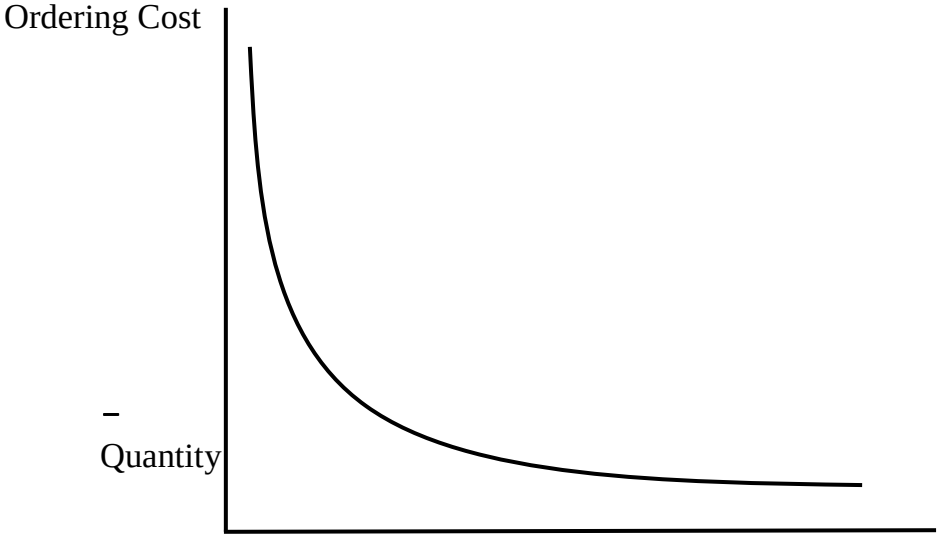

Figure 3.0: Graph of Total Ordering Cost

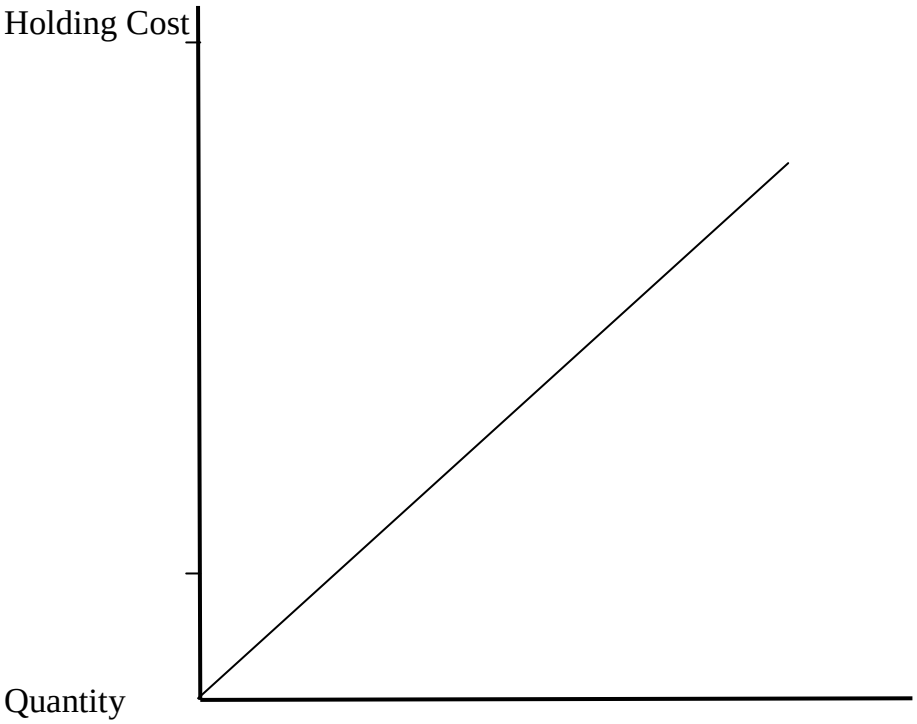

Figure 3.1: Graph of Holding Cost

4.0 CONCLUSION

The relevance of effective inventory management to achieving the goals and objectives of organisations cannot be overemphasised as demonstrated in this unit. The orientation is to stockpile large amount of raw materials to avoid production breakdown and, shortage of finished goods to meet customers' demands and avoid loss of revenues. Despite this, huge investment in inventory which in some cases is tied up carrying inventory is inevitable.

5.0 SUMMARY

We have attempted in this unit to address the nature and reasons why organisations hold inventory and how they can operate at close to zero inventory level. Classification of inventory and inventory reduction techniques were among the scope of this unit. We also examined the different costs associated with organisations carrying inventory.

In the next unit, we shall enlighten you on types of inventory management models and how they can be used to obtain optimum inventory. Also, the modern inventory management philosophy-JIT concepts shall be discussed.

6.0 TUTOR-MARKED ASSIGNMENT

i. What do you understand by inventory management? State the objectives of inventory management?
ii. Mention the reasons for firms carrying inventory.
iii. Discuss the types of inventory costs with graphical illustration where applicable.
iv. Explain the classifications of inventory.

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UNIT 4 BASIC INVENTORY MANAGEMENT MODELS

CONTENTS

1.0 INTRODUCTION

In making decisions on complex and uncertain business situations, we resort to the use of models to reduce the complexity into a manageable situation. Models can be defined as a situation where by a complex reality confronting an organisation is reduced to a simplified version of the situation. That is, modeling is a process whereby simple inexpensive objects that focus on the key factors represent complex or uncertain situations. Inventory management model is a mathematical formula that organisations use to determine inventory level or optimum quantity to order, frequency of ordering, to keep smooth production and goods or services flowing to the customer without interruption or delay.

In this unit, we will consider some common types of models starting with the deterministic-Economic Order Quantity to Just-in-Time Philosophy. Although, inventory system involves some levels of uncertainties, it is common to assume much simpler deterministic models for which solutions are found using quantitative equations.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the concept of inventory management models
- mention the assumptions of EOQ
- solve inventory problems using EOQ
- solve problems of inventory using EOQ with Quantity Discount
- discuss Just-In-Time philosophy.

3.0 MAIN CONTENT

3.1 Inventory Control Model under Conditions of Certainty-Economic Order Quantity

This is a deterministic inventory control model which is applicable when demand of materials is assumed to be fixed and completely known with certainty. Also, demand remains constant over a period under consideration. The most popular deterministic model is Economic Order Quantity (EOQ). Economic Order Quantity (EOQ) refers to the model that helps to identify the best ordering policy that determines the order quantity that minimises the annual holding cost and the annual ordering cost and hence sets these costs at equilibrium. In determining the economic order quantity, there is a trade-off between ordering and holding costs as shown in figure 4.0. This model may be adequate for small organisations but rather crude for large organisations. For this model to be applicable the following assumptions must be met.

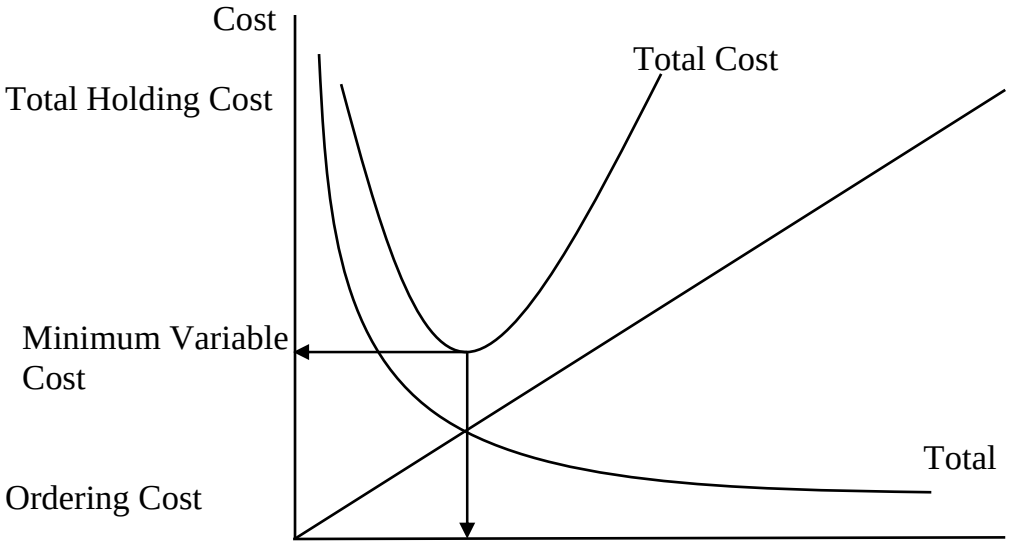

Figure 4.0: Relationship between Total Cost, Total Ordering Cost and Total Holding Cost (source: Adedayo et al, 2006)

- **Assumptions of Economic Order Quantity**

(1) It deals with only one material whose demand is assumed to be fixed and completely predetermined
(2) Demand remains constant over a period of time
(3) Holding and ordering related costs per unit remain constant during the period of one year irrespective of the order quantity
(4) No stock out is allowed and ordered materials arrive instantaneously
(5) The lead time which is the time between ordering and receiving goods is instantaneous and is equal to 0

(6) All materials ordered are delivered at the same time, i.e. no piecemeal delivery is allowed
(7) No quantity discount is permitted irrespective of quantity
(8) Rate of demand is constant.

The various notations used in deterministic basic Economic Order Quantity (EOQ) are shown below;

D = Total demand for inventory material
C = fixed cost per order
Q = order quantity in units
P = Inventory holding cost rate in percentage
H = Holding or inventory carrying cost per unit quantity per unit time.
C = Ordering cost per order or set-up cost per unit
Cs = Shortage or stock-out cost per unit quantity per time
N = Number of orders placed
f(x) = Probability density function for demand x.

Derivation of EOQ Formulas

- Cost of holding (H) one inventory item = Purchased cost per unit of inventory item x unit holding cost rate = PS, therefore H = PS …….. (1)
- Total inventory holding cost = Cost of holding one inventory item x average stock. Recall average stock = ½Q and so we have Total holding cost = PS x 2 = PSQ/2 …… (2)
- Number of orders = Total annual demand for the period/ Order Quantity = D/Q
- Ordering cost = number of quantity ordered x ordering cost per order = D/Q x C = CQ …….. (3)
- Total cost = Total Holding cost + Total Ordering cost = T = PSQ/2 + CD/Q …… (4)

See if the second derivative $\partial^2 T/\partial Q^2$ is positive (calculus)

Equate the first partial derivative $\partial T/\partial Q$ to 0.

So $\partial T/\partial Q = PS/2 - CD/Q^2$

Also $\partial^2 T/\partial Q^2 = 2CD/Q^3$ which is positive since all the variables are positive?

So T is a minimum when $\partial T/\partial Q = 0$

So $\partial T/\partial Q = PS/2 - CD/Q^2 = 0$

$PS/2 = CD/Q^2$

$Q = \frac{2CD}{PS}$

$$Q = \sqrt{\frac{2CD}{PS}}$$

This implies that economic order quantity as Q* and PS as H to obtain

$$Q = \sqrt{\frac{2CD}{H}} \text{ …….. (5)}$$

.

Inventory Total Cost

The annual cost associated with holding and ordering cost equation T = PSQ/2 + CD/Q can be written as T = $\frac{Q}{2}H + DC/Q$ since PS = H

The total cost per optimum order quality for a given inventory model = $T = \sqrt{2CHD}$, where we substitute H, D, C and Q.

Example 1

Let annual demand (D) of ABC Ltd be = 6,000 units, ordering cost = #40 and Holding cost = #2. Find (i) optimal quantity (ii) total inventory cost.

Solution

(a)

$$Q* = \sqrt{\frac{2CD}{H}} = Q = \sqrt{\frac{2 \times 40 \times 6000}{2}} = \sqrt{240000} = 490 \ units$$

(b) Total inventory cost =

1st Method

$$T = \frac{DC}{Q} + \frac{HQ}{2} = \frac{40 \times 6000}{490} + \frac{490 \times 2}{2} = 490 + 490 = \#980$$

2nd Method

Using $T = \sqrt{2CDH}$

Total inventory cost

$$T = \sqrt{2CDH} = \sqrt{2 \times 40 \times 6000 \times 2} = \sqrt{960000} = \#980$$

Example 2

Brown Ltd annual holding cost rate of an inventory item is 30% unit cost of inventory item of ₦150, ordering cost =₦40, and the company annual demand = 200,000.

(a) Identify the EOQ
(b) Calculate the number of order
(c) Determine the total cost.

Solution

(a) The EOQ- optimal quantity
Holding cost = 30% of 150= .3*150= #45

$$Q* = \sqrt{\frac{2CD}{H}} = Q* = \sqrt{\frac{2 \times 40 \times 200000}{45}} = \sqrt{355556} = 596$$

(b) Number of order = D/ $Q*$ = 2000l 00/596 = 336 times

(c) Total cost; $T = \sqrt{2CDH}$

$= T = \sqrt{2 * 40 * 200000 * 45}$

= #26,833

Example 3

XYZ pure water producer demands 600,000 units of pet bottles per year. The ordering cost is ₦120 while it costs ₦80 per unit of inventory. If the annual inventory holding rate is 20% of the unit cost of inventory. Calculate:

(a) the economic order quantity
(b) the number of orders
(c) the total cost

Solution

D = 600,000, C = 120, H = 80 x 0.20 = 16

(b) $$Q* = \sqrt{\frac{2CD}{H}} = \sqrt{\frac{2 \times 120 \times 600000}{16}} = 3000$$

(c) Number of orders

$$\frac{\text{Annual Demand}}{EOQ} = \frac{600{,}000}{3000} = 2000 \ times$$

(d)

$$T = \frac{CD}{Q} + \frac{HQ}{2} = \frac{600000 \times 120}{3000} + \frac{3000 \times 16}{2} = 24000 + 24000 = \#48{,}000$$

Or $T = \sqrt{2CDH}$

$$= \sqrt{2 \times 120 \times 16 \times 600000} = \#48{,}000$$

3.2 Economic Order Quantity with Volume Discount

One of the major assumptions of EOQ model is constant price per unit inventory irrespective of the volume of materials. However, in reality sellers give discount to buyers who purchase large quantity of materials to encourage them to buy more. When this occurs, the buyers select the order quantity that will minimise total cost of materials. It is pertinent to know that total cost is the summation of new purchased cost, holding cost and ordering cost.

Tc= Total holding cost +Total ordering cost + Purchased cost
Tc= QH/2 + (D/Q)/2 + PD where P= unit price or cost of purchased of unit of material

Example 4

ABC Construction Company uses about 4000 bags of cement annually. Ordering cost is N2000, holding cost N50 per cement/year and a new price policy shows that orders less than 200 bags will cost N2000 per bag; 200 to 599 will cost N1950 per bag; 600 to 999 will cost N1900 per bag and 1000 and above will cost N1850 per bag. Calculate the optimal order quantity and the total cost.

Solution

D = 4000, C = 2000, H = 50

Range of orders	Price
1- 199	2000
200 – 599	1950
600 – 999	1900
1000 and above	1850

i. The common EOQ $Q = \frac{\sqrt{2CD}}{H} = \frac{\sqrt{2 \times 2000 \times 4000}}{50}$ = 566 bags of cement

The 566 bags will be purchased at #1950 per bag.

So T_{566} $\frac{QH}{2} + \frac{CD}{Q} + SD = \frac{566 \times 50}{2} + \frac{4000 \times 2000}{566} + 1950 * 4000 = 14150 + 14134 + 7{,}800000$

= #7828284

Total costs for the remaining categories i.e. 600 – 999 and 1000 and above.

$$T_{600} = \frac{QH}{2} + \frac{CD}{Q} + SD = \frac{600 \times 50}{2} + \frac{4000 \times 2000}{600} + 1900 \times 4000$$

$$= 15000 + 13333 + 7{,}600000 = \#7628333$$

$$T_{1000} = \frac{QH}{2} + \frac{CD}{Q} + SD = \frac{1000 \times 50}{2} + \frac{4000 \times 2000}{1000} + 1850 \times 4000$$

$$= 25000 + 8000 + 7400000 = \#7433000$$

The results show that it is better to order 1000 and above bags of cement since it has the lowest total cost of #7433000.

3.3 Just-In-Time Philosophy

Just-in-time philosophy (JIT) was introduced by the Ford motor company but publicised by Total Motor Corporation of Japan as part of its Toyota Production Systems (TPS). Toyota's effort to continually improve their production system over years, along with diffusion of their improved production system to other Japanese companies and a dedicated effort to pursue perfection has resulted in the effective, efficient, integrated materials management system known as Just-In-Time manufacturing technique. Just in Time (JIT) manufacturing is described as a system that helps in making appropriate order of materials available to each operating unit at the right time in the right quantity. JIT is a systematic concept consisting of JIT purchasing, JIT transportation and JIT production. These three elements combine to create a material handling system that avoids waste and minimises inventory investment. The technique has changed employees' belief, attitude, work habits and awareness of quality assurance.

JIT technique's main focus is identification and elimination of all material handling related activities that do not add value to product or service, a commitment to a high level of quality from purchasing, transporting to production, a commitment to continuous improvement in the efficiency of materials management activities and quality product. Product quality is one of the central managerial focuses of any competitive organisations. It requires planning and organising and controlling manufacturing resource tailored towards high quality and performance. Just-in-time is a method based on initiation of a "pull" system of manufacturing (matching production to predetermined demand) and the advantages include significant reductions of raw materials, semi-finished goods, components and parts, and finished goods inventories. Also, some benefits include meaningful reduction in throughput time and reduction of production process space. Hence, this helps management to reduce production costs, achieve their target and offer quality product to customers.

The JIT philosophy begins with purchasing the raw materials by receiving frequent receipts of material from supplier to meet immediate requirements. This is achieved if there are close and collaborative buyer-

seller relationships, extensive sharing of information between parties, a commitment to zero defects and processing data electronically. JIT purchasing method does not tolerate high inventory levels, less materials quality, waste between buyer and seller and related inefficiency. JIT transportation is the next important philosophy which addresses the efficient movement of materials between the buyer and seller. This entails frequent deliveries of materials directly to the right pace as required by the buyer. JIT transportation relies on efficient private or public carriers that move materials between buyer and seller on a regular and repetitive basis. Closed-loop system of transportation refers to a situation where materials are moved from seller to buyer and then from buyer back to seller with return material where necessary. Adopting efficient JIT transportation scheme involves the following: organisation must adjust its structure to support JIT deliveries, reduce the number of carrier, have long-term agreements with carriers to foster commitment and dedication, process supply chain related activities electronically, a closed-loop system of delivery should be adopted and materials flow should be handled by modern equipment and technology.

The third aspect of JIT philosophy is JIT production which involves transforming raw and semi finished materials to finished products to satisfy the needs and wants of customers. JIT production addresses the following activities among others: machine setup time reduction, adjusting facility layout, focused factory, group technology layout, pull production system, total quality management, product and process improvement, teamwork management, sound performance evaluation, flexible workforce arrangement, harmless material handling and packages, preventive maintenance and safe work environment, etc.

Objectives of Just-in-Time Technique

The objectives of JIT are to reduce processing time, elimination of waste, have respect for people and cost minimisation. This can be achieved if firms hold zero inventory; a system known as lean supply chain. The summary of the objectives of lean supply chain oriented organisations is to improve productivity by minimising the cost of the quality product. The following factors can be considered for the required improvements:

1. process and product design
2. using state-of-the art equipment and technology
4. holding zero inventory
5. reducing lead-time of supply of materials
5. reducing batch size
6. using pull production system.
7. simplifying factory layout

8. reducing machine set up
9. improving on waste reduction

In order for organisations to achieve these objectives, JIT practices must be linked with other activities that provide supporting infrastructure. Supporting infrastructure refers to those concepts that give synergy advantages to JIT practices in items of above mentioned factors. Few amongst the JIT supporting infrastructures that are considered important are: visionary leadership, total organisation commitment, customer empowerment, strict adherence to product quality standard, qualified personnel, employee's education and training, systematic performance appraisal, good salaries and other benefits and employees' empowerment.

4.0 CONCLUSION

The past orientation of stockpiling large amount of raw materials to avoid stock out and production breakdown and, shortage of finished goods to meet customers' demands and avoid loss of revenues led to huge investment on inventory. This challenge of carrying too much inventory has been resolved with the adoption of Just-In-Time philosophy by competitive organisations in areas of purchasing, transportation and manufacturing. To achieve the objectives of JIT concept, certain supporting infrastructures such as having visionary leadership who is totally committed to the organisation, customers and employees should be empowered, etc. We therefore conclude that while inventory is considered a technical asset, it has direct effects on organisations' financial performance.

5.0 SUMMARY

The discussion in this unit is a continuation of previous unit. You have learnt how to use some inventory models to determine optimum quantity. We have discussed how organisations can operate at close to zero inventory level using JIT philosophy, a system of lean supply chain- a combination of JIT purchasing, JIT transportation and JIT production.

6.0 TUTOR-MARKED ASSIGNMENT

i. Explain Economic Order Quantity and its assumptions.
ii. Assuming ABC Ltd uses 1000 bags of Rice annually, ordering cost per bag is #6500 and holding cost is 300per bag. Calculate
    a. Economic order quantity
    b. Number of order
    c. Total cost of order

iii. What are the main objectives of JIT philosophy.
iv. Discuss the likely benefits of adopting JIT concept to organisations.

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UNIT 5 TRANSPORTATION MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Transportation is an integral part of any economy. It is an essential vehicle for social and political integration and development. Transportation evolves in order to cope with the demand for it in the society. The enormity of the role of transportation makes it constitute the major chunk of government's annual budget and developmental attention. This section explains how transportation forms the integral part of purchasing and supply management. It highlights the basic functions of transportation and identifies the major participants in transportation decisions.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- identify the two major functions of transport and describe the fundamental principles guiding transport management
- identify the major participants in transport decisions
- describe the basic methods of transport and identify different transportation formats that you are familiar with
- identify different suppliers of transportation services.

3.0 MAIN CONTENT

3.1 Transportation

3.1.1 Transport Functionality and Principles

Transportation is one of the most visible elements of logistics operations. As consumers, we are accustomed to seeing trucks and trains moving product or parked at a distribution facility. While this experience provides a good visual understanding of transportation elements, it does not allow the necessary depth of knowledge to understand transportation's role in logistics operations. This section establishes that foundation by reviewing functionality provided by transportation and the underlying principles of transport operation.

Transport Functionality

Transportation functionality provides two major functions: product movement and product storage. Each is briefly described.

- **Product Movement**– whether the product is in the form of materials, components, assemblies, work-in-process, or finished goods, transportation is necessary to move it to the next stage of manufacturing process or physically closer to the ultimate customer. A primary transportation function is product movement up and down the value. Since transportation utilises temporal, financial, and environmental resources, it is important that items be moved only when it truly enhances product value.
- **Product Storage**– a less common transportation function is temporary storage. Vehicles make rather expensive storage facilities. However, if the in-transit product requires storage but will be moved again shortly (e.g., in a few days), the cost of offloading and reloading the product in a warehouse may exceed the per diem (Daily) charge of storage in the transportation vehicle.

Principles

There are two fundamental principles guiding transportation management and operations. They are economy of scale and economy of distance.

- Economy of scale refers to a situation where transportation cost per unit of weight decreases when the size of the shipment increases. Transportation economies of scale exist because fixed expenses associated with moving a load can be spread over the

load's weight. As such, a heavier load allows cost to be "spread out," thereby decreasing cost per unit of weight.

- Economy of distance refers to a situation where transportation cost per unit of distance decreases as distance increases. For example, a shipment of 1600 miles will cost less than two shipments (of the same combined weight) of 800 miles. Transportation economy of distance is also referred to as the *tapering* principle since rates or charges taper with distance. The rationale for distance economies is similar to that for economies of scale. Specifically, the relatively fixed expense incurred to load and unload the vehicle must be spread over the variable expense per unit of distance. Longer distances allow the fixed expense to be spread over more miles, resulting in lower overall per mile charges.

These principles are important considerations when evaluating alternative transportation strategies or operating practices. The objective is to maximise the size of the load and the distance that it is shipped while still meeting customer service expectations.

3.1.2 Role of Transport in the Society

The role of transport in the society cannot be over emphasised or exhausted. As already observed, transport is indispensible if any meaningful economic development, social integration and development, and the enhancement of standard of living is to be achieved in any society. Below are some important roles played by transport:

1. **Communication:** transport is a major vehicle for communication. People have to take transport in order for them to make contact with others and disseminate information. Mails and other materials for information dissemination are also taken to their destination by transport.
2. **Global Sourcing of Raw Materials and Production Input:** in the past, industries were usually sited close to the source of raw materials. But with increasing competition and the development of faster and cheaper means of transport, most entrepreneurs now prefer to site their production plants close to the market. With good transport they can now easily source their raw materials and any other production input from any part of the world.
3. **Aid to the Mobility of People and Freight:** transport is synonymous with mobility. People rely on the means of transport to move from place to place for economic, social, political, religious and other purposes. They also use transport to move their effects from one location to another.

4. **Stabilization of Prices:** transportation cost has a direct bearing on the price of goods and services. This is more so in our developing economy in which competitive pressure is not yet much high.
5. **Intensification of Production Activities:** without transport, it would be useless encouraging farmers and manufacturers to intensify their production activities. It is through the means of transport that they are able to effectively source their input from far places and distribute their output to consumers that are far away.
6. **Facilitation of Geographical Specialisation**: the law of comparative advantage encourages geographical specialisation of production activities. But it cannot be carried out if transport is not available to make people obtain and enjoy the goods which they have comparative disadvantages in producing.
7. **Disposal of Surplus Production Output**: transport enables manufacturers and farmers link up with the buyers who would absorb their surplus production output.
8. **Increasing the Volume of Trade:** where there is no good means of transport the volume of trade and tempo of economic activities would be low.
9. **Expansion of Market:** through the means of an efficient transport system, producers can take their goods to new markets or exploit old markets more efficiently.
10. **Effective and Efficient Physical Distribution of Goods:** the increasing competition and growing consumer affluence have made it necessary for manufacturers and marketers to bring their goods closer to consumers.
11. **Aid to Uniform Pricing Policy Implementation**: it is only an efficient transport system that can enable a firm to get its goods to all consumers at a uniform price.
12. **Decongestion of Highly Populated Cities**: the most effective way to decongest these cities is the provision of mass transit vehicles and other transport facilities that would enable people live in the suburbs of these big cities while transporting themselves to and fro the cities for work every day.
13. **Generation of Revenue for the Government**: transport is a great source of revenue for the government. The government generates a lot of revenue from the issuance of vehicle licenses, registration of vehicles, motor parks, airports, sea ports, fines, and other fees and charges imposed on transporters and users of transport facilities.
14. **Provision of Career Opportunities:** this refers to driving or operating transport vehicles, automobile repairs or maintenance, traffic control or navigation.

15. **Enhancement of Peoples Standard Of Living**: people employ transport to go to work to make their living. The goods and services they consume also get to them through the means of transport.
16. **Enhancement of The Socio-Economic And Political Development Of The Society**: experience has shown that the more developed the transport facilities of a society, the more rapid its growth economically, socially, and politically.
17. **Promotion of Tourism:** the success of the whole tourism industry greatly depends on the contribution of the society's transport system. No matter how fascinating or great a tourist attraction is, it would not be able to draw any meaningful number of visitors if it is not well-accessible, transport wise.

SELF ASSESSMENT EXERCISE 1

Examine the contributions of transport to national development

3.2.1 Participants in Transportation Decisions

In order to understand transportation decision making, it is necessary to first understand the transportation environment, which is unique compared to many commercial enterprises. Buyers and sellers alone negotiate the terms and conditions and then consummate the sale. While government involvement is necessary for some commercial transactions, it is not customary for most.

However, unlike most commercial buying and selling, transportation transactions are often used by five (5) parties: the shipper (originating party), the consignee (destination party or receiver), the carrier, the government and the public.

- **Shippers and Consignees**– the shipper and consignee have the common objective of moving goods from origin to destination within a prescribed time at the lowest cost. Services include specified pickup and delivery times, predictable transit time, zero loss and damage, as well as accurate and timely exchange of information and invoicing.
- **Carriers** – the carrier, as the intermediary, takes a somewhat different perspective. Careers desire to maximise their revenue associated with the transaction while minimising the costs necessary to complete the transaction. The perspective suggests that a carrier wants to charge the highest rate that the shipper (or consignee) will accept and minimise the labor, fuel, and vehicle costs required to move the goods. To achieve this objective, the

carrier desires flexibility in pickup and delivery times to allow individual loads to be consolidated into economic moves.

- **Government** – the government maintains a high interest level in transaction because of transportation's impact on the economy. Government desires a stable and efficient transportation environment to sustain economic growth.
- **The Public–** the final participant, the public, is concerned with transportation accessibility, expense, and effectiveness, as well as environmental and safety standards. The public ultimately determines the need for transportation by demanding goods from around the world at reasonable prices. While minimisation cost is important to customers, trade-offs associated with environmental and safety standards also require consideration.

3.2.2 Transport Infrastructure

Transportation infrastructure consists of the rights-of-way, vehicles, and carrier organisations that offer transportation services on a for-hire or internal basis. The nature of the infrastructure also determines a variety of economic and legal characteristics for each mode or multimodal system. A mode identifies the basic transportation method or form.

Modal Characteristics

The five (5) basic transportation modes are rail, highway, water, pipeline, and air. The relative importance of each mode can be measured in terms of system mileage, traffic volume, revenue, and the nature of traffic composition.

- **Rail Network**– historically, railroads have handled the largest number of ton-miles within Nigeria. As a result of the early establishment of a comprehensive rail network connecting almost all major cities and towns, rail roads dominated intercity freight tonnage. This early superiority resulted from the capability to transport large shipments economically and to offer frequent service, which gave rail roads somewhat a monopolistic position.
- **Motor Carriers**– highway transportation has expanded rapidly. To a significant degree the rapid growth of motor carrier industry results from door-to-door operating flexibility and speed of intercity movement.
- **Water Transport** – water is the oldest mode of transportation. The original sailing vessels were replaced by steamboats in the early 1800s and by diesel power in the 1920s. A distinction is usually made between deep-water and navigable inland water transport.

- **Pipelines**– pipelines are a significant part of the business operation. They are used to transport all crude and petroleum products.
- **Air Transport**– the newest but least utilised mode of transport is air freight. Its significant advantage lies in the speed with which a shipment can be transported. A coast-to-coast shipment via air requires only a few hours contrasted to days with other modes of transportation. One prohibitive aspect of air transportation is the high cost. However, this can be traded off for high speed, which allows other elements of logistic design, such as warehousing, or inventory, to be reduced or eliminated. Air transport still remains more of a potential opportunity than a reality.

Modal Classification

The basic modes of transportation were reviewed in terms of historical development and share of intercity ton-miles and freight revenue. The essential operating characteristics of each mode were noted. They are speed, availability, dependability, capability, and frequency.

Transportation Formats

In addition to classifying transportation by mode, another common grouping is the legal status, or format of carrier operating authority. Unlike most free enterprise operations, governments may restrict carriers to specific markets and services to maintain carrier and market stability. The restrictions limit competition in individual markets, so carriers are able to operate in a stable pricing and competitive environment. Individual carrier restrictions, called operating authority, form the legal authorisation to transport goods and commodities between two points.

- **Common Carriers** – the basic foundation of the public transportation system is the carrier. Common carriers have the responsibility to offer service at non-discriminative prices to the public. The operating authority received by a common carrier may include the right to transport all commodities, or it may limit transport to specialized commodities such as steel, household goods and computers. In addition, the operating authority specifies the geographical area the carrier may service and indicate if such service is to be on a scheduled or unscheduled basis
- **Contract Carriers** – they provide transport services for selected customers. Although contract carriers must receive authorisation, requirements are normally less restricted than common carrier operating authority. The basis for the contract is an agreement

between a carrier and a shipper for a specified transportation service at a previously agreed cost. For example, the agreement may be a contract to move a single load or a number of loads over time. The business agreement becomes the basis for the contract carrier to receive a permit to transport the specified commodities

- **A Private Carrier** – this consists of a firm providing its own transportation. Private carriers are not for hire and are not subject to economic regulation although they must comply with regulations concerning hazardous goods movement, employee safety, vehicle safety, and other social regulations established by government agencies such as the department of transportation (DOT).
- **Exempt Carriers**–they, as their name implies, are not constrained by economic regulation. The traditional exemption was for specific commodities called hauled or market served. Typical exempt commodities include unprocessed agricultural products and extracted raw materials. Typical exempt market includes the zones around airport or metropolitan areas. Exempt carries, however must comply with the licensing and safety laws of the state in which they operate. If the exempt carrier is engaged in interstate movement, rates must be published.

SELF ASSESSMENT EXERCISE 2

Highlight the basic functions and the principles that guide transport management.

3.3 Suppliers of Transportation Services

Transportation services are offered by a combination of suppliers. Historically, government policy limited providers to single-mode operation. This restriction was designed to promote competition between modes and thus limit the potential for monopoly practices experienced in the early railroad era. The limitations were lifted following deregulation so that carriers could develop integrated intermodal services to more efficiently and effectively meet the needs of customers. The following sections review the services that are offered by different carrier types.

Single-Mode Operators

The most basic carrier type is a single-mode operator that offers service utilising only one transport mode. This degree of focus allows a carrier to become highly specialised, competent, and efficient. However, the

approach creates significant difficulties for intermodal transport because it requires negotiation and a transaction with each individual carrier.

Specialised Carriers

Over the past several decades a serious problem existed in small-shipment transportation. The minimum charge and lack of low cost rail alternatives, gives an opportunity for companies offering specialised service to enter the small-shipment or package-service market.

- Basic Package Services– numerous carriers offer package delivery services within commercial zones of metropolitan areas. As noted earlier, this type of service is classified as exempt common carriage.
- Premium Package Services – Several carriers– such as Federal Express (Fed Ex), Roadway, Emery Worldwide, and DHL – have entered the package or premium transportation market over the past two decades. Most organisations that provide routine package service also offer premium service.

Intermodal Operators

Intermodal operators use multiple modes of transportation to take advantage of the inherent economies of each and thus provide integrated service at the lowest total cost.

- **Piggyback/TOFC/COFC/Roadrailer** – the best known and most widely used intermodal system is the trailer or container on a flatcar (TOFC or COFC). Containers are the “boxes” utilised for intermodal product storage and movement between motor freight, railroads, or water transportation.
- **Containerships**– fishyback, trainship, and containerships are examples of the oldest form of intermodal transport. They utilise water ways which are one of the least expensive modes for line-haul movements.
- **Coordinated Air and Truck**– another form of intermodal is the combination of air and truck. Local cartage is a vital part of every air movement because air freight must be eventually moved from the airport to the final delivery destination. Air-truck movements usually provide service and flexibility comparable to straight motor freight.

Non-operating Intermediaries

Other transport service providers are non-operating intermediaries that typically do not own or operate equipment but broker the services of

other firms. Their functions are somewhat analogous to that of wholesales in marketing channels.

- **Freight Forwarders**– freight forwarders are for profit business that consolidates small shipments from various customers into a bulk load and then utilise a common carrier (surface or air) for transport. At the destination, the freight forwarders split the bulk loads into the original smaller shipments.
- **Shipper' Association/Cooperatives and Agents**– shippers associations are usually similar to freight forwarders in that they consolidate individual small loads into bulk shipments to gain cost economies. However, shippers' associations are voluntary non-profit entities where members, operating in a specific industry, join to manage small-shipment purchases.

  Brokers– brokers are intermediaries that coordinate transportation arrangements for shippers, consignees, and carriers. They also locate shipment for exempt carriers and owner operators. Brokers who must obtain a license from the ICC, typically operate on a commission basis.

SELF-ASSESSMENT EXERCISE 3

Discuss the activities of non operating operators in transport business?

4.0 CONCLUSION

Although problems do exist within and between modes, shippers have many choices for transport between two locations. Within the five basic modes, several legal forms exist. In addition, intermodal arrangement, specialised carriers, and auxiliary transportation add to the alternatives. The task in logistical system design is to select the transport mix that best satisfies the overall transportation requirements.
Traditionally, the transportation supply market included a large number of relatively segmented carriers. Segmentation was based on multi-mode operations and service restriction, which reduced the alternatives offered to shippers as well as carrier competitiveness and responsiveness. While this made shipper decisions easier, it also resulted in transportation system inefficiencies and higher cost.

5.0 SUMMARY

Transportation is a key activity in the logistics value chain as it moves product through the various stages of production and ultimately to the consumer. This section reviewed transportation's role, infrastructure, suppliers, economies, and decision making. The objective was to

provide an overview of transportation resources and an understanding of the factors influencing transportation management.

6.0 TUTOR-MARKED ASSIGNMENT

i. Identify and describe at least ten suppliers of transport services in Nigeria.
ii. Describe the five basic transportation modes you are familiar with?
iii. Discuss the modal characteristics.

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MODULE 3

UNIT 1 WAREHOUSING MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Warehousing is an integral part of material management which is found in every manufacturing firm. It ranges from self-store facilities, garages stockroom, to integrated computerised professionally managed warehouses. Warehousing can be described as ‘transportation at zero miles per hour’. Warehousing plays a significant role in keeping various types of materials, semi-finished, parts purchase and internally manufactured materials for production requirement and providing finished goods to satisfy customer needs at the lowest possible total cost. It has been estimated that effective warehousing management can reduce the cost of a firm’s physical distribution cost, and entire operations.

Effective warehousing management promotes a better understanding of functions of warehousing, advantages of public or private warehousing, and financial and service involvement in warehousing decision.

The warehousing and materials handling costs are justified because they can be traded off with purchasing, transportation and production costs. In effective warehousing inventories, overall production costs can be reduced through optimum purchase and right transportation of materials. This implies that firms can avoid the wide fluctuations in materials prices and supplies, and production output level due to uncertainties and variations in demand pattern. Furthermore, warehousing inventories can lead to lower transportation cost through the shipment of larger, more economical quantity of materials. The aim is effective warehousing so that productivity can be realised among warehousing, production, and transportation costs.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning and objectives of warehousing
- explain centralised and decentralised warehousing
- explain the importance of warehousing
- discuss the types of warehousing.

3.0 MAIN CONTENT

3.1 The Nature of Warehousing Management

3.1.1 Definition of Warehousing Management

Warehousing can be defined as materials management that houses and stores materials (raw materials, parts, components, work-in-process and finished goods) temporarily or for sufficient period between the point of origin and place of consumption and provision of necessary managerial information about the conditions of stored materials. All organisations have a minimum level of inventory they keep for future operation whether they operate JIT or traditional delivery system. Where inventory is kept is typically referred to as warehouse. Although, in many logistical arrangements the role of warehouse is more properly viewed as a switching facility as contrasted to a storage facility, i.e. effective distribution systems should be designed not to hold inventory for an excessive length of time but there are times when inventory storage is economical. In the same vein, warehouse management means effective and efficient storage and provision of required materials to ensure smooth operations.

Warehouse decisions fall into major categories, namely; strategic and operational. Strategic decisions plan logistical activities and resources over a long period of time in a manner that supports overall organisation goals and policies. For instance, should company hold or rent a warehouse or should warehouse handling materials be fully automated. Operational warehouse decisions have to do with daily activities whose are routine in nature and covers a period of one year or less. They involve the coordination of the various activities and the performance of warehouse. For example manager must decide who to operate handling devices daily.

3.1.2 Objectives of Warehousing Materials

The objective of warehousing is to provide storage facilities for materials procured by purchasing department and deliver them to production units and other departments when they are needed. It also collects, processes and disseminates information on the status of stored materials to appropriate officers. The totality of service provided by warehousing can be categories as follows:

1. to render advise on procurement and storing of materials (raw materials, components, parts, equipments, tools and finished goods) for firms' operations and processes
2. to provide maintenance care for warehoused materials against damages, spoilage, theft, etc
3. to maintain and receive up-to-date records of all materials received and delivered
4 to inspect and check the standard of materials at point of taking delivery whether they are of conformity with predetermined standard.
5. to store and manage the process of disposing defect, scrap, discarded and obsolete materials
6. to receive, warehouse and deliver finished products as required
7. to provide information on recovery and recycling of waste
9. to assist organisations in waste management according to environmental regulations

3.2 Warehousing Decision Strategy

3.2.1 Centralised and Decentralised Warehouses

A strategic logistics decision is to determine whether to keep all materials at one centralised place or near the place of their usage – workstations (i. e. decentralised warehouses).

A *centralised* warehousing is a situation where all materials (raw materials, parts, components, and finished goods) are stored in a specific location where materials are received and delivered to required operating places. This method is most suitable for small organisations because one store can be sufficient for their operations.

Decentralised warehousing permits materials to be stored in different right places to facilitate production operations and provide quality customer services. Decentralisation of warehouse is a common practice of large organisations that have different plants and product lines scattered over the country.

- **Advantages of Centralised Warehouse**

1. Since different materials are stored in one central location, it encourages uniformity of activities in terms of actions, policies and procedures of receiving and delivering materials to the right place of usage
2. It enhances proper co-ordination of warehousing resources and activities because they are located and performed in one place
3. It reduces the duplication of same activities in different stores, hence minimising operational costs
4. It requires less manpower because activities are performed in one location
5. It enhances better control of materials processing and materials handling equipment
6. Having materials located in a central store may ensure store and space utilisation
7. It reduces conflict and unhealthy rivalry among warehouses personnel if stores are located in different places
8. Receipts, inspection and delivery of materials can be efficiently organised
9. Central store allows bulk purchase and transportation which enjoys discounts and cost reduction in materials handling
10. It reduces wastage and deterioration of materials.

- **Disadvantages of Centralised Warehousing**

1. It may not be suitable for large manufacturing concern that has different plants located in different places and various product lines
2. It may increase transportation cost for transportation for receiving and delivering materials to various production units
3. Total centralisation of warehousing means that the future of the company is put in one location in the hands of few; this can hold the company to ransom if there is any problem

4. Centralised warehousing policy may cause delays as various departments send their materials requisitions to one department for necessary actions
5. Since the activities in central store may be much, proper record keeping is difficult
6. This strategy disallows priority or flexibility in departments warehousing their materials
7. Centralised warehousing can limit training opportunity to few employees.

It is pertinent to know that centralised and decentralised warehousing are two sides of a coin. This implies that most of the advantages of centralised store are disadvantages of decentralised store and vice versa. Decentralised warehousing major task is the identification of optimum locations to store materials according to places of usage. Another task is the need for efficient planning, organising, coordinating and controlling of materials flows between stores and operating units. However, it is a strategic logistics decision to select any type of warehousing system. Although irrespective of the option some materials such as small parts as nut, bolts, screws, fixtures, chemicals, paints, gas cylinders, grease, containers of flammable liquids like petrol, kerosene and lubricants, etc., are better stored separately and closer to places of requirements.

3.2.2 Classification of Warehouses

Warehouses are classified according to production process, type of materials and so according to location of operations and markets. The common methods of locating warehouses are:

1. **Fixed Location:** this location permits materials to be stored in a specific place. It is efficient and economical to receive and deliver materials at a fixed location
2. **Random Location:** in this case, fixed location is not considered for warehousing materials but stores can be randomly located
3. **Zoned location:** zoned location allows a group of materials to be warehoused in a given region and other classes of materials stored in different regions or zones.

Irrespective of the choice of location of warehouse, the major factors considered in location selection process are (i) to reduce material handling equipment movement in receiving and delivering materials (ii) to enjoy space utilisation and (iii) lower warehouse cost per unit of item.

3.2.3 Factors Influencing the Nature of Warehousing

Warehouse decisions are fundamental to firms' operations and they are being influenced by some factors as stated below:

1. firms' philosophy on whether to run centralised or decentralised and public or private warehousing
2. firms' financial ability determines to a large extent the type of storage system it can afford
3. materials' characteristics in terms of size, weight, nature (perishability) are also key factors in determining type of warehouse to invest it. For instance (*i*) raw materials , (*ii*) parts and components (that is, major parts like engines, gears, etc, or small parts like screws, pins, bolt and nuts), (*iii*) flammable materials such as petrol, kerosene, etc., (*iv*) hazardous and toxic materials like chemical, acids and gases, (*v*) small parts like nut, bolts, screws, nails and fixtures, (*vi*) manual or semi-automated or automated machines, (*viii*) furniture and office fittings, (*ix*) office stationery etc., may require distinct stores
4. numbers of plants and product lines: Firms with various plants located in different places and different product lines must consider locating warehouses closer to points of requirements. Adopting Just-In-Time Philosophy: with which the concept firms can operate near zero inventory level and reduce number of warehouses
5. Time: time is of great importance in effective warehousing, hence, the best warehouse operations are those planned to reduce materials handling movement and order cycle time
6. Quality: firms expect quality performance from warehouse services because of the continuous quality improvement in all area of production An effective warehouse must empower employees to focus more on value-added services.

3.2.4 Importance of Warehousing

The general purpose of warehousing is to store inventories before, during and after production. Raw materials, parts and components inventories are stored before operation, work-in-progress materials are kept for further processing and finished products are warehoused for prompt delivery to customers. The question is what are the reasons why organisations hold inventories in store despite the capital outlay? The reasons for warehousing inventories are:

1. **To Reduce Transportation Cost:** warehousing and the associated inventory are added expenses, but they may be traded off with lower cost realised if JIT transportation is adopted. The

use of warehousing enables management to select optimum transportation system that, when combined with other purchasing and production processes lead to total costs minimisation while increasing quality of customer service

2. **To Achieve Smooth Production:** warehousing to some levels of inventories make materials available at all time for production process, hence, it helps to avoid stock-out of materials
3. **Coordination of Supply and Demand:** firms that experience highly seasonal production and sales most times have problem in coordinating supply with demand of materials. Warehouse helps them to even out supply and demand of materials over a given period. For example, food companies producing canned tomatoes, vegetables and fruits must store perishable agricultural products and final products to guarantee stable supplies.
4. **To Take Advantage of fluctuation in Commodity Prices**: seasonal raw materials such as agricultural products are cheaper during their seasons. So it is better to buy the materials at the lowest prices and store for future requirement provided the cost of storage will not be higher than future purchased prices
5. **To Enjoy Quantity Purchase Discounts:** availability of warehouse encourages bulk purchases at discounted prices
6. **To Maintain a Reliable Source of Supply**: companies that have where to store materials always purchase materials and have regular supplier(s)
7. **To Increase Customer Service Quality:** warehousing provides the opportunity for organisations to meet the unpredicted needs of customers at any point in time by delivery as required. This improves customer service through availability and prompt delivery of products.

SELF-ASSESSMENT EXERCISE 1

Identify the basic reasons for warehousing inventory in an organisation.

3.3. Types of Warehousing

Considering the above-mentioned factors, firms can choose the kind of warehouse(s) that suit their operations from the following several alternatives:

3.3.1 Direct Store Delivery

This type of warehousing is used by organisations that produce and deliver straight to the customers and thereby eliminate finished goods warehousing. Though, they use warehousing at a point-of-origin of

products. This method of warehousing is emerging and made possible with JIT philosophy, technology and e-commerce.

3.3.2 Private Warehouses

A firm may decide to store its materials in a facility owned and managed by the company. Private warehouse is a situation whereby firms store their materials in facilities owned and operated by the companies. The actual store, however may be owned or leased but under the control of the company. The basic strategic decision is to determine whether to privately own or lease the facility. Most time, it is difficult to find a warehouse for lease that meets the exact requirement of the firm. However, effective material handling system that can encourage maximum efficiency of material flow is one of the fundamental factors to this strategic decision.

Operating privately owned warehouses offer more flexibility and less costly than public warehousing because private facility operating policies and procedures can be adjusted to meet unique needs and does not have a profit markup like public facility.

- **Advantages of Private Warehousing**

1. **Greater Degree of Control:** privately managed warehouses provide opportunity for the owner of materials to exercise direct control over the store, material handling and management on receiving, storing and delivering to the right place(s). This level of control permits the firm to integrate the warehousing policies and procedures into company's overall logistics system
2. **Cost:** private warehousing cost less than public warehousing because private facility has no profit markup
3. **Flexibility:** with owner having direct control over the management of the warehouse functions there is more flexibility in designing and operating the facility to suit the unique characteristics of the materials and customers' needs
4. **Existing Employees**: private warehousing permits organisations to make greater use of their existing employees who already know the culture and vision of the organisations. Therefore, there is greater care in handling and managing the warehouse
5. **Tax Benefits**: a company that holds warehouse facility enjoys tax relief through depreciation allowances on buildings and equipment which can substantially reduce the cost of the facility over its life

- **Disadvantages of Private Warehousing**

1. A privately owned and managed warehouse may be too costly because of it fixed size and cost irrespective of level of demands. It cannot expand facility when the demand is high neither can it be reduced if material demand is low
2. Operating a private warehouse is a strategic decision (long-term) and sometimes it is risky and uncertain investment that may be difficult to sell off because of it is custom-built if the need arises
3. There is also loss of flexibility in its location if relocation of company arises.

3.3.3 Public Warehousing

This is a situation whereby a firm decides to store its materials on the field in a rented space or with private warehouse operator for either short-term or long duration depending on the company's policies and type of materials. This arrangement is used extensively in modern logistics systems. There are different classifications of public warehouses, namely:

1. **Special Commodity Warehouses**: these warehouses offer special services and designed to store one class of product. The services are limited to storing and handling certain commodities such as agricultural products like grains, lumber, cotton, tobacco, etc
2. **Bulk Storage Warehouses**: some warehouses offer storage and handling services for product in bulk. They can provide tank storage for liquids materials and large sheltered storage for dry products such as sand, salt, coal, etc.
3. **Temperature-Regulated Warehouses:** these facilities regulate environmental temperature to preserve perishable materials such as fruits, vegetables, drugs, chemicals etc. The temperature and humidity of these materials must be controlled for future uses
4. **Household Materials Warehouses:** these are for storing and handling of household materials such as furniture, electronics, etc. for long period of time
5. **General merchandise warehouses:** this is the most commonly used warehousing facility. They are designed to store all kind of product. They are used by producers, distributors and customers for broad range of merchandise
6. **Cross-docking Warehouses:** cross-docking warehouses provide storing services for limited time. It serves as a store and distributing centre by receiving materials in bulk and are immediately broken down and mixed in the proper range and quantity for direct shipment to customer.

- **Advantages of Public Warehousing**

1. **No Initial Capital Investment:** firms using public warehousing avoid capital investment in land, buildings, and materials handling equipment as well as start up cost and free of the responsibility of hiring and training personnel in different specialised areas
2. **Flexibility of Operations:** another advantage is type of flexibility that public warehouse offers. It can easily change the location, size, and number of facilities allowing a firm to quickly respond to suppliers, customers and seasonal demands. Public warehouse allows short-term contract and thus short-term commitments. This allows necessary changes if dictated by business conditions
3. **Meet Dynamic Demands:** in different business situations, public warehouse facilities and services can be adjusted to meet current materials requirements. If there are fluctuations in customer demands, there will be variations in production and inventory level and, public warehouses allow materials storage and costs to vary directly with volume of sales and production outputs.
4. **Economies of Scale:** since public warehouses provide material storing and handling for a number of firms at the same time, they enjoy economies of scale from service efficiency of specialized employees and use of semi-automated or automated materials handling equipment, and by providing consultancy and administrative services
5. **Forecast Storage and Materials Handling Costs:** using public warehouses gives organisations opportunity to know the exact storage and materials handling costs in advance and it can be forecasted. Organisations that use private warehouses find it difficult to determine the exact total storage and materials handling cost because of variability in volume.

- **Disadvantages of Public Warehousing**

1. **Inadequate Space:** public warehouses policy of providing storage facilities to a lot of companies may result to non-availability of space when required and this may have adverse effect on logistics and marketing strategies of companies
2. **Lack of Effective Communication**: effective communication may be a challenge between the companies and public warehouses because of volume of the activities and lack of standardisation in contractual agreements. Although, this challenge has been reduced by use of information technology devices such as internet, intranets, phones, e-mail, and electronic data interchange

3. **Availability of Limited Specialised Services**: in most cases, public warehouses provide general storing and materials handling services and lack some specific services for special materials unless a sufficient number of companies demand for it.

3.3.4 Contract Warehouses

This third type of warehousing combines the best characteristics of both private and public warehousing. The arrangement involves a long-term mutual relationship between the intended firm and the storing and materials handling provider. It provides unique and customised warehousing and logistics services exclusively to the company. The contracted parties shared risk associated with the arrangement. The emphasis of the arrangement is efficient services and productivity. Also, contract warehouse can provide benefits of expertise, flexibility, and economies of scale by shared assets, management, labour, and information resources among clients.

SELF-ASSESSMENT EXERCISE 3

Identify and describe different types of warehousing that you are familiar with.

4.0 CONCLUSION

For manufacturing organisations either operating in a single or multiple location, efficient warehousing offers a method of reducing materials and parts storage, and handling costs while optimising production. Warehousing became an internal part of material management. While the basic notion of JIT philosophy is to reduce materials inventory, the concept of manufacturing must be supported by highly dependable delivery. Such logistical support, in a nation as geographically vast as Nigeria, may be possible only through the use of strategically located warehouses. A basic stock of parts can be staged at a central warehouse, thereby reducing the need to maintain inventory at each assembly plant. Using consolidated shipments, products are purchased and transported to the supply warehouse and then distributed to the manufacturing plants as needed. When fully integrated, the warehouse is a valid extension of manufacturing.

5.0 SUMMARY

The focus of every management is effectiveness and efficiency of business operations. This section described what warehouse management is all about and expatiates on its contributions towards the overall efficiency of the organisation. The basic objectives and reasons

for warehousing as well as the factors influencing warehousing decisions were discussed. Different types of warehousing were explored. It is obvious from our discussion so far that proper warehousing management reduces costs, risks and promotes productivity.

6.0 TUTOR-MARKED ASSIGNMENT

i. Critically examine the economic and service benefits of warehousing.
ii. State the factors influencing warehousing decisions.
iii. Distinguish between centralised and decentralised purchasing decisions.
iv. Differentiate between private and public warehousing. What are the merits and demerits of each type?

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UNIT 2 MATERIALS HANDLING AND COMPUTERISATION

CONTENTS

1.0 INTRODUCTION

To many production and distribution organisations, material handling is an indispensable factor of their systems. Although most people think material handling is generally adding nothing to the value or cost of the materials (such as raw materials, work-in-progess, components and parts, and finished goods) that flow through the system. It is pertinent to remind us that the process of producing any product involves the movement of materials in the factory from the receiving place(s) to distribution place(s) to operation unit(s) or movement of materials from one stage of the manufacturing process to another. This movement of materials which implies the loading and unloading of different kinds of materials to and from the conveying vehicles to processing units or from department to department necessitates the use of many personnel, equipment and other material handling devices. Materials movement is a continuous activity which frequently occurs everywhere and every time in a factory or warehouse—before, during, and after production. In fact it accounted for over 50% of production activity. Therefore, effective and efficient keeping the materials in different racks, storage places and bins by the material handling equipment helps to reduce the huge material handling costs which may be significant if separated from overall production costs .

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define materials handling
- explain the objectives of materials handling
- discuss types of materials handling equipment
- mention the factors influencing selection of materials handling equipment.

3.0 MAIN CONTENT

3.1 The Nature of Materials Handling

3.1.1 Definition of Materials Handling

Materials handling can be defined as the process of moving, storing, controlling, containing, unitising and protecting materials (either those required for smooth production process or finished goods) throughout the process of manufacturing, distribution, consumption, and disposal. It involves the use of manual or automated equipment or personnel to manage the movement of material in the warehouse and factory. Management of material handling centres on decisions related to number and size of materials, and location of warehouse(s) and processing points and if not properly coordinated can affect many aspects of the production processes. It is pertinent to mention that in designing materials handling system, consideration should be given to facility layout, products routings, warehouse and material flow control. Also, materials handling equipment should be standardised, the system should be designed to provide continuous material flow, there should be full utilisation of handling equipment, etc.

Traditionally, warehouse materials handling has been done manually with more emphasis on using people and non-automated materials handling systems. But due to the increasing demand for a high variety of products, adopting JIT philosophy, shorter response times and increasing profitability in today's competitive manufacturing industry, a highly integrated, flexible, efficient and automated material handling system with sophisticated management information and control systems is to receive top management attention. Management view of materials handling as the routine transfer of materials from place to place had changed and materials handling system is considered as part of a total materials flow system.

The orientation is that the new material handling concept is capable of improving material information processing, order picking, storage,

materials sorting, shipping and transportation while reducing materials handling labour, order cycle time and reduced inventory level.

The improvement of materials handling system can be done in the following areas:

(a) **Motion**: this implies that materials movement from one place to another should be handled efficiently to eliminate avoidable movements so as to minimise cost.
(b) **Time**: materials handling officer must ensure materials get to, or remove from production unit at the right time
(c) **Place**: materials being at the right place at the right time enhance smooth operations.
(d) **Quantity**: materials supply to, or remove from the right place should be according to operating unit demands.
(e) **Space**: efficient storage space is paramount to achieving the objectives of materials handling system and overall organisation goals.

3.1.2 Objectives of Materials Handling

The main objective of materials handling system is reducing the total costs of materials handling by reducing the number of handling involved while the specific objectives amongst other are stated below:

1. Reduce materials handling costs per unit. This can be achieved if moving of materials is effectively and efficiently controlled then total materials handling is reduced and obviously item unit handling can be reduced
2. Reduce the production cycle time. Effective management of materials can reduce production time i.e. the total time required for processing of raw materials to finished products
3. Provide a better control of the flow of materials. Sound control of materials flow system whereby reducing wasted time and movements to improve productivity
4. Provide safety environment and conditions for movement of materials. Adhering to safe environment and conditions as relate to material handling reduce industrial accident and conflict
5. Provide employee training for proper handling of materials for fewer reject. Proper materials handling will reduce materials (especially goods) damages, and rate of rejection which is a major cost to producer
6. Achieve decreased storage requirement. Effective and efficient materials movement enhances storage utilisation
7. Reduce total production cost and increase productivity. The aim is to design materials handling system that is efficient, flexible,

and fast, and can process material information without delay. This will improve productivity and reduce overall production cost.

3.1.3 Types of Materials Handling Equipment

Materials handling system engages a wide range of handling equipment. The equipment are designed, selected and put to use after the analysis of the materials characteristics, movement requirements and nature of handling equipment. Most material handling equipment move materials through material handling paths on the operations shop floor while there are some materials handling equipment that utilise the space above the machines. The decision on a specific material handling depends on a number of factors such as cost, weight, size, volume of the loads, space availability; store and factory floor.

Materials handling system can be classified as manual, semi automated, automated, and integrated computerised tracking and information system. Manual system involves the combination of labour and less complex handling equipment to facilitate receiving and processing of materials but labour account for the high percentage of overall cost. This type of system enjoys the highest level of flexibility in order processing, since it uses the very most flexible handling systems. In contrast, automated materials handling system uses more of technology powered equipment and minimise the use of direct labour. The emphasis of automated handling system is on capital investment on modern equipment that can process materials more effectively and efficiently. Semi-automated materials handling system makes use of less direct labour and modern equipment compared to manual and automated handlings system respectively. In semi-automated system, selected materials handling required are done using modern equipment and the remaining part is performed manually. Few amongst the advantages of automated handling system include reducing operating cost, consistency and accuracy level of service is high, increasing productivity, materials handling reduction, improving service availability and quality levels and; increasing control through more accurate and timely information. While some of the disadvantages involve initial capital outlay, maintenance cost, machine breakdown or unreliability, obsolescence, capacity problem, inflexibility of equipment, worker acceptance, etc. Integrated computerised tracking and information system use various high technology computerised documentation procedures. Companies such as Nigerian Breweries, May and Baker and Ota Pharma centre use this modern materials handling system because they recognise the benefits associated with it namely: improved productivity, maximised space utilisation, enhanced flow of materials, increased customer service quality, and reduced overall operating expenses.

Generally, there are several types of materials handling equipment and the handling systems in place in organisations determine the types of equipment to use for receiving and processing materials. The types of handling equipment commonly used are namely forklift trucks, walkie pallet trucks, tow tractors, picker trucks, reach trucks, conveyors, monorails, hoists, cranes, containers and supports, automated guided vehicles, robots, shipping automation, etc. Few of these methods are discussed in the next section.

Materials Handling Equipment

1. Forklift Trucks

Forklift trucks can be powered (by petrol or diesel engines) or non-powered materials handling devices that can move loads of master cartons both horizontally and vertically. There are different types of trucks which are mostly useful when the volume of material to be moved is small and it varies frequently in size and shape when the number of moves required for each part is relatively small. They are more flexible than conveyors and are very useful to receive and deliver materials in a manufacturing plant.

2. Hand-lift Truck

Hand-lift truck is also known as pallet jack that storage officer(s) can use to reach the higher shelves. It contains two load-carrying tracks that can move about 4 inches to carry pallet loads. It is suitable to move pallet loads that do not have to be stacked and to move loads within short distances. It can be operated in small spaces where forklift truck does not fit. It is highly flexible and does not occupy space since it can be transported anywhere. The other common types of industrial trucks are: walkie trucks, tractor-trailer train, platform truck, pallet truck, counterbalanced truck, and automated guided vehicles (AGVs) etc.

3. Tow Tractors

These are self-powered operator-driven tractors to tow a number of individual four wheels trailer, wagons and hold several palletised loads. The typical trailer size is about 4 to 8 feet. It is flexible but not as flexible as fork-lift trucks.

4. Conveyors

Conveyors are used widely in shipping and receiving of large volume of materials which is relatively uniform in size and shape over a fixed path. Conveyors are fixed-path materials handling equipment which are

classified according to (1) power, (2) gravity, (3) roller or belt movement. They are used mainly for loading and unloading buses, trucks, and cars because they have uniform sizes. The most commonly types of carousels are: belt conveyors, roller conveyors, trolley conveyors, pneumatic conveyors, buckets, chutes and pipes. These devices can move hazardous materials.

5. Carousels

Carousels are forms of automated storage and retrieval systems. They are equipment handling devices that house and rotate items for order picking. Carousels deliver the required materials to the order selector by using a series of bins mounted on an oval rack. They are powered electronically and can be operated by computer control or manually by the order picker operating its keypad. They help in maximising floor storage requirements. There are two common types of carousels, namely, vertical or horizontal carousels.

6. Palletisers

Palletisers are high-speed automated equipment used to pallet building process in a warehouse, distribution, or manufacturing facility. With operator-friendly touch-screen controls, start-up and lead times are reduced, and they palletise at the rate of a hundred cases per minute.

7. Robots

Robots are human like programmed electronic devices that have resemblance of human arms. They are also capable of moving, welding, picking, loading, unloading, feeding or disengaging parts or tools to or from a location, or for transferring parts from one machine to another like the human arms. Some major advantages of using a robot handling equipment are that they can perform complex repetitive tasks automatically. They reduce involvement of people from tasks that may be hazardous, tedious, or fatiguing. They can work in hazardous and uncomfortable environments for human beings. The major disadvantages are that robots are relatively expensive and lack flexibility like human beings.

8. **Automated Guided Vehicles (AGVs)**

The use of AGVs is very common in automated materials handling system. They are driverless devices powered by battery and controlled by computers for task assignment and manage product movements in any manufacturing or industrial warehouse environment with minimal labour intervention. AGVs can be regarded as a type of specially

designed robots that can pick up and deliver product directly to and from manufacturing paths, storage areas and warehouse without the need to interface with the materials handing devices such as industrial trucks and cranes. The main advantages of AGVs is elimination of product or equipment damages, improving materials movement efficiency, reducing labour intervention and costs, and enjoying safety risks (less machines and people movements) and improved environmental conditions(such as factory noises and exhaust emissions).

Hoists, Cranes, and Jibs

These types of materials handling equipment are used when the materials or parts to be received or delivered are bulky and required more space for transportation. Because they make use of the space above the equipment, there is enough room to move bulky material. This movement of materials in the overhead space does not affect other operations. Hoist, Cranes, and Jibs are used for constructing big and high rising buildings to move cement, planks, concretes, blocks, etc.

3.2 Factors Affecting the Selection of Materials Handling Equipment

The main objective of materials handling is to effectively use the right equipment that will reduce materials handling movements and lower cost per unit of material handled. The following factors are considered in selecting the right equipment:

1. **Types of Materials**. The features of material such as size, shape, weight and volume of the materials decide the type of materials handling equipments to be used.
2. **Adaptability of Equipment.** The equipment operation and movement should suit the type of materials to be received and delivered.
3. **Cost of Equipment.** Since an organisation's resources are limited, thorough cost and benefit analysis of any decision must be done. So cost of materials handling equipment is an important factor in equipment selection.
4. **Factory Layout**. Layout of the plant, production centre, warehouse and other operating units are designed to suit the materials handling and the intended equipment must be in conformity.
5. **Flexibility of Equipment**. Ability of equipment to move more than a set of materials or been able to adjust operation to suit another class of materials.
6. **Production Processes and Systems.** Different types of production processes and systems demand different types of

material handling equipment. For instance, a continuous production system will require non-stop materials handling equipment. Both supply raw materials and parts to production centres and remove finished goods for warehouse or outright loading of carrier.

7. **Equipment Source of Power**. Availability of power should be considered before selection of materials handling equipment.
8. **Speed of Equipment**. A highly automated materials handling system may prefer rapid movement material handler, so that receiving and delivering of materials will be done within the limits of the production process.
9. **Space Requirements**. Space available in the factory or warehouse will to a large extent determine the type and size of equipment to be installed.
10. **Personnel Requirement**. Who to operate handling equipment must be considered before it is purchased.
11. **Availability of Spare Parts and Ease of Maintenance**. Equipment spare parts and components should be readily available and should be easily maintained at bearable cost.
12. **Environmental Regulation**. Material handling equipment to be purchased must conform to any environment regulations in area of usage.

4.0 CONCLUSION

In today's competitive business operations, organisations must constantly strive to improve on their operations by producing more quality at lowest unit cost. This can also be achieved if quality decisions are made in all aspects of production, especially in area of materials management. Purchasing right materials at the right prices and delivered to the right place (s) can only be through effective materials handling. Therefore, it is important for organisations to design effective material handling system which give consideration to facility layout, products routings, warehouse and material flow control. Also, materials handling equipment should be standardised, the system should be designed to provide continuous material flow and there should be full utilisation of handling equipment etc.

5.0 SUMMARY

In the past, warehouse materials handling has been done manually with more emphasis on using people and non-automated material handling systems. But due to the increasing demand for a high variety of products, adopting JIT philosophy, shorter response times and increasing profitability in today's competitive manufacturing industry; a highly integrated, flexible, efficient and automated material handling

system with sophisticated management information and control systems is beginning to receive top management attention.

In the next study unit, we shall discuss how organisations can make money from waste materials through material recovery and recycling. Also, the techniques of disposing scraps or waste materials in conformity with environmental regulations will be examined.

6.0 TUTOR-MARKED ASSIGNMENT

i. What do you understand by materials handling and why is it relevant to materials management?
ii. Mention the objectives organisations want to achieve by having a well-designed materials handling system.
iii. Discuss the common types of materials handling equipment
iv. What are the factors that influence materials handling equipment selection?

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UNIT 3 RECOVERY, RECYCLING AND DISPOSAL OF SCRAPS

CONTENTS

1.0 INTRODUCTION

For every organisation, especially large and highly diversified organisations, there is need for proper disposal management if the best possible results are to be obtained. There is need for good relationship and clear line of communication between the purchasing and supply department and all the other departments within the organisation. This is necessary for timely recovering of scraps and recycling in order to salvage the material for use within the organization.

The financial implication as well as the complexity of laws and regulations guiding environmental issues makes disposal management to be a little bit difficult for small-and medium-sized firms. It is based on all these facts that organisations must strive to obey the existing environmental laws and utilise best means of reducing pollution and enhancing efficiency of business operations.

The general conclusion is that, except in the cases of companies with separate salvage or investment recovery departments, management has found the supply department, because of its knowledge of original suppliers, materials, markets, prices, and possible uses, in a better position than other departments of the company to salvage what can be used and to dispose what cannot.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- identify the basic concepts in recovering and recycling of materials
- identify and explain disposal procedures
- describe the basic disposal channels; recovering and recycling
- describe how to select the right disposal partner.

3.0 MAIN CONTENT

3.1 The Nature of Recovering and Recycling and Disposal of Scraps

Organisations are concerned with the effective, efficient and profitable recovery and disposal of scrap, surplus, obsolete, and waste materials and assets generated within the firm. Emerging stringent environmental laws as well as a rise in disposal costs have drawn the attention of many organisations to proper disposal management. Supply chain management is not complete until the organisation recaptures its initial materials investment through recycling. Frantic efforts must be made by organisations to avoid the generation of solid waste products and environmental pollution. In a nutshell, recovery, recycling and disposal of scraps promotes the efficiency of the business operations and at the same time it is a sound environmental management approach. This approach also puts supply in a critical position within the organisation.
This section discusses the need for environmentally protective waste management and concept of an integrated waste management system in general. This calls for material recovering facilities, recycling (returning a product to commerce) and landfills (providing the final disposal option for materials that cannot be reclaimed).

3.1.1 Some Basic Concepts in Recovering and Recycling of Materials

The following concepts will help you to appreciate some terms and concepts in recovery, recycling and disposal of scraps.
Recovering simply refers to the process of retrieving the disposed or about to be disposed materials and make it ready for recycling. That is, removal of materials from the solid waste stream for sale, use, or reuse as raw materials.

Recovered Materials refer to the materials that have been recovered. Such materials could be plastic paper, metal glass, textile, plastic or

rubber materials that have known recycling potential and can be feasibly recycled. It must be noted that these materials are not solid waste but those that have been separated from the solid waste stream.

Recovered Materials Processing Facility means a facility put in place mainly for the purpose of storage, processing, resale as well as reuse of recovered materials. Such facility is different from a solid waste management facility.

Recycling is the process of converting or processing solid waste for the purpose of returning it to use in the form of raw materials or products.

Recycling Equipment means machinery or equipment that is put in place for the actual process of converting the solid waste or materials which would otherwise become solid waste to use in the form of raw materials or products.

Resource Recovery means the process of recovering materials or energy from solid waste, excluding those materials or solid waste under control of the Nuclear Regulatory Commission.

Resource Recovery Equipment means equipment or machinery exclusively and integrally used in the actual process of recovering material or energy resources from solid waste.

Putrescible simply means to be capable of being decomposed by microorganisms thereby constituting nuisances through its odour or gases to the environment.

Recyclable Material means solid waste that can be processed and returned to the economic mainstream in the form of raw materials or products. Recyclable material includes, but is not limited to:

(i) newspaper
(ii) corrugated cardboard
(iii) aluminum
(iv) office paper
(v) glass
(vi) tin and steel cans
(vii) metal
(viii) motor oil
(ix) plastic
(x) wood and
(xi) food waste.

Solid Waste means all refuse in solid or semisolid form, including, but not limited to construction waste, incinerator residue, dead animals, street refuse, commercial and industrial waste, junk vehicles, garbage, rubbish, ashes and junk vehicles.

SELF-ASSESSMENT EXERCISE 1

Identify and describe at least five basic concepts in the recovering and recycling of materials.

3.2 Disposal Procedures

When selling scrap and surplus materials, adequate procedures must be established that will protect the company from loss, dishonest employees, and irregular practices on the part of the purchaser. These procedures must cover a broad range of activities, including recovering and storage, negotiation, supplier selection, and payment.

Scrap should be properly segregated in order to avoid being contaminated by foreign materials. For example, assuming steel and copper scrap are mixed, the return per pound on sale will likely be less than the lowest-priced scrap. This is because the buyer would have to incur the expense of separating the scrap before processing. As a result of this, it is advisable that scrap should be segregated, prepared, and analysed systematically during the various stages of the production process in order to protect its value. Scrap can be segregated by type, size, texture, colour, property, alloy and grade as at the time where the scrap is generated. This requires proper planning and organisation of segregation activities, which includes providing instructions to employees at collection points.

Training programmes can also be used to help company employees identify and separate scrap materials. Plants, not the dealers or the processors, should control the collection and classification of scrap materials, and company personnel should be familiar with the grades of scrap produced. Periodic studies should be conducted to evaluate the most effective methods of disposing of scrap in the light of changing volumes and different mixes of scrap grades.

It is also necessary that control measures should be put in place for accurate reporting, payment and conformity of implementation to plan. All sales should be approved by the head of the department and cash transactions should be done through the account section. In other word, there is need for proper documentation of all transactions. All delivery of byproducts sold should be accomplished through the issuing of an order form. The department responsible for the performance of this

function should maintain a list of reputable dealers in the particular line of material or equipment to be disposed of and should periodically review this list. While it is advisable to enter into a long contractual relationship with qualified buyers in order to reduce administrative costs, it is also good to ask for new bidders in order to stimulate competition among the buyers. The contract for sale of scrap items should include price, quantities involved (all or a percentage), time of delivery, FOB point, weight, and payments terms.

SELF- ASSESSMENT EXERCISE 2

Highlight the disposal procedures that you are familiar with.

3.3 Disposal Channels

There are several possible means of material disposal. In general, the options are, in order of maximum return to the selling company.

1. **Use elsewhere within the firm on an "as is" basis**. Recovered materials could be used just as they are with little or no modifications. While it may not be found useful again by the department for which it was originally bought for, it could be transferred and used by other plant within the same firm. For example, in the case of a multi-division operation, it is expected that each division should circulate to all other divisions a list of scrap/surplus/obsolete material and equipment and arrange them for interplant transfer. Enterprise resource planning (ERP) system should be put in place to facilitate efficient and effective transfer of these resources.

2. **Reclaim for use within the plant**. In a situation where there are shortages, materials could be processed or modified for reuse by the same plant within the organisation. The process could be welding, casting, refining, refurbishing, repackaging and updating depending on the nature of the material. In other words, this method constitutes a recycling; it reduces the waste stream and the cost of operation in organisations.

3. **Sell to another firm for use on an "as is" basis**. These materials could be sold to another organisation just as it is with little or no modification. A good example of this is when surplus or obsolete equipment and vehicles are sold at public auction. Some firms encourage its employees to buy, as part of their employee relations program, used equipment or surplus materials at preset prices.

4. **Return to supplier**. There are situations when materials can actually be returned to the manufacturer or supplier from whom it was purchased, either for cash or for credit on other later purchases. For example, most of the steel scrap is sold by large-quantity purchasers directly back to the mills. In the case of surplus (new) inventory items, the original supplier may be willing to accept returned items.

5. **Sell through a broker**. There are some brokers that specialise in handling the sale of scrap, surplus, and obsolete equipment and materials. These brokers bring buyer and seller together and get commission once the transaction is successful. Some of these brokers have active websites in order to facilitate direct marketing of these obsolete materials or scraps as the case may be.

6. **Sell to a local dealer**. This channel of disposing materials may not be very attractive to firms because the profit margin may be low. Unlike that of broker, the dealer assumes the risk of investment and so will like to buy it at a reduced rate from the firm and then add its own profit margin to the price.

7. **Donate, discard, or destroy the material or item**. Apart from all the options already identified above, firms may decide to discard or donate the material to schools or charity homes where such materials will be needed. Before the firm could decide to discard the material it must have been obvious that the material could not be resold, recycled or donated any more perhaps for total erosion of value. There are instances when the material would have to be destroyed if it will constitute pollution to the environment.

SELF-ASSESSMENT EXERCISE 3

Identify and discuss different channels available for disposal of materials.

3.3.2 Selecting the Right Disposal Partner

Disposal of scraps or obsolete materials must be handled with care because of its effects on the cost of operations. It is obvious that supply managers are trained for supply of valuable equipments and materials to the organisation. There is therefore need for adequate orientation for them with regards to disposal or recycling of materials.

In some situations, plants would need to rely on support from scrap dealers to help in managing the elements of their disposal activities. Disposal management is highly regulated especially in developed countries. It is therefore advisable that firms should select qualified dealers based on its level of expertise in areas such as secondary processing and waste treatment capabilities and capacity; size and capacity of truck fleet; ability to provide dependable service; problem-solving capabilities; ability to provide destruction of scrap products in order to avoid entry into the market; and financial stability.

Among other factors that will determine the disposal partners to be selected is the volume of the scrap or waste materials. This has a significant influence on how companies choose to manage their disposal activities. Plants with high volumes often prefer disposal partners with dedicated staff and employ a greater level of resources in the disposition process.

Every effort should be made by firms to secure the right partner that will help to obtain maximum competition from sources available to buy scrap or surplus material. Most of the time, firms would prefer brokers who will only collect commission to dealers, who will likely buy from the firm at a reduced rate. Unfortunately, the number of potential users and buyers of scrap in a particular area may be small, resulting in noncompetitive disposal situations. Firms should actively attempt to find new buyers and encourage them to compete in terms of price paid and services provided.

SELF-ASSESSMENT EXERCISE 3

What are the efforts to be embarked upon in the course of identifying the right disposal partner?

4.0 CONCLUSION

The volume of scrap or waste material has a significant influence on how companies choose to manage their disposal activities. Plants with high volumes often support disposal activities with dedicated staff and employ a greater level of resources in the disposition process. Depending on volume, logistics systems also differ. For example, plants that generate a high volume of a particular grade of scrap may find it cost-effective to utilise rail transportation or specialised highway trailers. Every effort should be made to obtain maximum competition from sources available to buy scrap or surplus material. Unfortunately, the number of potential users and buyers of scrap in a particular area may be small, resulting in noncompetitive disposal situations. Materials management department should actively attempts to find new buyers

and encourage then to compete in terms of price paid and services provided.

5.0 SUMMARY

In most situations, plants must rely on support from scrap dealers to help manage elements of their disposal activities. As a result of the costs associated with regulatory noncompliance, generators of scrap and waste must be aware of what happens to the material after it leaves the company premises. Consequently, only approved processors, dealers, or brokers should be used, with qualification based on a range of possible criteria: secondary processing and waste treatment capabilities and capacity; size and capacity of truck fleet; ability to provide dependable service; problem-solving capabilities; ability to provide destruction of scrap products in order to avoid entry into the market; and financial stability. Assessing the financial stability of the dealer, broker, or processor often requires obtaining a list of credit references or obtaining a credit report from an organisation.

6.0 TUTOR-MARKED ASSIGNMENT

i. In a situation where the material could not be reclaimed within the plants, what are other options available for the disposal of the material?
ii. Compare and contrast these two disposal channels: selling through a dealer or selling through a broker. Which one of them would you like to recommend for firms?
iii. What are the factors that should be considered in the selection of right disposal partner?
iv. "It has been argued that procedures for disposal of materials involve activities such as segregating, planning, training, control, proper record keeping and documentation." Elucidate.

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UNIT 4 PUBLIC PROCUREMENT ACT

CONTENTS

1.0 INTRODUCTION

Public procurement is described as the acquisition by any means of goods, works and services by the government. By virtue of the provisions of Section 55(2) of Public Procurement Act 2007, a Public Procurement Entity (PPE) is also a Public Disposal Entity (PDE) which by implication means that public procurement also includes the disposal of all government assets (whether tangible or intangible, serviceable or non serviceable) (Bougei, 2012). This description demonstrated clearly that public procurement is part of materials management functions that coordinate the process, systems or other activities of buying materials either raw materials or goods (consumer or industrial goods) or services from suppliers either externally or internally which are required to effectively and efficiently run government at federal, state and local levels.

This Act establishes the National Council on Public Procurement. The Bureau of Public Procurement was established by Public Procurement Act of 2007 to serve as the regulatory authority responsible for the monitoring and oversight of public procurement, harmonising the existing government policies and practices by regulating, setting standards and developing the legal framework and professional capacity for Public Procurement in Nigeria (Public Procurement Act, 2007).

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain how National Council on Public Procurement is established
- discuss the operations of Bureau of Public Procurement
- explain the scope of application of Public Procurement Act
- discuss the fundamental Principles for Procurements.

2.0 MAIN CONTENT

3.1 Part I - Establishment Of National Council On Public Procurement

According to the Public Procurement Act of 2007, the process of establishment of Bureau of Public Procurement is stated as follows:

Part I, Section (2) states that:

(1) --- (1) There is established the National Council on Public Procurement (in this Act referred to as "the Council").

(2) The Council shall consist of:

(a) The Minister of Finance as Chairman

(b) The Attorney-General and Minister of Justice of the Federation

(c) The Secretary to the Government of the Federation

(d) The Head of Service of the Federation

(e) The Economic Adviser to the President

(f) Six part-time members to represent

(i) Nigeria Institute of Purchasing and Supply Management

(ii) Nigeria Bar Association

(iii) Nigeria Association of Chambers of Commerce, Industry, Mines and Agriculture

(iv) Nigeria Society of Engineers

(v) Civil Society

(vi) The Media; and

(g) The Director-General of the Bureau who shall be the Secretary of the Council.

(3) Notwithstanding the provisions of Section (2), the council may co-opt any person to attend its meeting but the person so co-opted shall not have a casting vote or be counted towards quorum.

(4) The Chairman and other members of the Council shall be appointed by the President.

(5) Subject to subsection (2) of this Section. a member of the Council being:
   (a) the holder of an elective office under the Constitution of Nigeria, shall hold office for the period he remains so elected and no more ; and
   (b) the Director-General of the Bureau, shall hold office on such terms and conditions as may be specified in his letter of appointment.

Functions of the Council

The Council shall:

(a) consider, approve and amend the monetary and prior review thresholds for the application of the provisions of this Act by procuring entities
(b) consider and approve policies on public procurement
(c) approve the appointment of the Directors of the Bureau
(d) receive and consider, for approval, the audited accounts of the Bureau of Public Procurement
(e) approve changes in the procurement process to adapt to improvements in modern technology; and
(f) give such other directives and perform such other functions as may be necessary to achieve the objectives of this Act.

SELF-ASSESSMENT EXERCISE

List the members of National Council on Public Procurement.

3.2 Part II - Establishment Of The Bureau Of Public Procurement

According to the Public Procurement Act of 2007, the process of establishment of Bureau of Public Procurement is stated as follows:

Part II, Section (3) states that:

1. There is established an agency to be known as the Bureau of Public
   Procurement in this Act referred to as "the Bureau".
2. The Bureau:
   (a) shall be a body corporate with perpetual succession and a common seal
   (b) may sue and be sued in its corporate name; and

(c) may acquire, hold or dispose of any property, movable or immovable for the purpose of carrying out any of its functions under this Act.

Part II, Section (4) states that:

(4) The objectives of the Bureau are:

(a) the harmonisation of existing government policies and practices on public procurement and ensuring probity, accountability and transparency in the procurement process

(b) the establishment of pricing standards and benchmarks

(c) ensuring the application of fair, competitive, transparent, value-for money standards and practices for the procurement and disposal of public assets and services; and

(d) the attainment of transparency, competitiveness, cost effectiveness and professionalism in the public sector procurement system.

Part II, Section (5) states that:

(5) The Bureau shall:

(a) formulate the general policies and guidelines relating to public sector procurement for the approval of the Council

(b) publicise and explain the provisions of this Act

(c) subject to thresholds as may be set by the Council, certify Federal procurement prior to the award of contract

(d) supervise the implementation of established procurement policies

(e) monitor the prices of tendered items and keep a national database of standard prices

(f) publish the details of major contracts in the procurement journal

(g) publish paper and electronic editions of the procurement journal and maintain an archival system for the procurement journal

(h) maintain a national database of the particulars and classification and categorisation of Federal contractors and service providers

(i) collate and maintain in an archival system, all federal procurement plans and information

(j) undertake procurement research and surveys

(k) organise training and development programmes for procurement professionals

(l) periodically review the socio-economic effect of the policies on procurement and advise the Council accordingly
(m) prepare and update standard bidding and contract documents
(n) prevent fraudulent and unfair procurement and where necessary apply administrative sanctions
(o) review the procurement and award of contract procedures of every entity to which this Act applies
(p) perform procurement audits and submit such report to the National Assembly bi-annually
(q) introduce, develop, update and maintain related database and technology
(r) establish a single internet portal that shall, subject to Section 16 (21) to this Act serve as a primary and definitive source of all information on government procurement containing and displaying all public sector procurement information at all times; and
(s) co-ordinate relevant training programs to build institutional capacity.

Part II, Section (6) states that:

6--- (1).The Bureau shall have the power to:

(a) enforce the monetary and prior review thresholds set by the Council for the application of the provisions of this Act by the procuring entities
(b) subject to the paragraph (a) of this subsection, issue certificate of "No Objection" for Contract Award" within the prior review threshold for all procurements within the purview of this Act
(c) from time to time stipulate to all procuring entities the procedures and documentation pre- requisite for the issuance of Certificate of 'No Objection' under this Act
(d) Where a reason exists:
    (i) cause to be inspected or reviewed any procurement transaction to ensure compliance with the provisions of this Act
    (ii) review and determine whether any procuring entity has violated any provision of this Act
(e) debar any supplier, contractor or service provider that contravenes any provision of this Act and regulations made pursuant to this Act
(f) maintain a national database of federal contractors and service providers and to the exclusion of all procuring

entities prescribe classifications and categorisations for the companies on the register

(g) maintain a list of firms and persons that have been debarred from participating in public procurement activity and publish them in the procurement journal

(h) call for such information, documents, records and reports in respect of any aspect of any procurement proceeding where a breach, wrongdoing, default, mismanagement and or collusion has been alleged, reported or proved against a procuring entity or service provider

(i) recommend to the Council, where there are persistent or serious breaches of this Act or regulations or guidelines made under this Act for.

(j) the suspension of officers concerned with the procurement or disposal proceeding in issue:

(ii) the replacement of the head or any of the members of the procuring or disposal unit of any entity or the Chairperson of the Tenders Board as the case may be

(iii) the discipline of the Accounting Officer of any procuring entity

(iii) the temporary transfer of the procuring and disposal function of a procuring and disposing entity to a third party procurement agency or consultant; or

(iv) Any other sanction that the Bureau may consider appropriate

(k) call for the production of books of accounts, plans, documents, and examine persons or parties in connection with any procurement proceeding

(l) act upon complaints in accordance with the procedures set out in this Act

(m) nullify the whole or any part of any procurement proceeding or award which is in contravention of this Act;:

(n) do such other things as are necessary for the efficient performance of its functions under this Act

(o) the Bureau shall serve as the Secretariat for the Council.

(p) the Bureau shall, subject to the approval of the Council, have power to:

(a) enter into contract or partnership with any company, firm or person which in its opinion will facilitate the discharge of its functions

(b) request for and obtain from any procurement entity information including reports, memoranda and audited accounts, and other information relevant to its functions under this Act; and

(c) liaise with relevant bodies or institutions national and international for effective performance of its functions under this Act.

Part II, Section (7) states that:

7. -- (1). There shall be for the Bureau, a Director-General who shall be appointed by the President, on the recommendation of the Council after competitive selections.

(2) The 'Director-General shall be:

(a) the Chief Executive and accounting officer of the Bureau

(b) responsible for the execution of the policy and day to day administration of the affairs of the Bureau; and

(c) a person who possesses the relevant and adequate professional qualification and shall have been so qualified for a period of not less than 15 years.

(3) The Director-General shall hold office:

(a) for a term of 4 years in the first instance and may be re-appointed for a further term of 4 years and no more; and

(b) on such terms and conditions as may be specified in his letter of appointment.

(4) without prejudice to the provisions of this Act, the Director- General of the Bureau may be removed from office at the instance of the President on the basis of gross misconduct of financial impropriety, fraud, and manifested incompetence proven by the Council.

Part II, Section (8) states that:

8. — (1). the Council shall appoint the principal officers for the Bureau after competitive selection process

(2) the principal officers appointed under Section 9 (I) of this Section shall each have the requisite qualification and experience required for the effective performance of the functions of their respective Departments and the Bureau as specified under this Act

(3) the Council shall have power to modify the operational structure of the Bureau as may be necessary to enhance the Bureau's duties and functions under this Act.

Part II, Section (9) states that:

9. — (1). the Council may appoint such officers and other employees as may, from time to time, deem necessary for the purposes of the Bureau.

(2) subject to the Pension Reform Act, the terms and conditions of service (including remuneration, allowances, benefits and pensions) of officers and employees of the Bureau shall be as determined by the Council

(3) without prejudice to the generality of subsection, the Council shall have power to appoint either on transfer or on secondment from any public service in the Federation, such number of employees as may, be required to assist the Bureau in the discharge of any of its functions under the Act and persons so employed shall be remunerated (including allowances) as the Council may consider appropriate.

Part II, Section (10) states that:

10. - (1) the Council may, subject to the provisions of this Act and within six
months of the inauguration, make staff regulations relating generally to the conditions of service of the employees of the Bureau and without prejudice to the foregoing, such regulations may provide for:

(a) the appointment, promotion and disciplinary control (including dismissal) of employees of the Bureau ; and

(b) appeals by such employees against dismissal or other disciplinary measures.

(2) Until such regulations are made, any instrument relating to the conditions of service of officers in the civil service of the Federation shall be applicable.

Part II, Section (11) states that:

(11) employees of the Bureau shall be entitled to pensions, and other retirement benefits as prescribed under the Pension Act.

Part II, Section (12) states that:

(12) — 1. the Bureau shall establish and maintain a Fund to be approved by the Council into which shall be paid and credited:

(a) the sums appropriated by the National Assembly for the running of the Bureau

(b) all subventions, fees and charges for services rendered or publications made by the Bureau; and

(c) all other assets which may from time to time accrue to the Bureau.

(2) the Bureau shall charge its fund to meet all its expenditure

(3) the Council may make regulations for the Bureau:

(a) specifying the manner in which assets or the fund of the Bureau are to be held, and regulating the making of payment into and out of the fund; and requiring the keeping of proper accounts and records for the purposes of the fund in such form as may be specified in the rules.

(4) the Bureau may, from time to time, apply the proceeds of the fund for:

(a) the cost of administration of the Bureau;

(b) the payments of salaries, fees and other remuneration, employees of the Bureau or experts or professionals appointed by the Bureau;

(c) the maintenance of any property acquired by or vested in the Bureau;

(d) any matter connected with all or any of the functions of the Bureau under his Act.

(e) the payments of salaries, fees, and other remuneration, of employees of the Bureau or experts or professionals appointed by the Bureau; and

(f) any expenditure connected with all or any of the functions of the Bureau under this Act.

Part II, Section (13) states that:

13. - (1) the financial year of the Bureau shall be the same as that of the
Federal Government.

(2) not later than 6 months before the end of the financial year, the Bureau shall submit to the Council an estimate of its expenditure and projected income during the next succeeding year.

(3) the Bureau shall keep proper accounts and records of its receipts, payments, assets and liabilities and shall in respect of each financial year prepare a statement of account in such form as the Council may direct.

(4) the Bureau shall within 6 months after the end of the financial year to which the accounts relate cause the accounts to be audited in accordance with guidelines supplied by the Auditor-General of the Federation.

(5) the Bureau shall at the end of each financial year, prepare and submit to the Council a report in such form as shall accurately capture all the activities of the Bureau during the preceding year and shall include in their report a copy of the audited accounts of the Bureau for that year.

Part II, Section (14) states that:

14. --- (1) subject to the provisions of this Act, no suit shall be commenced
against the Bureau before the expiration of 30 days after written notice of an intention to commence the suit shall have been served upon the Bureau by, the intending plaintiff or his agent; and the notice shall clearly and explicitly state:

(a) the cause of action
(b) the particulars of the claim
(c) the name and address of legal practitioner of the intending plaintiff; and
(d) the relief being sought.

(2) the Director-General of the Bureau, its officers, employees or agents shall not personally be subject to any action, claim or demand by, or liable to any person in respect of anything done or omitted to be done in exercise of any functions or power conferred by this Act upon the Bureau, its Director-General, officers, employees or agents.

(3) a member of the Bureau or the Director-General or any officer or employee of the Bureau shall be indemnified out of the assets of the Bureau against any liability incurred by him in defending any proceeding, whether civil or criminal, if the proceeding is brought against him in his capacity as a member, Director-General, officer or other employee of the Bureau.

(4) a notice, summons or other documents required or authorized to be served upon the Bureau under the provisions of this Act or any other law enactment may be served by delivering it to the Director-General or by

sending it by registered post and addressed to the Director-General at the principal office of the Bureau.

SELF-ASSESSMENT EXERCISE 2

Highlight the functions of Bureau of Public Procurement

3.3.1 PART III –Scope of Application Public Procurement Act

According to Public Procurement Act of 2007, the scope of application of Public Procurement Act is stated as follows:

Part III, Section (15) states that:

15. - (1) the provisions of this Act shall apply to all procurement of goods,
works, and services carried out by:
(a) the Federal Government of Nigeria and all procurement entities
(b) all entities outside the foregoing description which derive at least35% of the funds appropriated or proposed to be appropriated for any type of procurement described in this Act from the Federation share of Consolidated Revenue Fund.

(2) the provisions of this Act shall not apply to the procurement of special goods; works and services involving national defense or national security unless the President's express approval has been first sought and obtained.

3.3.2 PART IV-Fundamental Principles for Public Procurements

According to Public Procurement Act of 2007, the scope of application of Public Procurement Act is stated as follows:

Part IV, Section (16) states that:

16. - (1) subject to any exemption allowed by this Act, all public procurement
shall be conducted:
(a) subject to the prior review thresholds as may from time to time be set by the Bureau pursuant to Section 7(1) (a)-(b)
(b) based only on procurement plans supported by prior budgetary appropriations and no procurement

proceedings shall be formalised until the procuring entity has ensured that funds are available to meet the obligations and subject to the threshold in the regulations made by the Bureau, has obtained a "Certificate of ' No Objection' to Contract Award" from the Bureau;

(c) by open competitive bidding

(d) in a manner which is transparent, timely, equitable for ensuring accountability and conformity with this Act and regulations deriving there from

(e) with the aim of achieving value for money and fitness for purpose

(f) in a manner which promotes competition, economy and efficiency; and

(g) in accordance with the procedures and time-line laid down in this Act and as may be specified by the Bureau from time to time.

(2) where the Bureau has set prior review thresholds in the procurement regulations, no funds shall be disbursed from the Treasury or Federation Account or any bank account of any procuring entity for any procurement falling above the set thresholds unless the cheque, payments or other form of request for payments is accompanied by a certificate of "No objection" to an award of contract duly issued by the Bureau

(3) for all cases where the Bureau shall set a prior review threshold, the Bureau shall prescribe by regulation, guidelines and the conditions precedent to the award of Certificate of "No Objection" under this Act.

(4) subject to the prior review thresholds as may be set by the Bureau, any procurement purported to be awarded without a "Certificate of ‘No Objection' to Contract Award" duly issued by the Bureau shall be null and void

(5) a supplier, contractor or service provider may be a natural person, a legal person or a combination of the two. Suppliers, contractors or service providers acting jointly are jointly and severally liable for all obligations and or responsibility arising from this Act and the non-performance or improper performance of any contract awarded pursuant to this Act

(6) all bidders in addition to requirements contained in any solicitation documents shall:

(a) possess the necessary:

(i) professional and technical qualifications to carry out particular procurements ;

(ii) financial capability ;

(iii) Equipment and other relevant infrastructure
(iv) Shall have adequate personnel to perform the obligations of the procurement contracts

(b) possess the legal capacity to enter into the procurement contract;
(c) not be in receivership, the subject of any form of insolvency or bankruptcy proceedings or the subject of any form of winding up petition or proceedings
(d) have fulfilled all its obligations to pay taxes, pensions and social security contributions
(e) not have any Director who has been convicted in any country for any criminal offence relating to fraud or financial impropriety or criminal misrepresentation or falsification or acts relating to any matter
(f) accompany every bid with an affidavit disclosing whether or not any officer of the relevant committees of the procurement entity or Bureau is a former or present Director, shareholder or has any pecuniary interest in the bidder and confirm that all information presented in its bid are true and correct in all particulars

(7) the procuring entity may require a bidder to provide documentary evidence or other information it considers necessary as proof that the bidder is qualified in accordance with this Act and the solicitation documents and for this purpose any such requirements shall apply equally to all bidders
(8) whenever it is established by a procuring entity or the Bureau that any or a combination of the situations set out exists, a bidder may have its bid or tender excluded from any particular procurement proceeding if:
(a) there is verifiable evidence that any supplier, contractor or consultant has given or promised a gift of money or any tangible item, or has promised, offered or given employment or any other benefit, item or a service that can be quantified in monetary terms to a current or former employee of a procuring entity or the Bureau, in an attempt to influence any action, or decision making of any procurement activity
(b) a supplier, contractor or consultant during the last three years prior to the commencement of the procurement proceedings in issue, failed to perform

or to provide due care in performance of any public procurement

(c) the bidder is in receivership or is the subject of any type of insolvency proceedings or if being a private company under the Companies and Allied Matters Act, is controlled by a. person or persons who are subject to any bankruptcy proceedings or who have been declared bankrupt and or have made any compromises with their creditors within two calendar-years prior to the initiation of the procurement proceeding

(d) the bidder is in arrears regarding payment of due taxes, charges, pensions, or social insurance contributions, unless such bidders have obtained a lawful permit with respect to allowance, difference of such outstanding payments or payment thereof in installments

(e) the bidder has been validly sentenced for a crime committed in connection with a procurement proceeding, or any other crime committed to gain financial profit

(f) the bidder has in its management or is in any portion owned by any person that has been validly sentence for a crime committed in connection with a procurement proceeding, or other crime committed to gain financial profit; and

(g) the bidder fails to submit a statement regarding its dominating or subsidiary relationships with respect to other parties to the proceedings and persons acting on behalf of the procuring entity participating in same proceeding or whom remains in subordinate relationship with other participants to the proceedings

(9) in such cases the procuring entity shall inform the Bureau and person referred to in subsection (8) (a)-(b)of this Section, in writing that the bid or tender in question has been excluded and the grounds for the exclusion and to keep a record of same in the file pertaining to the public procurement proceeding in question

(10) all communications and documents issued by procuring entities and the Bureau shall be in English language

(11) all communications regarding any matter deriving from this Act or proceedings of public procurement shall be in writing or such other form as may be stipulated by the Bureau

(12) every procuring entity shall maintain both file and electronic records of all procurement proceedings made within each financial year and the procurement records shall be maintained for a period often years from the date of the award

(13) copies of all procurement records shall be transmitted to the Bureau not later than 3 months after the end of the financial year and shall show:
   (a) information identifying the procuring entity and the contractors
   (b) the date of the contract award
   (c) the value of the contract: and
   (d) the detailed records of the procurement proceedings.

(14) all unclassified procurement records shall be open to inspection by the public at the cost of copying and certifying the documents plus an administrative charge as maybe prescribed from time to time by the Bureau

(15) the criteria stipulated as the basis upon which suppliers or contractors would be evaluated shall not be changed in the course of any procurement proceeding

(16) the burden of proving fulfillment of the requirements for participation in any procurement proceeding shall lie on the supplier or contractor

(17) a contract shall be awarded to the lowest evaluated responsive bid from the bidders substantially responsive to the bid solicitation

(18) notwithstanding subsection (16) of this Section, the Bureau may refuse to issue a 'Certificate of "No Objection" to Contract Award' on the grounds that the price is excessive

(19) pursuant to subsection (17) of this Section, the Bureau may direct either that the procurement proceedings be entirely cancelled or that the procuring entity conduct a re-tender.

(20) pursuant to subsection (18) of this Section, the Bureau may either direct that the procurement proceedings be entirely cancelled or that the procuring entity conduct a re-tender

(21) the accounting officer of a procuring entity and any officer to whom responsibility is delegated are responsible and accountable for any actions taken or omitted to be taken either in compliance with or in contravention of this Act

(22) the accounting officer of a procuring entity has the responsibility to ensure that the provisions of this Act and the regulations laid down by the Bureau are complied

with, and concurrent approval by any Tenders Board shall not absolve the accounting officer from accountability for anything done in contravention of this Act or the regulations laid down hereunder.

(23) procurement and disposal decisions of a procuring entity shall be taken in strict adherence to the provisions of this Act and any regulations as may from time to time be laid down by the Bureau

(24) persons who have been engaged in preparing for a procurement or part of the proceedings thereof may neither bid for the procurement in question or any part thereof either as main contractor or sub-contractor nor may they cooperate in any manner with bidders in the course of preparing their tenders

(25) a procuring entity shall not request or stipulate that a bidder should engage a particular subcontractor as a requirement for participating in any procurement proceedings.

(26) all procurement contracts shall contain provisions for arbitral proceedings as the primary forms of dispute resolution

(27) the values in procurement documents shall be stated in Nigerian currency and where stated in a foreign currency shall be converted to Nigerian currency using the exchange rate of the Central Bank of Nigeria valid on the day of opening a tender or bid

(28) all procurement contracts shall contain warranties for durability of goods, exercise of requisite skills in service provision and use of genuine materials and inputs in execution.

SELF-ASSESSMENT EXERCISE 3

Mention the fundamental principles for Public Procurement.

4.0 CONCLUSION

The Parts and Sections of Public Procurement Act 2007 demonstrate clearly that public procurement is part of materials management functions that coordinate the process, systems or other activities of buying materials (either raw materials or goods) (consumer or industrial goods) or services from suppliers either externally or internally which are required to effectively and efficiently run government at federal, state and local levels. The major differences between private and public procurement are (i) capital in some public procurements is higher compared to private procurements (ii) public

procurement involving huge capital must pass through Due Process Office.

5.0 SUMMARY

In this unit, we have presented some parts and sections of the Public Procurement Act of 2007. We showed how the National Council on Public Procurement was established. We discussed how the Bureau of Public Procurement is managed. Scope of application of Public Procurement Act and the fundamental principles of procurement were also presented.

6.0 TUTOR-MARKED ASSIGNMENT

i. Explain how National Council on Public Procurement is established.
ii. Describe the management of Bureau of Public Procurement.
iii. Present the fundamental principles of Public procurement

7.0 REFERENCES/FURTHER READING

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Public Procurement Act of 2007.

UNIT 5 PROCUREMENT METHODS/ DISPOSAL OF PUBLIC PROPERTY/DUE PROCESS OFFICE

CONTENTS

1.0 INTRODUCTION

The relevance of the unit is to study the organisation of public procurement activities and understand the rules and procedures for procurement methods. Due Process is a framework that certifies and ensures only materials (either goods or services) that have passed the public test of proper implementation packaging and which follow strictly the rules and procedures of international competitive bid approach in the award process can be funded and procured. The Public Procurement Act of 2007 states that all procurements of goods and works by all procuring entities shall be conducted by open competitive bidding. Any reference to open competitive bidding in this Act means the process by which a procuring entity based on previously defined criteria, effects public procurements by offering to every interested bidder equal simultaneous information and opportunity to offer the goods and works needed. The winning bid shall be the lowest evaluated responsive bid which has been responsive to the bid with regards to work specification and standard Public Procurement Act of 2007.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the organisation of Public Procurement
- discuss Public Procurement Methods
- explain how Public Property can be disposed
- discuss Due Process as relates to Processing Contract Bids.

3.0 MAIN CONTENT

3.1 PART V-Organisation of Public Procurements

According to the Public Procurement Act of 2007, the scope of application of Public Procurement Act is stated as follows:

Part V, Section (17) states that:

(17) subject to the monetary and prior review thresholds for procurement, this Act as may from time to time be determined by the Council and the following approving authority:

(A) in the case of:

(i) a government agency parastatal, or corporation, a Parastatals Tenders, Board ; and,

(ii) a ministry or extra-ministerial entity, the Ministerial Tender Board.

Part V, Section (18) states that:

(18) subject to regulations as may from time to time be made by the But under the direction of the Council, a procuring entity shall plan its procurement

(a) preparing the needs assessment and evaluation

(b) identifying the goods, works or services required

(c) carrying appropriate market and statistical surveys and on that basis prepare analysis of the cost implications of the proposed procurement

(d) aggregating its requirements whenever possible, both within the procurement entity and between procuring entities, to obtain economy of scale and reduce procurement cost

(e) integrating its procurement expenditure into its yearly budget

(f) prescribing any method for effecting the procurement subject to the necessary approval under this Act; and

(g) ensuring that the procurement entity functions stipulated in this Section shall be carried out by the Procurement Planning Committee.

Part V, Section (19) states that:

(19). subject to regulations as may from time to time be made by the Bureau, under direction of Council, a procuring entity shall, in implementing its procurement plans:

(a) advertise and solicit for bids in adherence to this Act and guidelines as may be issued by the Bureau from time to time;
(b) to invite two credible persons as observers in every procurement process, one person each representing a recognised:
    (i) private sector professional organisation whose expertise is relevant the particular goods or service being procured, and
    (ii) non-governmental organisation working in transparency, accountability and anti-corruption areas, and the observers shall not intervene in the procurement process but shall have right to submit their observation report to any relevant agency or body including their own organisations or associations
(c) receive, evaluate and make a selection of the bids received in adherence to this Act and guidelines as may be issued by the Bureau from time to time
(d) obtain approval of the approving authority before making an award
(e) debrief the bid losers on request
(f) resolve complaints and disputes if any
(g) obtain and confirm the validity of any performance guarantee
(h) obtain a "Certificate of ' No Objection' to Contract Award" from the Bureau within the prior review threshold as stipulated in Section 3 of this Act:
(i) execute all Contract Agreements; and
(j) announce and publicise the award in the format stipulated by this Act and guidelines as may be issued by the Bureau from time to time.

Part V, Section (20) states that:

20. – (1) the accounting officer of a procuring entity shall be the person charged with line supervision of the conduct of all procurement processes; in the case of ministries the Permanent Secretary and in the case of extra-ministerial departments and corporations the Director-General or officer of co-ordinate responsibility.

(2) the accounting officer of every procuring entity shall have overall responsibility for the planning of, organisation of tenders, evaluation of tenders and execution of all procurements and in particular shall be responsible for:

(a) ensuring compliance with the provisions of this Act by his entity and liable in person for the breach or contravention of this Act or any regulation made hereunder whether or not the act or omission was carried out by him personally or any of his subordinates and it shall not be material that he had delegated any function, duty or power to any person or group of persons;
(b) constituting the Procurement Committee and its decisions
(c) ensuring that adequate appropriation is provided specifically for the procurement in the Federal budget
(d) integrating his entity's procurement expenditure into its yearly budget
(e) ensuring that no reduction of values or splitting of procurements is carried out such as to evade the use of the appropriate procurement method
(f) constituting the Evaluation Committee
(g) liaising with the Bureau to ensure the implementation of its regulations.

Part V, Section (21) states that:

21. — (1) for each financial year, each procuring entity shall establish a Procurement Planning Committee

(2) the Procurement Planning Committee shall consist of:

(a) the accounting officer of the procuring entity or his representative who shall chair the Committee
(b) a representative of:
(i) the procurement unit of the procuring entity who shall be the Secretary
(ii) the unit directly in requirement of the procurement
(iii) the financial unit of the procuring entity
(iv) the Planning, Research and Statistics unit of the procuring entity
(v) technical personnel of the procuring entity with expertise in the subject Matter for each particular procurement, and
(vi) the legal unit of the procuring entity.

Part V, Section (22) states that:

22. — (1) there is hereby established by this Act in each procuring entity Tenders Board (in this Act referred to as "the Tenders Board").

(2) subject to the approval of the Council, the Bureau shall from time to time prescribe guidelines for the membership of the Tenders Board

(3) the Tenders Board shall be responsible for the award of procurements goods, works and services within the threshold set in the regulations

(4) in all cases where there is a need for pre-qualification, the Chairman of the Tenders Board shall constitute a technical evaluation sub-committee of the Tenders Board charged with the responsibility for the evaluation of bids which shall be made up of professional staff of the procuring entity and the Secretary of the Tenders Board who shall also be the Chair of the Evaluation Sub-committee

(5) the decision of the Tenders Board shall be communicated to the Minister.

Part V, Section (23) states that:

23. – (1) where a procuring entity has made a decision with respect to the
bidders minimum qualifications of suppliers, contractors or service providers by requesting interested persons to submit applications, to pre-qualify, it shall set out precise criteria upon which it seeks to give consideration to the applications in reaching decision as to which supplier, contractor or service provider qualifies, apply only the criteria set out in the prequalification

(2) procuring entities shall supply a set of prequalification documents to each supplier, Contractor or Consultant that request them, and the price that a procurement entity may charge for the prequalification documents shall reflect only the cost of printing and provision to suppliers or contractors and consultants

(3) the prequalification document shall include:

(a) instructions to prepare and submit prequalification application

(b) a summary of the main terms and conditions required for the procurement contract to be entered into as a result of the procurement proceedings

(c) any documentary evidence or other information that must be submitted to suppliers, contractors or consultants to demonstrate their qualifications

(d) the manner and place for the submission of applications to pre-qualify and the deadline for the submission, expressed as a specific date and time which allows sufficient time for suppliers, contractors or consultants to prepare and submit their applications, taking into account the reasonable need of the procuring entity ; and

(e) any other requirement that may be established by the procuring entity in conformity with this Act and procurement regulations relating to the preparation and submission of applications to pre-qualify and to the prequalification proceedings

(4) the procurement entity shall respond to any request by a supplier, contractor or consultant for clarification of the prequalification documents if the request is made at least ten days before the deadline for the submission of applications to prequalify

(5) the response by the procuring entity shall be given within a reasonable time and in any event within a period of at most seven working days so as to enable the supplier, contractor or consultant to make a timely submission of its application to prequalify

(6) the response to any request that might reasonably be expected to be of interest to other supplier, contractor or consultant shall, without identifying the source of the request, be communicated to other suppliers or contractors or consultants provided with the prequalification documents by the procuring entity.

(7) a procuring entity shall promptly notify each supplier, contractor or consultant which submitted an application to pre-qualify of whether or not it has been pre-qualified and shall make available to any member of the general public upon request, the names of the suppliers, contractors or consultants who have been pre-qualified.

(8) suppliers, contractors or consultants who have been pre-qualified may Participate further in the procurement proceeding

(9) the procuring entity shall upon request communicate to suppliers, contractors or consultants who have not been pre-qualified, the grounds for disqualification

(10) the procuring entity may require a supplier, contractor or service provider who has been pre-qualified to demonstrate its qualifications again in accordance with the

same criteria used to pre-qualify the supplier, contractor or consultant

(11) the procuring entity shall promptly notify each supplier, contractor or service provider requested to demonstrate its qualifications again whether or not the supplier, contractor or consultant has done so to the satisfaction of the procuring entity

(12) the procuring entity shall disqualify any supplier, contractor or service provider who fails to demonstrate its qualification again if requested to do so.

3.1.1 PART VI - Procurement Methods (Goods and Services)

According to the Public Procurement Act of 2007, the scope of application of Public Procurement Act is stated as follows:

Part VI, Section (24) states that:

24. - 1 except as provided by the Public Procurement Act Nigeria, all procurements of goods and work by all procuring entities shall be conducted by open competitive bidding.

2 any reference to open competitive bidding in this Act means the process by which a procuring entity based on previously defined criteria, effects public procurements by offering to every interested bidder equal simultaneous information and opportunity to offer the goods and works needed.

3. the winning bid shall be the lowest evaluated responsive bid which has been responsive to the bid with regards to work specification and standard.

Part VI, Section (24) states that:

25. - (1) invitations to bid may be either by way of National Competitive
Bidding or International Competitive Bidding and the Bureau shall from time to time set the monetary thresholds for which procurements shall fall under either system. Every invitation to an open competitive bid shall:

(i) in the case of goods and works under International Competitive Bidding, the invitation for bids shall be advertised in at least two national newspapers and one relevant internationally recognized publication, any official websites of the procuring entity and the Bureau as well as the procurement

journal not less than six weeks before the deadline for submission of the bids for the goods and works

(ii) in the case of goods and works valued under National Competitive Bidding, the invitation for bids shall be advertised on the notice board of the procuring entity, any official web sites of the procuring entity, at least two national newspapers, and in the procurement journal not less than six weeks before the deadline for submission of the bids for the goods and works.

Part VI, Section (26) states that:

26. --- (1) subject to the monetary and prior review thresholds as may from time
to time be set by the Bureau all procurements valued in excess of the sums prescribed by the Bureau shall require a bid security in an amount not more than2% of the bid price by way of a bank guarantee issued by a reputable bank acceptable to the procuring entity

(2) the Bureau shall from time to time specify the principal terms and conditions of the required bid security in the tender documents

(3) when the procuring entity, requires suppliers or contractors submitting tenders to provide a bid security the requirement shall apply to each supplier or Contractor.

Part VI, Section (27) states that:

27. --- (1) all bids in response to an invitation to open competitive bidding shallbe submitted in writing and in addition to any other format stipulated in the tender documents, signed by an official authorised to bind the bidder to a contract and placed in a sealed envelope

(2). all submitted bids shall be deposited in a secured tamper-proof bid-box.

(3). all bids submitted shall be in English language

(4). the procuring entity shall issue a receipt showing the date and time the bid was delivered.

(5). any bid received after the deadline for the submission of bids shall not be opened and must be returned to the supplier or contractor which submitted it

(6). no communication shall take place between procuring entities and any supplier or contractor after the publication of a bid solicitation other than as provided in this Act.

SELF-ASSESSMENT EXERCISE 1

Discuss the organisation of Public Procurement Act of 2007

3.1.2 PART X-Disposal of Public Property

According to the Public Procurement Act of 2007, the scope of application of Public Procurement Act is stated as follows:

Part VI, Section (55) states that:

55. - (1) this Section shall apply subject to the Public Enterprises (commercialisation and commercialisation) Act 1999.

(2) for the purposes of this Act every procuring entity shall also be disposing entity

(3) the open competitive bidding shall be the primary source of receiving offers for the purchase of any public property offered for sale

(4) the Bureau shall, with the approval of the Council:

- (a) determine the applicable policies and practices in relation to the disposal of all public property
- (b) issue guidelines detailing operational principles and organisation modalities to be adopted by all procuring entities engaged in the disposal of public property and
- (c) issue standardised document, monitor implementation, enforce compliance and set reporting standards that shall be used by all procuring entities involved in the disposal of public property

(5) for the purposes of this Act, public property is defined as resources in the form of tangible and non-tangible assets (ranging from serviceable to the unserviceable)

- (a) created through public expenditure
- (b) acquired as a gift or through deeds
- (c) acquired in respect of intellectual or proprietary rights
- (d) acquired on financial instruments (including shares, stocks, bonds, etc); and
- (e) acquired by goodwill and any other gifts of the Federal Government.

(6) the means of the disposal of public assets shall include:

- (a) sale and rental;
- (b) lease and hire purchase
- (c) licenses and tenancies
- (d) franchise and auction

(e) transfers from one government department to another with or without financial adjustments; and
(f) offer to the public at an authorised variation.

Part VI, Section (56) states that:

56. — (1) before slating any public property for disposal, the accounting officer
(whether acting in his own authority or at the direction of any superior or other authority) in charge of any public property set for disposal shall authorise the preparation of a valuation report for such property by an independent Evaluator, or such professional with the appropriate competence to carry out the valuation

(2) the disposal of assets whether or not listed in the Assets register for a procuring entity shall be planned and integrated into the income and expenditure budget projection of the procuring entity

(3) the disposal of assets referred to in subsection (2) of this Section shall be timed to take place when the most advantageous returns can be obtained for the asset in order to maximize revenue accruing to the government

(4) all procuring entities shall distribute responsibilities for the disposal of public property between the procurement unit and the Tenders Board.

SELF-ASSESSMENT EXERCISE 1

Describe public property according the Public Procurement Act of 2007.

3.1.3 The Due Process Office: Structure and Functions

According to Eze (2005) in SLGP Consultants' Report Number 308, the Budget Monitoring and Price Intelligence Unit (BMPIU), also known as Due Process, was formally established under the Presidency in June 2003. It is run as an operationally independent body under the leadership of a Senior Special Assistant to the President. Its staff includes experts with bias for project management, construction and procurement.

The goal of Due Process is to ensure strict compliance with Federal government laid down guidelines and procedures for the procurement of capital and minor capital projects as well as associated goods and services. The objectives and functions of BMPIU, organisation of due process certification and due process review procedures are summarised below.

- **Objectives of Due Process**

Ezekwesili (2005) posits that Budget Monitoring and Price Intelligence Unit (BMPIU) which also addresses the development and operation of procurement of services for Federal Government and its agencies has the following objectives:

1. to harmonise existing government policies/practices and update same on public procurement
2. to ensure that packaging of project conception is geared to the realisation of priorities and targets
3. to determine whether or not Due Process has been observed in the procurement of services and contracts through the initiation and execution of such projects
4. to introduce more probity, accountability and transparency into the procurement process.
5. to establish and update pricing standards and benchmarks for all supplies to government
6. to monitor the implementation of projects during execution with a view to providing information on performance, output, compliance with specifications and targets (cost, quality and time).
7. to ensure that only projects which have been budgeted for are admitted for execution
8. to ensure that Budget spending is based on authentic reasonable and fair costing.

- **Functions of Due Process**

The functions of Due Process office according to Ezekwesili (2005) are:

1. to regulate and set standards including the enforcement of harmonized bidding and tender documents, and formulate the general policies and guidelines related to public sector procurement
2. certify all Federal-wide procurements.
3. supervise the implementation of established procurement policies, monitor the prices of tendered items and perform procurement audits
4. undertake monitoring of capital projects that have exceeded 50% of contract sum before release of further funds and document all projects at award and completion stages and publish same in designated journals
5. co-ordinate relevant training programmes to build institutional capacity and embark on regular public enlightenment

programmes to sensitise various stakeholders involved in procurement

In summary, the underlisted documents are to be forwarded to the Budget Monitoring and Price Intelligence Unit (BMPIU) as requirements for Due Process Review as asserted by Ezekwesili (2005).

1. The Project Policy file
2. Evidence of Advertisement as appropriate
3. Tender Returns
4. Tender Evaluation Report
5. Contract Award Letter and Agreement
6. Original Contract Bills of Quantities (if any)
7. Contract Drawings (if any)
8. Other Contract Documents
9. Financial Summary and Statements
10. Progress Reports
11. Variation Requests and Variation Orders arising
12. Interim Valuation and Certificates.

SELF-ASSESSMENT EXERCISE

Mention the documents required by Due Process Office to perform its functions.

4.0 CONCLUSION

The Public Procurement Act of 2007, a vital document in the operation of any nation, cannot be said to fully satisfy its functions and roles effectively and efficiently if all the parts and sections are properly followed and implemented. In this unit therefore, we have tried to present the portions of the Act that deal with procurement methods and how due Process office was established and also discuss its objectives and functions.

5.0 SUMMARY

In continuation of our study on Public Procurement Act, this unit was devoted to the understanding of the Act in areas of procurement methods and how to dispose public property following strictly the rules and procedures of international competitive bid approach in the award process. Also, the unit concluded by explaining the objectives and functions of Due Process Office.

4.0 TUTOR-MARKED ASSIGNMENT

i. Describe the procedure of Public Procurement methods.
ii. Explain how to dispose public property according the Public Procurement Act of 2007.
iii. State the functions and objectives of Due Process Office

7.0 REFERENCES/FURTHER READING

Eze, C. (2005). 'Framework for the Creation of a Due Process Unit in Enugu State Government'. SLGP Consultants' Report Number 308, Department for International Development.

Ezekwesili, O (2005). 'Due Process Mechanism and Digital Opportunities'. Paper Presented to the University Community at Princess Alexandria Auditorium, University of Nigeria, Nsukka.

Public Procurement Act of 2007.