



Mt Kenya

University

DEPARTMENT OF BUSINESS AND SOCIAL STUDIES

COURSE CODE: SPM **411**

COURSE TITLE: MATERIAL MANAGEMENT

Instructional Materials for Distance Learning

COURSE OUTLINE

COURSE CODE: SPM 411

COURSE OBJECTIVES: By the end of the course the student should be able to:

- Understand the concepts and principles of Operations Management
- Visualize Production and Operations Management as an interdisciplinary function.
- Understand the significance of production processes and process change
- Recognize professional issues such as material management process.
- Understand the importance of planning and control in material management

COURSE CONTENT

WEEK 1-2: CHAPTER 1: STRATEGIC ROLE OF MATERIALS MANAGEMENT:

- Introduction
- Objectives and advantages of materials management in an organization .
- Scope of Materials Management.
- Functional role of materials management
- Roles of materials management in an organization

WEEK 3-4: CHAPTER 2: INTRODUCTION TO SUPPLY CHAIN MANAGEMENT

- Introduction
- Functions supply chain management
- Concept of Supply-Chain Management
- Logistics and Supply Chain Management
- Decision phases in a supply chain

WEEK 5-6: CHAPTER 3: INVENTORY MANAGEMENT & CONTROL

- Functions of Inventory
- Minimum inventory Level
- Maximum inventory Level
- Inventory Control Systems
- Types of Stock-Holding/Inventory
- Variety Reduction of inventory
- Controlling special classes of stock

WEEK 7: CHAPTER 4: I.T. APPLICATION IN SUPPLY CHAIN

- Basic types of e-commerce
- E-Procurement
- Bar Coding
- Electronic Data Interchange (EDI).
- Enterprise Resource Planning(ERP)

AFTER THE 7TH WEEK YOU ARE REQUIRED TO A CAT ONE

WEEK 8: CHAPTER 5: PURCHASING STRATIES AND STRATEGIC OPTIONS ON MATERIAL MANAGEMENT

- Planning process
- The planning system
- Factors influencing choice of a strategy:
- Levels of strategy

WEEK9: CHAPTER 6: OPERATION PLANNING:

- Aggregate Planning
- Master Production Schedule
- Material Requirement Planning
- MRPII
- MRP I

WEEK 10: CHAPTER 7: COST MANAGEMENT IN SUPPLY CHAIN

- Categories of Cost
- Price analysis
- Cost analysis
- Activity- Based Costing (ABC) analysis
- ABC Analysis Categories

WEEK 11: CHAPTER 8: MATERIAL/ STORES AUDIT

- Introduction
- The Control of Stock – Stock Records
- Stock levels
- The Control of Stock-Methods
- The Control of Stock- Stocktaking and Stock Checking
- Perpetual inventory (continuous stock taking)

WEEK 12: CHAPTER 9: MATERIALS HANDLING EQUIPMENT

- Introduction
- Objectives of Materials Handling
- Principles of Materials Handling
- Effects of Good Material Handling (Benefits)
- Indicators of Poor Material Handling
- Types of Materials Handling Equipment

WEEK 13-14: CHAPTER 10: IDENTIFICATION OF MATERIALS AND CODING SYSTEMS

- Introduction
- Common Terms Used To Describe Various Kinds of Materials
- Identification of Material (Coding Of Materials)
- Advantages of a Coding System
- Methods of coding materials
- Types of Codes

AFTER THE 14TH WEEK YOU ARE REQUIRED TO DO CAT TWO

A SAMPLE OF MAIN EXAMINATION AND SUPPLIIMENTARY/SPECIAL EXAM

REFERENCE

Nair N. K. (2002), *Purchasing & Materials Management*, Tata McGraw Hill, New Delhi
Katoch S. (2000), *Materials Management*, PVT publishers, New Delhi
Starr M. K. (2009), *Production & Operations Management*, McGraw Hill, New York

MODES OF ASSESSMENT	MARKS (%)
CATS AND ASSIGNMENT	30%
FINAL EXAMINATION	<u>70%</u>
TOTAL	<u>100</u>
PASS-MARK	40%

TABLE OF CONTENT

CHAPTER 1

STRATEGIC ROLE OF MATERIALS

MANAGEMENT.....	1
INTRODUCTION.....	2
<i>The basic objectives of material management in an organization are:</i>	<i>2</i>
Objectives and Advantages of Materials Management in an Organizat.....	3
<i>Scope of Materials Management.....</i>	<i>6</i>
Roles of materials management in an organization	7

CHAPTER 2

INTRODUCTION TO SUPPLY CHAIN

MANAGEMENT.....	9
<i>Concept of Supply-Chain Management.....</i>	<i>10</i>
<i>Logistics and Supply Chain Management (SCM)</i>	<i>14</i>
<i>Supply management's relationship with other departments</i>	<i>15</i>

CHAPTER 3

INVENTORY MANAGEMENT & CONTROL.....17

Functions of

Inventory.....	18
Minimum inventory Level.....	19
Re-order level.....	20
Maximum inventory Level.....	23
Danger level.....	23
<i>Variety Reduction.....</i>	<i>24</i>
Controlling special classes of stock.....	25

CHAPTER 4

I.T. APPLICATION IN SUPPLY CHAIN.....	28
E- Commerce.....	28
E-Procurement	29
Bar Coding.....	30
Electronic Data Interchange (EDI).....	31
Enterprise Resource Planning (ERP).....	32
<i>Conclusion.....</i>	<i>33</i>
SAMPLE OF A CAT ONE.....	34

CHAPTER 5

PURCHASING STRATIES AND STRATEGIC OPTIONS ON MATERIAL MANAGEMENT..35

PLANNING

PROCESS.....	36
The planning system.....	37
<i>Purchasing strategy.....</i>	<i>38</i>
Factors influencing choice of a strategy.....	38

CHAPTER SIX	
PRODUCTION AND OPERATION PLANNING.....	39
Components of operations planning and scheduling system.....	39
Aggregate planning.....	42
Master production schedule (mps).....	43
Material requirement planning (MRP).....	44
CHAPTER 7	
COST MANAGEMENT IN SUPPLY CHAIN.....	47
Categories of Cost	49
<i>Price analysis.....</i>	<i>50</i>
<i>Cost analysis.....</i>	<i>51</i>
Learning curves and applications in supply chain.....	53
<i>ABC Analysis.....</i>	<i>54</i>
ABC Analysis Categories.....	54
<i>Merits of Adoption of ABC.....</i>	<i>55</i>
<i>Demerits of ABC.....</i>	<i>55</i>
CHAPTER 8	
MATERIAL/ STORES AUDIT.....	56
The Control of Stock – Stock Records.....	57
<i>Information Required On A Stock Record (Stock Cards, Bin, Etc).....</i>	<i>57</i>
STOCK LEVELS.....	58
<i>The Control of Stock-Methods.....</i>	<i>58</i>
The Control of Stock- Stocktaking and Stock Checking.....	59
Perpetual inventory (continous stock taking).....	60
CHAPTER 9	
MATERIALS HANDLING EQUIPMENT.....	62
INTRODUCTION	62
<i>Principles of Materials Handling.....</i>	<i>63</i>
<i>Indicators of Poor Material Handling</i>	<i>64</i>
<i>Types of Materials Handling Equipment.....</i>	<i>65</i>
<i>Review Questions.....</i>	<i>66</i>
CHAPTER 10	
IDENTIFICATION OF MATERIALS AND CODING SYST.....	67
Introduction.....	68
<i>Common Terms Used To Describe Various Kinds of Materials</i>	<i>69</i>
<i>Identification of Material (Coding Of Materials).....</i>	<i>70</i>
<i>Advantages of a Coding System.....</i>	<i>71</i>
<i>Disadvantages of Stock Coding.....</i>	<i>72</i>
<i>Methods of coding materials.....</i>	<i>73</i>
<i>Types of Codes.....</i>	<i>74</i>
<i>Interpretation of Codes</i>	<i>75</i>

WEEK 1 AND 2

CHAPTER 1

STRATEGIC ROLE OF MATERIALS MANAGEMENT

Chapter objectives:

By the end of this chapter, the learners should;

- i) Define the key advantages of material management process;*
- ii) Identify the scope of material management;*
- iii) Describe the strategic role of material management and its interfaces; and*
- iv) Discuss the possibility of material management in an organization Structure*

INTRODUCTION

Material management is a service function affecting the flow of materials in a manner in which it helps in conserving the material cost, the best way of utilizations of the materials and maintaining the quality of both the incoming and outgoing materials.

It covers the whole range of functions involved in the converting materials and ancillary supplies in to finished products

The basic objectives of material management in an organization are:

- To obtain materials at the minimum price, however, this minimum price must not compromise on the quality of goods and the continuity of supply.
- To minimize the inventory of an organization without sacrificing the timely availability of materials. This frees up working capital of an organization for other useful organization purposes.

Thus, the bottom line of any material management system is the minimization of material procurement, storage and handling costs, without compromising quality and availability of materials.

Material management procedures are strategically placed within an organisation. They have different meanings for different people. Some of the material management procedures may give more weight to purchasing, while others may attach a lot of importance to inventory control. A good material management process may have a strong backing of quality management and quality assurances of material purchasing and handling. This combination has a great impact on profitability and productivity as this may reduce the rejection rates of materials, thus, bringing down the overall cost of production in a well managed system. It is sometimes stated that it is the

control of quality from the procurement to final distribution of the product that improves productivity and corporate image.

A strong logistics system that can create a steady flow or continuum of materials flow into the production pipeline is the need of the hour. It is also claimed that such a continuum can minimize the need for material management. However, the question is how good this continuum is? And how are the quality controls processes associated and linked to this continuum in an organization?

Thus, the material management is an important strategic issue within an organization. Let us discuss more about its strategic placement in the subsequent chapters.

Objectives and Advantages of Materials Management in an Organization

Materials Management has several core objectives and many secondary objectives. The core objectives of material management are:

- Proper, cost effective material procurement.
- Proper storage of materials so as to minimize wastages and material hold ups.
- Making available the material TIMELY.

A good material management system will keep up to data records of all the information generated in it, preferably using a computer-based system.

In addition to these primary objectives a materials management system indirectly fulfills many secondary objectives also. These secondary objectives are normally related to the functions of a material management system. Some of these

Secondary objectives are:

- Identifying new or better sources of supply
- Development and sustenance of relationships with the vendors
- Creating a standardized quality of the products
- Performing the value analysis of inventory. This can be related to the cost of materials.
- Creating a smooth flow of materials and information among the various sections of materials management system.

The material management system works under the broad basic objectives of an organization that is “maximum profit with sustained growth and research, satisfied customers and staff of the organization”. The material management supports this objective by providing support through:

- Continuity of supply by maintaining a uniform flow of materials.
- Reducing the costs of materials purchased and handling by using scientific techniques and electronic tools. The use of scientific tools and techniques for materials and information management.

- Minimizing holdups of working capital and performing effective inventory control.
- Releasing working capital by ensuring effective control over inventories.
- Providing high quality at the lowest price.
- Development of better relationships with customers and suppliers.

Why Integrated Materials Management?

Some of the key functions that are undertaken during the process of material management are:

- Materials Planning
- Materials purchasing
- Receiving of Materials
- Stores
- Inventory Control
- Scrap and Surplus disposal

A material management system integrates all these functions as a single function.

But what is the need of such integration?

If we do not integrate the functions as above then they can operate of their own and integration can produce suboptimal results.

This is analogous to a situation when you want to make a computer hardware, you buy all the sub-systems that are cost optimized in there own way, for example the mother board may support fastest CPU, RAM may have maximum capacity in the same cost etc., but when you assemble your PC you find that all these components are not compatible to each other.

Similarly, one expects similar strains among the functions of the material management system, for example, although high procurement may reduce cost but is it really justifiable keeping the inventory control function requirements in considerations. Thus, various functions have conflicting optimizing requirements. A material management system has to bring solution within these conflicting requirements.

However, since the material management system is not controlled by a single sub- system, enforcing such requirements may create a problem. Therefore, in an integrated set up, a materials manager can be made responsible for inter-related function control. S/he may be allowed to control and coordinate with a view that ensures proper balance of the conflicting objectives of the individual functions.

Advantages of Materials Management

Material management has created a niche in many organizations, which have implemented the integrated materials management. These organizations usually enjoy the following advantages:

- Better accountability on part of materials as well as other departments as no one can shift blame to others.
- As materials management is handled by single authority, it can result in better coordination, as it becomes the central point for any material related problems.
- Materials management department makes sure that better quality material is supplied timely to the requesting departments. This can result in better performance of the organization.
- A materials management system is typically controlled through an information system, thus, can help in taking decisions related to material in the organization.
- One indirect advantage of material management is that good quality material develops the ethical and moral standard in an organization. However, please note there is no study on this issue.

Scope of Materials Management

However, after discussing so much about the role of material management it is worth mentioning the scope of the material management also.

Although the scope of a material management system is vast, yet we can define the following functions as its scope functions.

1. Material Planning and Controlling: One of the key functions that identify the scope of the materials management is the materials planning and control. This function is based on the sales forecast and the production plans of an organization. The activities of this function are:

- Estimation of materials requirements
- Preparation of materials budget of the organization
- Estimating the levels of inventories required in the organization
- Scheduling the orders placed with the vendors to ensure availability of material
- Controlling by monitoring of production vis a vis sales.

2. Purchasing: The purchasing is another major function for the materials management. This function contains the following activities:

- Identification and selection of possible Suppliers
- Finalizing the terms and references of purchases that are to be made.
- Placing the purchase orders this activity may be staggered as per the inventory control function.
- Managing the purchase orders till delivery of materials
- Giving clearance to payment of received good; and
- Analyzing the performance of the suppliers and rating them.

3. Stores and Inventory Control: This function helps in physical control of materials. It has the following list of activities:

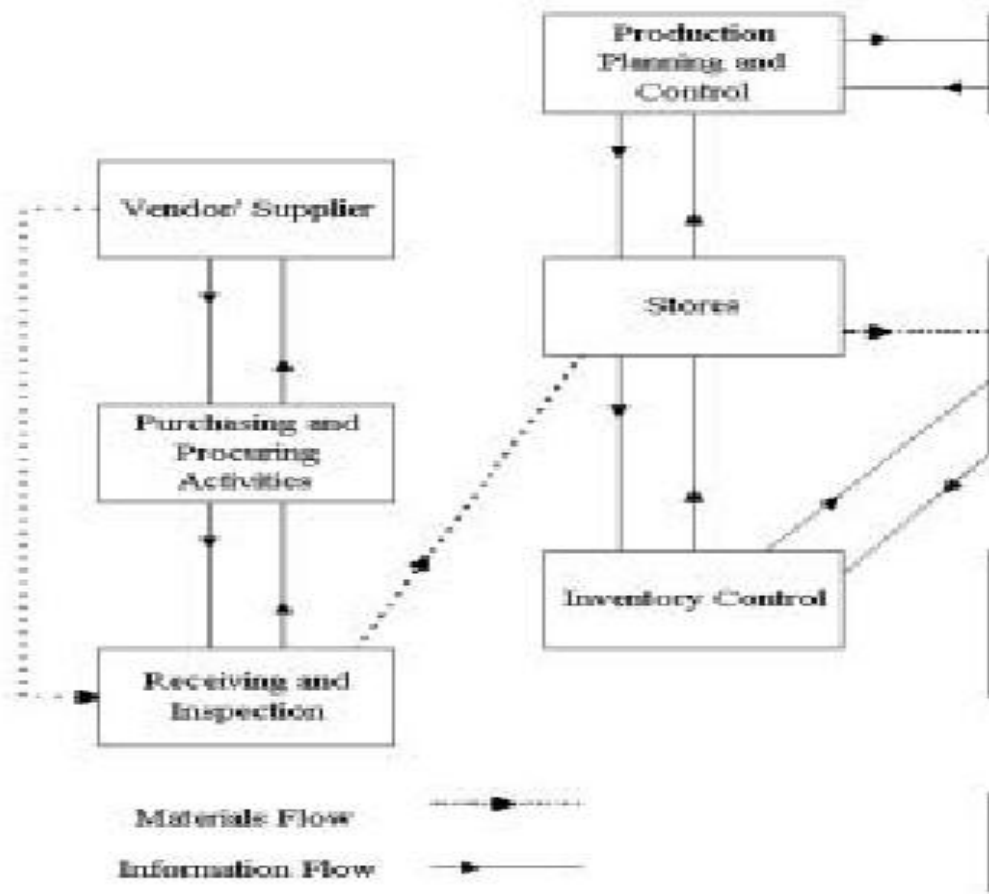
- Minimization of material losses due to obsolescence and handling. This activity controls the timely disposal and efficient handling of materials.
- Maintenance of stores records along with proper location and stocking of materials.
- Physical verification of stocks and reconciling.
- Performing inventory setting and control. Some such activities include performing ABC analysis, fixing economical ordering quantities, identification of selling safety stock levels, performing lead-time analysis etc.

4. Specific activities of materials management:

- Purchasing and Supply management activities.
- Inventory management.
- Receiving activities.
- Stores and Warehousing.
- In-plant materials handling
- Production planning, scheduling and control.
- Transport and transportation.

ROLES OF MATERIALS MANAGEMENT IN AN ORGANIZATION

Materials Management is a system that tries to ensure the following for an organization



Materials Flow Systems

- Availability of products desired by customers. These products should be prepared with best obtainable cost of manufacture.
- Quality and cost of manufacture should be most affordable for the organization. Although quality and cost of production are the responsibilities of the Production Manager, however, material management can support this process by the timely delivery of quality material.
- Advice the sales pricing. Although pricing is a sales function, but Materials Management with proper record keeping can be used for generating price data for the various destinations. For example, the cost of the materials used for a product can be determined through this system.

Thus, material management can help in determining the cost of the product.

Let us revisit the materials flow process that you have seen in Unit 1. As shown in above, a simple customer demand can trigger a series of flow of material along with lot of information flow. Please notice that material management will be required across the entire life cycle of the material flow. Please also note that during the material flow a lot of information is generated, which can be used strategically for various purposes as, explained in the following paragraphs

Internal Interfaces and Role of Material Management

Market forecasting

One of the key role-played by materials management is to forecast the future demands. For example, if a university like IGNOU is printing study material for its students, it needs to manage the raw materials and well as the finished product that is the printed blocks. The first point here would be to ascertain what would be the demand of study material for the various Programs; this forecast can be made on the basis of material usage patterns and increase in demand for the last few years, in addition expected enrolments for programs that are new, this information can be predicted on the basis of response to new programs of similar type/ area during last few years. Thus, materials management has a great role to play for an organization. But remember here, a forecast is always estimation.

Production

One of the key roles of material management system would be to see that the process of production goes unhindered. For example, once again the case of the university as above, printing would require availability of printing paper and art card paper - required for covers. If any of the two papers is out-of- stocks the printing process cannot continue. In addition, please note that the demands have been predicted thus the material requirements can be calculated with this data. In production organizations making predictions is even more difficult as the sales are to be predicted without much of a basis.

Finance

The material management is strategically very much linked to cost reduction. The cost may include the inventory cost and thus, have a major impact on the material budget. For example, one must procure the paper for the university, so that the paper requirement of printing is fulfilled in time, however, this should not cause any unnecessary hold up of the finance. The hold up time should be minimum.

For example, if study materials are to be sent to student in the month of May-June then procurement of paper may be done in January- February so that study material can be printed in March-April.

Inventory Control

One of the key strategic roles of material management would be to minimize the inventory of an organization. This also results in cost minimization. In general a production schedule is made in an organization. This should be synchronized with the material procurement and supply so that the production process is not hampered. For example, as stated above the material should be procured in January-February such that the printing process can proceed smoothly.

Inspection or quality control

This is a very interesting interface as the quality of material for different types of an organization is impacted during materials management cycles, though materials management is not directly responsible for quality, yet it can cause indirect effects on the quality of products. The products, whose quality deteriorates with time, are very likely candidates in this category. For example, if we buy paper 3-4 months in advance then proper storage conditions may need to be kept in store to avoid any deterioration of quality of the paper. This is also the problem of inventory control.

Material handling, traffic and physical distribution logistics

The role here is to see that the material is handled and distributed easily. For example, the paper stores of the university may be located outside the campus and may be near the place where most of the printing presses are located. Also since the university sends the study materials through post, a unit of distribution may be located near some head post office.

Materials Flow Systems

The material flow process is given in Figure 2.1. Please note that in Figure 2.1 how the material is flowing but more important than that is the information flow.

Materials management system activities have impact on:

- Purchasing and procurement activities sometimes it determines the details of past performance of vendors, quality, etc details which may help in proper selection of vendors. If so needed the orders can even be distributed over time.
- Receiving and inspection data is very important quality control activity during this process, where information about the quality is registered.
- Production planning information/ sales information does impact the process of material management.

Thus, Materials Management is a social technology, which demands professional expertise of its own and have a direct impact on the cost effectiveness of an organization. It can also be defined in terms of the functions that are needed for the coordination of planning, sourcing, moving, storing and controlling materials in an optimum manner so as to provide a pre-decided service to the customer at a minimum cost. But which department should be made responsible for coordinating the functions of Materials Management?

In the recent past the Materials Management is not tied up to any group within an organization rather it is largely system-oriented, which takes into account functional dependence with a wide range of partial activities, where utility of materials is enhanced as these pass through each of the stages of the production process till the finished product. Thus, material management may be found a very suitable component that needs to be controlled by a centralized database or enterprise resource planning (ERP) packages

FUNCTIONAL ROLE OF MATERIALS MANAGEMENT

The material management for an organization is very important. Let us define some basic roles of it for various organizational functional Activities in the following table:

Table 2.1: Role of Materials Management in Various Organizational Functional Activities

Role of Material Management	Description
Decision on making the material or buying it.	Supplies are not adequately obtained successfully in the past •The quality of supplied goods is not of standard • The volume requirement of sales is exceeding the possible manufacturing capacity •The material fails in the cost analysis

Review Questions

- i) Discuss the primary and secondary objectives and advantages of materials management in an organization*
- ii) Highlight briefly the objectives and advantages of materials management in an organization.*
- iii) With examples, briefly discuss the internal interfaces and role of material management.*

References

- i) Nair N. K. (2002), *Purchasing & Materials Management*, Tata McGraw Hill, New Delhi
- ii) Katoch S. (2000), *Materials Management*, PVT publishers, New Delhi
- iii) Starr M. K. (2009), *Production & Operations Management*, McGraw Hill, New York

WEEK 3 AND 4

CHAPTER 2

INTRODUCTION TO SUPPLY CHAIN MANAGEMENT

Chapter objectives:

By the end of this chapter, the learners should;

- i) Definition of supply chain*
- ii) The learner should understand the concept of supply chain management in different environments*
- iii) The learner should understand the upstream and downstream suppliers and their effects on the supply chain*

Introduction

This is an integrative philosophy to manage the flow of a distribution channel from the supplier to the ultimate user. A supply chain management can be likened to a well-balanced and practiced relay team in which the entire team is co-coordinated to win the race. From this definition, supply chain is therefore a cross-functional process for strategy definition and implementation with total cost focus and a strong continuous improvement drive aimed at serving the organization's customer.

The Kenya Institute of Supply Management (KISM) defines supply chain management as managing a series of activities and processes ranging from the source of raw material, performing a series of value adding activities, procurement, production or conversion of the finished product or service purchased by ultimate consumer to satisfaction.

Supply chain is that network of organizations that are involved through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customers.

It involves the following functions:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management
- Procurement
- Information facility structure

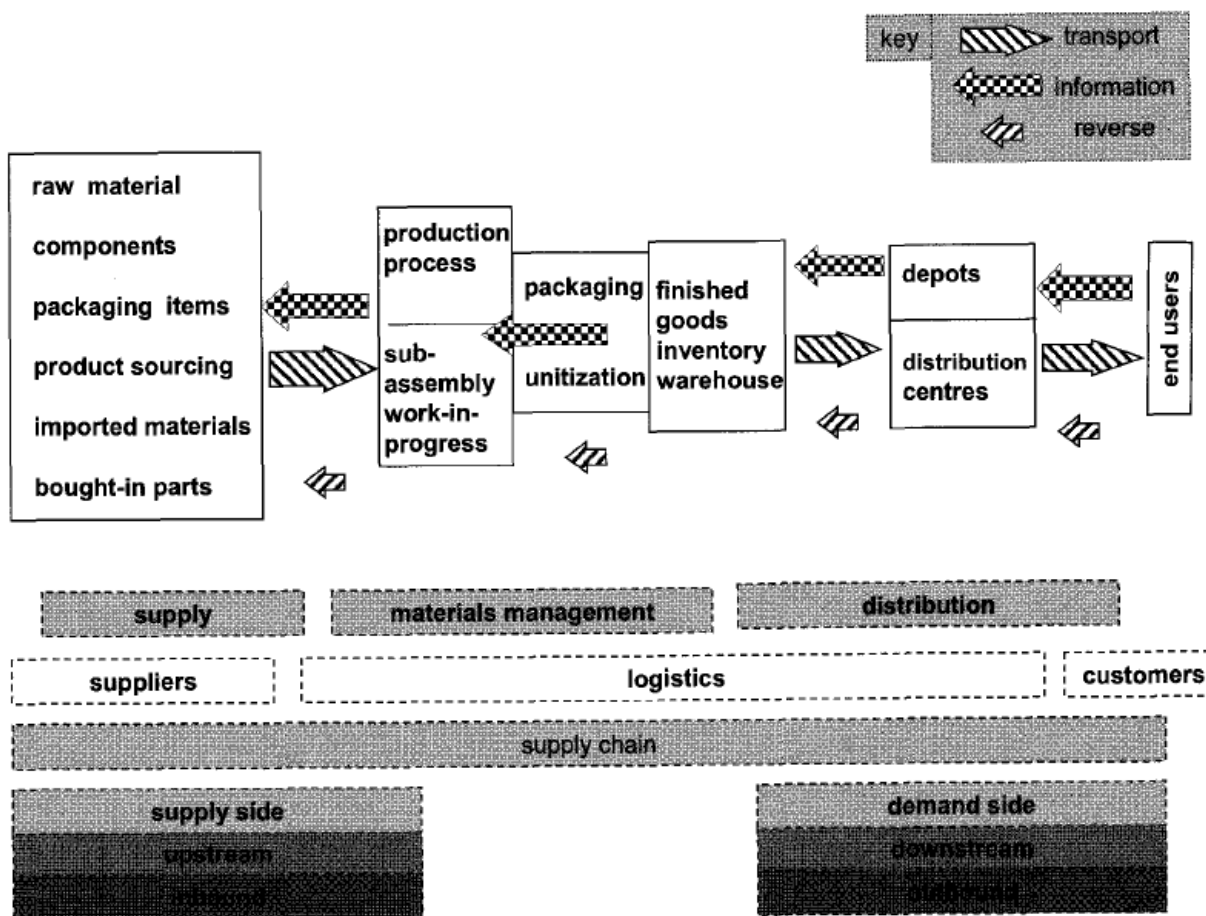
Most supply chains are actually networks. Although the word chain is commonly used, the term 'supply network' or 'supply web' is technically more accurate. A network has been described as a set of supply chain, which together describes the flow of goods and services from original

source to their uses. The term network is intended to imply a more strategic concept with the idea that networks compete.

There are nine different types of activities that companies perform in coordinating and managing supply networks:

- Partnering
- Risk and benefit sharing
- Resource integration
- Information processing
- Knowledge capture
- Social coordination
- Decision making
- Conflict resolution
- Motivation

Successful supply chain management requires a change from managing individual functions to integrating activities into key supply chain processes. Operating an integrated supply chain requires continuous information flow, which in turn helps create the best product flows. The customer remains the primary focus of the process.



Materials Management

The grouping of management functions supporting the complete cycle of material flow, from the purchase and internal control of production material to the planning and control of work-in-process, warehousing, shipping and distribution of finished product.

Logistics Management

This refers to the process of strategically managing the acquisition, movement and storage of material, parts and finished inventory through an organization and its marketing channels to fulfill orders most cost-effectively.

Logistics does add value and can play a vital role in the organization's profitability. However, only by linking all logistics activities directly to the organization's strategic plan can it be useful in supporting the organization's strategy for achieving competitive advantage.

Procurement is thus a supporting activity in logistics which should be properly handled to enable firm's improve cash flow, open new territories, introduce new products etc.

The term Logistics management was used to mean combining materials i.e. the inbound side and the outbound side with the aim of improving customer service and reduce the associated costs. The process was developed further to encompass not only the key functions within an organization's own boundaries but also those functions outside that contribute to the provision of a product to a final customer. This is known as supply chain management.

Concept of Supply-Chain Management

The development of supply-chain management concept is attributable to two major paradigm shifts:

- Change in focus on internal processes to value adding benefits.
- Change in focus from tactical to strategic.

Supply chain management represents a relatively new way of approaching business and different views exist regarding the process involved, the key process typically would include customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement and product development and commercialization. Supply chains are essentially a series of linked suppliers and customers. Every customer is in turn a supplier to the next downstream organization until a finished product reaches the ultimate end user. It is important to note that the supply chain includes: a firm's internal function, upstream suppliers and downstream customers.

Internal functions: Different processes used in transforming the inputs provided by the supplier network. This involves order-processing, managers translating customer's requirements into actual orders, which are inputs in the system. Proper co-ordination and scheduling of these internal flows is challenging. Examples of internal functions include: Purchasing, warehousing, engineering, production and operation departments.

Upstream external suppliers:

In order to manage the flow of materials between all the upstream organization in the supply chain, firms employ an array of managers who ensure that right materials arrive at the right location at the right time. Purchasing managers are responsible for ensuring that:

- Right suppliers are selected.
- The suppliers are meeting performance expectation
- Appropriate contractual mechanisms are employed.
- Good relationships maintained with these suppliers

They may also be responsible for driving improvement in the supply base and acting as a liaison between suppliers and other internal members.

External downstream supply chain: Encompasses all the downstream distribution channels, processes and functions that the product passes through on its way to the end customer. This includes distribution of finished goods, pipeline inventory, warehouses and sales operations. Within the downstream portion of the supply chain, logistics managers are responsible for the actual movement of materials between locations. One major part of logistics is transportation management, involving the selection and management of packaging, storing and handling of materials at receiving docks, warehouses and retail outlets. After sales services and maintenance services have also been introduced in the downstream supply chain to ensure customer satisfaction.

Thus, supply chain management is a system approach that is highly interactive and complex, and requires simultaneous consideration of many tradeoffs. Therefore, the management should monitor and evaluate the performance of the supply chain regularly and frequently. Its implementation also requires executive support and commitment. Managing a supply chain is a complicated task considering the degree of complexity one faces if he's actually going to manage all suppliers back to the point of origin and all products and services out to the point of consumption.

Executives would want to manage their supply chains to the point of consumption because whoever has the relationship with the end user has the power in supply chain. Management must therefore frequently monitor and evaluate the performance of the supply chain.

Successful supply chain management requires a change from managing individual functions to integrating activities into key supply chain processes. Operating an integrated supply chain requires continuous information flow, which in turn helps create the best product flows. The customer remains the primary focus of the process.

Logistics and Supply Chain Management (SCM)

There are four distinct differences claimed for supply chain management over the more classic view of Logistics although some of these elements have also been recognized as key to successful planning of logistics operations. These four are:

- The supply chain is viewed, as a single entity rather than a series of fragmented elements such as procurement, manufacturing, distribution etc. This is also how logistics is viewed in most forward – looking companies. The real change is that both the supplier and the end user are included in the planning process thus going outside the boundaries of a single organization in an attempt to plan for the supply chain as a whole
- Supply chain management is very much a strategic planning process with a particular emphasis on strategic decision-making rather than on operational systems.
- Supply chain management provides for a very different approach to dealing with inventory throughout the pipeline process. Traditionally, inventory has been used as safety – leading to large and expensive stocks of production. SCM aims to alter this perspective so that inventory is used as a last resort to balance the integrated flow of products through the pipeline.
- Central to the success of effective SCM is the use of integrated information system that is a part of the whole supply chain rather than merely acting in isolation for each of the separate components. These enable visibility of products demand and stock levels through the full length of the pipeline. This has only become a possibility with the recent advances in information system technology.

The objectives of supply chain management

The objective of every supply chain is to maximize the overall value generated. The value a supply chain generates is the difference between what the final product is worth to the customer and the effort the supply chain expends in filling the customer's request

The next objective is the appropriate management of all flows of information, product, or funds within the supply chain. Thus resulting maximized total supply chain profitability.

Decision phases in a supply chain

- Supply chain strategy or design: During this phase, a company decides how to structure the supply chain over the next several years. It decides what the chain's configuration will be, how resources will be allocated, and what processes each stage will perform
- Supply chain planning: The time frame considered is a quarter to a year. Planning includes decisions regarding which markets will be supplied from which locations, the subcontracting of manufacturing, the inventory policies to be followed, and the timing and size of marketing promotions.
- Supply chain operation: The time horizon here is weekly or daily, and during this phase companies make decision regarding individual customer orders. At the operational level, supply chain configuration is considered fixed and planning policies are already fixed. The goal of supply chain operations is to handle incoming customer orders in the best possible manner.

Supply management's relationship with other departments

a) Supply Management and Engineering

- Engineering department prepares material requirement schedule that the quantities required and when required to the supply department to buy accordingly
- Engineering department should prepare reports on quality performance on material and equipments.

b) Supply management and manufacturing.

- Supply management should provide in advance on any delays or failures in material delivery so that production can make alternative arrangements
- Supply management provides raw materials, operating tools and equipment to the manufacturing department.
- Both departments should agree on the economic order quantities of materials to buy that will meet production needs.
- Both departments should introduce a variety of techniques that will improve performance such as Electronic Data Interchange (EDI), Material Requirement Planning (MRP) systems etc.

c) Supply management and quality.

- Quality control sets standards or specifications to be observed during inspection.

d) Supply management and marketing.

- Supply management ensures that through efficient buying costs are reduced. Marketing then prices the items competitively.
- Supply department obtains materials on time and enables marketing to meet promised delivery date and schedules.
- Supply department should give advice on price changes and material availability so that marketing can respond appropriately.
- Marketing provides sales forecasts so that supply department can plan the buying of materials.

e) Supply management and Finance and Accounts.

- Accounts provide for effective purchase of materials. Supply management should consult with the accounts department before placing orders with suppliers.
- Supply management should prepare material requirements and budget allocations by searching for commodity prices.
- The supply department on receiving materials certifies the supply invoice before presenting to accounts for payments.
- Through annual stocktaking, supply management provides information on the value of stock that finance can use in making financial statements.
- Supply management should give accounts information on materials damage, obsolete and redundant materials so that accounts can adjust value of assets.

f) Supply management and Logistics.

- Supply management should provide information on load size packaging for proper handling during transport
- Supply management should prepare material delivery and collecting schedules
- The two departments should agree on the vehicle availability, routing, loading and unloading arrangements

- Supply management should give information on consignment picking from different suppliers and discharge points to customers
- Supply management should provide fuel, maintenance and servicing, spare parts for the transport department to work efficiently.

g) Supply management and lawyers.

- Legal professionals are frequently actively involved in contract negotiations and contract formation.
- In other cases, their role is one of review and approval of contracts developed by supply management professionals.
- Value-adding attorneys who are involved in supply management issues normally must embrace a collaborative approach to dealing with the firm's suppliers.

h) Supply Management and Research and Development (R&D).

- Supply management agrees with research and development on material specifications, availability of substitutes and price of substitutes.

i) Supply Management and Personnel and Administration.

- Personnel department is responsible for recruitment, employment, promotions, transfers and dismissal of the staff.
- The two departments determine staff qualifications requirements, training needs, job description and evaluation to enable supply staff develops themselves.
- Personnel provide advice to Supply staff in matters of motivation, conflicts resolutions etc.

j) Supply Management and Information Technology.

- Electronic communication for production materials requires coordination and cooperation between supply management and IT
- The two departments should develop a database which provides timely and accurate input to supply management for strategic planning and tactical activities.

Review Questions

- Purchasing staff are still relevant in the supply chain. Highlight the activities that purchasing can undertake as supply chain member.*
- Explain how the role of procurement manager has changed with the concept of supply chain management.*
- Logistics is the key to the success of the supply chain of a business firm'. Explain*
- Supply chain management can be used for gaining competitive advantage to deliver superior customer service. Discuss.*
- Value added service is an innovative approach adopted for gaining a competitive edge in the supply chain'. Discuss.*

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- Nair N. K. (2002), *Purchasing & Materials Management*, Tata McGraw Hill, New Delhi
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- Starr M. K. (2009), *Production & Operations Management*, McGraw Hill, New York

WEEK 5 AND 6

CHAPTER 3

INVENTORY MANAGEMENT & CONTROL

By the end of this chapter, the learners should;

- i) Understand Functions of inventories*
- ii) Explain Operating System*
- iii) Describe Operations Management*
- iv) Know how to Manage Global Operations*
- v) Understand the Scope of Production and Operations*

Introduction

Inventory

Inventory is the stock of any item or resource used in an organization. Inventory includes: raw Materials, finished products, component parts, supplies, and work-in-process. An inventory system is the set of policies and controls that monitors levels of inventory and determines what levels should be maintained, when stock should be replenished, and how large orders should be

The purposes of inventories are:

- To maintain independence of operations
- To meet variation in product demand
- To allow flexibility in production scheduling
- To provide a safeguard for variation in raw material delivery time
- To take advantage of economic purchase order size

Functions of Inventory

1. To meet anticipated customer demand. These inventories are referred to as anticipation stocks because they are held to satisfy planned or expected demand.

2. To smooth production requirements. Firms that experience seasonal patterns in demand often build up inventories during off-season to meet overly high requirements during certain seasonal periods. Companies that process fresh fruits and vegetable deal with seasonal inventories

3. To decouple operations. The buffers permit other operations to continue temporarily while the problem is resolved. Firms have used buffers of raw materials to insulate production from disruptions in deliveries from suppliers, and finished goods inventory to buffer sales operations from manufacturing disruptions.

4. To protect against stock-outs. Delayed deliveries and unexpected increases in demand increase the risk of shortages. The risk of shortages can be reduced by holding safety stocks, which are stocks in excess of anticipated demand.

5. To take advantage of order cycles. Inventory storage enables a firm to buy and produce in economic lot sizes without having to try to match purchases or production with demand requirements in short run.

6. To hedge against price increase. The ability to store extra goods also allows a firm to take advantage of price discounts for large orders.

7. To permit operations. Production operations take a certain amount of time means that there will generally be some work-in-process inventory.

Minimum inventory Level

This is that level of an item of material, below which the actual stock should not normally be allowed to fall. It is fixed to ensure that the required quantity of each item of material is available in the stores at all times. To fix the minimum level, the following is taken into account:

- The average rate of consumption of the material
- The time required to obtain fresh supplies
- The reorder level
- The production material requirements
- The minimum quantity of materials which can be procured advantageously.

The minimum stock level is calculated as:

Re-order level – Average expected demand for the stock item during the lead time. This can be stated as:

Re-order level – (Normal consumption x Normal delivery time) where normal delivery time is taken as the average of maximum and minimum time taken for delivery.

Re-order level

This is the stock level fixed between maximum and minimum stock levels, at which an order for the replenishment of stock must be placed. The re-order level is generally higher than the minimum level to cover any emergency which may arise as a result of abnormal usage of materials or unexpected delay in obtaining fresh supplies. To fix this level, the following is taken into account:

- The consumption rate of material
- The margin of safety
- The normal delivery time or lead time
- The minimum level to be maintained
- Cost of storage and interest on capital employed in materials
- Provision for emergencies such as delay in supply and abnormal wastage.

Re-order level is calculated as:

Maximum consumption x maximum delivery time Or

Re-order level = Minimum Stock + Average consumption during normal delivery time. The re-order level is revised frequently considering any factors that are likely to change supply and demand for goods.

Maximum inventory Level

This is the level that should never be exceeded. This is to avoid undue investment of capital leading to a loss of interest, obsolescence of materials, and additional overheads in the form of higher rents, etc. It is determined by taking into consideration the following factors:

- Normal consumption rate of materials
- Time required to obtain new supplies
- Amount of working capital available
- Availability of storage space
- Economic order quantity
- Cost of storage
- Risk of deterioration
- seasonal considerations as to price and availability of material
- Insurance costs
- Other inherent risks associated with the materials and any restrictions that may be imposed by government.

Maximum order level can be determined by using the following formula:

Re-order level + Re-order quantity – (minimum consumption x minimum time for delivery)

Or

Maximum level= Re-order level – Consumption during the time required to get fresh supplies at minimum rate + Economic Order Size.

DANGER LEVEL

Some firms also uses the danger level in respect of materials. Danger level is fixed at a point below the minimum level and represents the limit at which special steps must be taken to obtain emergent supplies of material i.e. sending a man personally to bring the required materials. When the stock of a particular item of materials reaches danger level, no further issues are made by the store keeper except on the special requisition approved by the works manager.

Danger Level = Normal consumption per day /per month etc X Time required to obtain emergency supplies.

Average stock level = Minimum Stock level + $\frac{1}{2}$ (Re-order Quantity)

Inventory Control Systems

- ***Red-line method:*** the simplest, since a red-line is drawn at the lower level inside an inventory bin then inventory is stacked and when the red-line shows, more inventory is ordered.
- ***Two-bin method:*** Inventory is stacked in two bins. When the working bin is empty, inventory is drawn from the second bin and an order for additional inventory is placed.
- ***Computerized inventory control system:*** the inventory is computerized and as inventory is withdrawn, they are recorded in the computer and the inventory balance revised. Orders are placed when the reorder point is reached.
- ***Just-In-Time System:*** it automatically coordinates a manufacturer's production with suppliers' production so that raw materials arrive from suppliers just as they are needed in the production process.

The Inventory policy must be coordinated with the firm's manufacturing and procurement policies since the ultimate goal is to minimize total costs and inventory is just one part of the total costs.

The Need to Hold Stocks

There are a number of reasons why a company might choose or need to hold stocks of different products. In planning any distribution system, it is essential to be aware of these reasons, and to be sure that the consequences are adequate but not excessively high stock levels. The most important reason for holding stock is to provide a buffer between supply and demand. This is because it is almost impossible to synchronize or balance the precise requirements of demand with the vagaries of supply. These and other important reasons are summarized, as follows:

- ***To keep down productions costs.*** Often it is costly to set up machines, so production runs need to be as long as possible to achieve low unit costs. It is essential, however, to balance these costs with the costs of holding stock.
- ***To accommodate variations in demand.*** The demand for a product is never wholly regular so it will vary in the short term, by season, etc. To avoid stock-outs, therefore, some level of safety stock must be held.

- *To take account of variable supply (lead) times.* Additional safety stock is held to cover any delivery delays from suppliers.
- *Buying costs.* There is an administrative cost associated with raising an order, and to minimize this cost it is necessary to hold additional inventory. It is essential to balance these elements of administration and stock-holding, and for this the economic order quantity (EOQ) is used.
- *To take advantage of quantity discounts.* Some products are offered at a cheaper unit cost if they are bought in bulk.
- *To account for seasonal fluctuations.* These may be for demand reasons whereby products are popular at peak times only. To cater for this whilst maintaining an even level of production, stocks need to be built up through the rest of the year. Supply variations may also occur because goods are produced only at a certain time of the year. This often applies to primary food production where, for example, large stocks result at harvest time.
- *To allow for price fluctuations/speculation.* The price of primary products can fluctuate for a variety of reasons, so some companies buy in large quantities to cater for this.
- *To help the production and distribution operations run more smoothly.* Here, stock is held to 'decouple' the two different activities.
- *To provide customers with immediate service.* It is essential in some highly competitive markets for companies to provide goods as soon as they are required (ex-stock).
- *To minimize production delays caused by lack of spare parts.* This is important not just for regular maintenance, but especially for breakdowns of expensive plant and machinery. Thus, spares are held to minimize plant shutdowns.
- *Work-in-progress.* This facilitates the production process by providing semifinished stocks between different processes.

Types of Stock-Holding/Inventory

There are a number of different stock types that can be found in company supply chains. These are generally held at strategic positions throughout the company logistics network and in particular at the interfaces with suppliers or customers.

The main categories are:

- *raw material, component and packaging stocks* – generally used to feed into a production or manufacturing process;
- *in-process stocks* – sometimes known as work-in-progress (WIP), these consist of part-finished stock that is built up between different manufacturing processes;
- *finished products* – stocks that are held at the end of the production line normally in a finished goods warehouse and sometimes known as finished goods inventory (FGI);
- *pipeline stocks* – probably the most common type of stock-holding, these are held in the distribution chain for eventual transfer to the final customer;
- *general stores* – containing a mixture of products used to support a given operation, for example a large manufacturing plant;
- *spare parts* – a special category because of the nature of the stock, which provides a crucial back-up to a manufacturer's machinery or plant where any breakdown might be critical, and also held by service and maintenance companies for supply to their customers to support service contracts. Service industries, such as utilities, hospitals and

maintenance, repair and overhaul (MRO) providers, invest in spare parts inventory to support their service offer. They have two main stock categories:

- i) consumables (nuts, bolts, etc);
- ii) rotatables and repairables (parts that require periodic maintenance or are repairable).

Within the above categories, stock can again be broken down into other major classifications:

- **Working stock.** This is likely to be the major element of stock within a distribution depot's stock-holding, and it should reflect the actual demand for the product.
- **Cycle stock.** This refers to the major production stock within a production warehouse, and it reflects the batch sizes or production run lengths of the manufacturing process.

Stock audit

Stock description:

This is the use of words to explain or identify a stock item. It may be simple or complex depending on the item in question. Some descriptions are long and complicated and may end up confusing stores staff. This reason makes the stores personnel to prefer coding of the stock. Nevertheless description of stock eases identification of stocks when it comes to the issuance of the goods to the user departments. Also good description of stock enables the stores personnel to send the right information to the purchasing function pertaining goods to be ordered.

Stores vocabulary:

When a coding operation is complete, the list of code numbers, description size etc are published in a document known as stores vocabulary. This is an encyclopedia book containing details of stores items. There are two types of stores vocabularies i.e. hard and soft vocabularies.

Hard vocabulary is recorded in books. It is original and requires manual access of information. Soft vocabulary on the other hand is recorded in computer system and in other integral devices of computers like Flash disc, CDR, Diskette etc. The information can only be accessed by checking its content through a computer system. In some organizations the information is available in the company's intranet.

How to organize stores vocabulary:

- The following stages can be used to organize stores vocabulary:
- Establish a catalogue library
- Inspect the present systems for stock identification
- Consult other interested departments like production, sales, purchasing, design etc to get their views.
- Prepare originating sheets showing items proposed by each department

- Compiling the vocabulary after removing the unnecessary items, reducing variety of materials etc.
- Distribute the vocabulary copies to the people (workforce) who need them.
- Amendments: Amendments are published at least quarterly in accordance with the original distribution list.

Treatment of Items Not In the Vocabulary

Sometimes it may not be advisable to include every stock item in the vocabulary. These items are described as NIVs (Not in the vocabulary). The NIVs include:

- Machine spares rarely required: these items should be kept out of the stores vocabulary since they are only purchased when a need arises. They are described as ONIS (Only when needed items).
- Items of non-repetitive nature: These are items which are needed at certain prescribed intervals e.g. 1-5 years, 2-3 years etc.

Variety Reduction

This is the process of reducing the number of varieties stocked to a controlled workable minimum.

Procedure for Variety Reduction

Variety reduction involves a complete examination of the list of commodities stocked to determine:

- The use or users for which each item is intended
- Which items have similar characteristics and can be used as substitutes for each other
- What range of sizes is essential
- Which items can be eliminated
- What specifications are necessary for retained items

Reasons That Lead To Variety Reduction

- Lack of specification when procuring items
- Where there are many suppliers of the same item
- Different sizes of containers or packages for items
- Lack of guidelines on how to use stocked items
- When there are varieties of the same item

Advantages of Variety Reduction:

- Reduction of stock holding cost
- Release of money tied up in stocks

- Easier specification while ordering
- Narrow range of inventory which leads to reduction in administrative cost
- Reduced supplier base: facilitates the building of long term relationship and supplier development.

Application of variety reduction and standardization in new stock

Before a new item is added into the inventory as survey should be conducted to avoid a situation where many lines or variety is maintained and also to ensure that standards are adhered to. This is done using a survey/ questionnaire that seeks to establish whether the new stock should be introduced or not. Common questions include:

- What are the functions of the item?
- Are there any substitutes of the item?
- Does the item meet the current specifications?

Application of the New Stock

Before a company commits itself on purchase of new stock, it is advisable for the supplier to give out samples to the prospective buyers. The rationale behind this attribute is to allow the users to test its performance. Other key ingredients which are looked upon by the users entail: durability, quality, effectiveness, consumption rate etc. In situations whereby the user does not have technical know-how of how to use the new product, the supplier is duty bound to give out instructions on how to use the product. After a thorough inspection of the new stock, a feedback is given in accordance to the user's verdict. The new stock can either be accepted or rejected.

Approval of the New Stock

Once the new stock is accepted by the users the approval can be made by various authorizing parties depending on the nature/price of the stock. For capital items the approval is normally done by the board of directors, chief executive officer (CEO), supplies manager as well as the production manager. For the items of less value approval can be done by the supplies manager in liaison with the production manager.

CONTROLLING SPECIAL CLASSES OF STOCK

This includes control of slow moving stock, obsolete stock and redundant stock.

- ***Slow moving stock:*** These are items which have slow turn. Turn is the rate at which stock items are issued or used. Items which may be described as slow moving include: spare parts, components (Sub-assemblies) and bulky stock. The reason which makes organisation to stock slow moving items is to ensure that the stocks are readily available when needed. It is important to note that slow moving items e.g. spares are very essential in the production process and need to be stocked. Slow moving items can be controlled by Just-in-time (JIT) purchasing for locally available materials, by using material requirement planning (MRP) to anticipate when items are likely to be required and also looking for replacement or substitution.
- ***Obsolete stock:*** These are stocks that have become out-dated and of no further use to the organisation. Obsolescence is more common in some stock categories e.g. spare parts which need to be replaced by more efficient ones. The control of obsolete stock requires a provision for latent obsolescence. Latent obsolescence is a situation which affects most of the items in the stock range. It refers to items that have not been identified as obsolete but passes the potential of becoming so. Provisioning for obsolescence can reflect the stores situation but the control of the phenomenon requires timely planning, running down of stock in anticipation of obsolescence.
- ***Redundant:*** Refers to all usable materials stocked in excess of current requirements. Redundant can be caused by:
 - i) Over ordering i.e. excess or surplus stock.
 - ii) Failure to relate stock levels to declining production of certain lines.
 - iii) Unexpected changes in demand patterns.

Minimizing or controlling redundancy:

- Stock levels should be kept low
- Informing stock controllers and buyers of changes in marketing policy, production programs and specifications
- Monitoring consumption patterns to detect the signs early
- Application of First in first out (FIFO) tactics: Using old materials first before using the new items introduced to replace them.
- Proper control of materials in production through material requirement planning (MRP).

How to dispose redundant materials

The following measures can be used to deal with redundancy:

- Circulation to other potential users
- Negotiate for a return of materials to suppliers at a price
- Advertise or invite offers or bids for them (tendering).
- Sell by auction
- Sell them to merchants or dealers
- Sell the materials to the employees
- Recycle to remake a new item to be used for a new purpose
- Give to deserving charitable institution

The Role of Other Departments in Determining Stock Range

Other departments are internal customers to the store departments. As such they can play a role in control of stock range and in variety reduction. This can be achieved through:

- Cooperation in the development of stock specifications.
- Timely forwarding of requisition in order to ensure the stores department can verify whether the items required can be found within the stores instead of buying others.
- Consultation in the development of standards to be applied in all items.
- Advising the stores department on the kind of quality they expect and the materials to be issued.
- Cooperate in minimizing the purchase of obsolete stock.

Review Questions

- Discuss various factors inventory control system*
- Discuss the purpose of the stores function.*
- Explain how stock can be classified according to its purpose*

- iv) *What are the measures you recommend to maintain inventory security in stores? Discuss in brief the problems and their remedies in case of valuation of finished goods and work-in-process inventory.*

References

- i) *Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
ii) *Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
iii) *Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

WEEK 7

CHAPTER 4

I.T. APPLICATION IN SUPPLY CHAIN

Chapter objectives:

By the end of this chapter, the learners should know about;

- i) E-Commerce*
- ii) E- Procurement*
- iii) Bar – coding*
- iv) Electronic data interchange.*
- v) Enterprise Resource Planning*

E- Commerce

Involves using an electronic network to simplify and speed up all stages of the business process, from design and making to buying and delivery. It is the exchange of information across electronic networks, at any stage in the supply chain, whether within the organization, between business and consumers or between the public and private sectors, whether paid or unpaid

Basic types of e-commerce

- Business to Business (B2B) e-commerce: The use of e-commerce between two companies. Example; online purchasing of supplies between company A and company B.
- Business to customer (B2C) e-commerce: The use of e-commerce between enterprise and customer. Example; online sale of a product to a customer.
- Government to Business e-commerce: The use of e-commerce between government and business. Example; Government website use by a business to obtain information about state aid to industry.
- Government to Citizen e-commerce: The use of e-commerce between government and citizens. Example; online submission of tax return.

E-Procurement

Electronic procurement refers to the use of computers linked by networks to do any or all of the following:

- Access data about products available in the supply market
- Find sources of supply
- Make price comparisons

- Issue invitation to tender
- Advertise organization requirement
- Receive invoices and make payments
- Access information on suppliers and make various reports.

Benefits of e-procurement to an organization

- Reduction of routine clerical activity by automatic preparation of documents – e.g. purchase requisition, purchases order etc.
- Provision of accurate and up to date information.
- Reduction of staff and staff related costs.
- Can easily cope with fluctuations in workloads.
- Reduction of time received to process orders.
- Rapid calculation order quantities and impact on variation of prices during budgeting.
- Provision of reports to be used by managers during decision making.
- Purchasing staff can devote more time to activities such as preparing for negotiations, sourcing suppliers, studying market trends etc.

Bar Coding

Bar coding involves the use of a system of printed bars of varying thickness and combinations to denote the letters and numbers of product identification codes. Desktop or hand held scanners linked directly or remotely to a central computer read the bar code and transmit the relevant product code data to the computer.

It can be used to verify stock levels, identify stock locations and track stock through various stages from original location via the picking process to load assembly and ultimately on to the delivery vehicle.

Bar coding applications

- Counting raw materials and finished goods inventories
- Automatic sorting of cartons and bins on conveyor belts and palletizes
- Lot tracking
- Production reporting
- Automatic warehouse applications including receiving, order picking and shipping
- Identification of production bottlenecks
- Package tracking
- Access control
- Tool cribs and spare parts issue

Benefits of Bar Coding

- Faster data entry: Bar code scanners can record data 5-7 times as fast as a skilled typist.
- Greater accuracy: Keyboard data entry creates an average of one error in 300 keystrokes. Bar code entry has an error rate of about 1 in 3 million.
- Reduced labor cost: through time saving and increased productivity.
- Elimination of costly over or under stocking and the increased efficiency of J.I.T inventory system.

- Better decision making: Bar code systems can easily capture information that would be difficult to collect in other ways. This helps managers to make fully informed decisions.
- Faster access to information.
- Greater responsiveness to customers and suppliers.

Electronic Data Interchange (EDI).

EDI generally means, computer- to- computer exchange of inter and intra – company business and technical data using agreed standards. The standards are set by the UN for uniformity and are known as EDIFACT – i.e. Electronic Data Interchange for Administration, Commerce and Transport.

How EDI works

- Company sets up purchase order using its internal business software.
- EDI software translates the order from the internal format to the standard 850 purchase order format.
- Company a sends 850 purchase order to company B over a third – party value added network (VAN) or encrypted in EDIFACT format over the internet.
- Company B receives 850 purchase order document and will translate it from EDI to its proprietary format. Typically company B will then send an acknowledgement to company A.

Indicators of need for EDI

- A high volume of paperwork transaction documents.
- Numerous suppliers.
- A long internal administration lead time associated with the purchasing cycle.
- Desires for personnel reduction, new hire avoidance or both.
- A need to increase the professionalism of the purchasing personnel.

Merits of EDI

- Replacement of paper documents – e.g. purchase orders, acknowledgements, invoices, etc; by standard electronic messages conveyed between computers often without the need for human intervention.
- Reduction in lead time through buyers and suppliers working together in a real time environment.
- Reduction in cost of inventory.
- Promotion of strategies such as JIT as a consequence of 2 and 3 above.
- Better customer service
- Facilitation of global purchasing through international standards – e.g. EDIFACT which is compatible with most equipment in most countries.

- Facilitation of invoice payment by the computer-to- computer transfer of money which eliminates the need for the preparation and posting of cheques.
- The integration of functions, particularly marketing, purchasing, production and finance.
- EDI tends to promote long term buyer- supplier relationships and increase mutual trust.

Demerits of EDI

- The costs are still prohibitive for many small and medium sized enterprises.
- It is only suitable for operational functions with very limited analytical capabilities.
- Security issues:
 - i) Interception and modification by third parties of messages sent – e.g. purchase orders, credit card numbers etc.
 - ii) Loss of messages
 - iii) Messages may be read by persons other than the intended recipients
 - iv) A third party may pretend to be one of the original two parties.
 - v) One of the parties may claim never to have sent or received a particular message.
- Legal issues:
 - i) Online contracts; contracts and types of contracts; pre-contract considerations; contract creation; writing and signature requirements; online terms and conditions.
 - ii) International issues; Jurisdiction; applicable law; enforcement etc.
 - iii) Evidence and security; type of evidence; reliability of computer evidence
 - iv) Data protection
 - v) Taxation of e-commerce.

Enterprise Resource Planning(ERP)

ERP is an integrated software encompassing all business operations, bringing about significant cultural change in the way people work.ERP is applicable to all organizations and allows managers from all functions or departments to have a consolidated view of what is , or is not taking place throughout the enterprise. Most ERP systems are designed around a number of modules each of which can stand alone or combine with others.

ERP can be defined as: A business management system that, supported by multi-module application software integrates all the departmental functions of an enterprise.

The applications modules under ERP include:

- Finance: This module tracks financial information such as accounts receivable and payable, pay roll and other financial and management accounting information throughout the enterprise.
- Logistics: This module is often further broken down into sub-modules covering inventory and warehouse management, and transportation.
- Manufacturing: This module tracks the flow of orders or products including MRP and the progress and coordination of manufacturing.

- **Supplier Management:** This module tracks the purchasing process from the requisition to the payment of suppliers and monitors delivery of supplies and supplier performance.
- **Human resources:** This module covers many human resource management activities including planning, training and job allocation.

The advantages of ERP

- **Faster inventory turnover.** Manufacturers and distributors may increase inventory turns by tenfold and reduce inventory costs by 10% – 40%.
- **Improved customer service.** In many cases an ERP system can increase fill rates to 80% or 90% by providing the right product in the right place at the right time thus increasing customer satisfaction.
- **Better inventory accuracy, fewer audits:** An ERP system can increase inventory accuracy to more than 90% while reducing the need for physical inventory audits.
- **Reduced set up times.** ERP can reduce set up times by 25% to 80% by grouping similar production jobs together ensuring coordination of people, tools and machinery together with efficient use of equipment and minimizing downtime through efficient maintenance.
- **Higher quality work.** ERP software with a strong manufacturing component proactively pinpoints quality issues providing the information required to increase production efficiency and to reduce or eliminate re-work.
- **Timely revenue collection and improved cash flow.** ERP gives manufacturers the power to proactively examine accounts receivable before problems occur instead of just reacting. This improves cash flow.

Disadvantages of ERP

- **ERP implementation is difficult.** This is because implementation involves a fundamental change from a functional to a process approach to business.
- **ERP systems are expensive.** This is especially so when the customization of standard modules to accommodate different business processes is involved. It has estimated that some 50% of ERP implementation fails to deliver the anticipated benefits. The cost is often prohibitive for small enterprises.
- **Cost of training employees to use ERP systems can be high.**
- **There may be a number of unintended consequences.** Such as employee stress, and resistance to change and the sharing of information that was closely guarded by departments or functions.
- **ERP systems tend to focus on operational decisions and have relatively weak analytical capabilities.**

Conclusion

Emerging technologies are creating strategic opportunities for progressive organizations to build competitive advantage in various functional areas of management. In building competitiveness, cost reduction and customer satisfaction are the two main objectives today's organizations have to achieve. Emerging technologies are helping them to achieve these goals. However, the degree

of success depends on the selection of the right technology for the application, availability of proper organizational structure, culture, management philosophy and policies.

Review Questions

- i) *Electronic point of sale (EPOS) is the recording of retail stores sales by scanning product bar codes at check-out tills. Explain the benefits of EPOS to customers and sellers.*
- ii) *Electronic Data Interchange (EDI) has received acclamations by many organizations yet the system has limitations. Discuss the limitations of EDI systems.*
- iii) *The successful implementation of Electronic Data Interchange (EDI) requires greater consultation with all stakeholders in an enterprise. Discuss the purposes of the consultations.*
- iv) *To improve the efficiency of the supply chain strategically it is imperative that information is communicated quickly to those who need it for decision-making purposes. Discuss how information technology can contribute to efficiency and effectiveness in this area.*

References

- i) *Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
- ii) *Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
- iii) *Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

SAMPLE OF A CAT ONE

- i) *To improve the efficiency of the supply chain strategically it is imperative that information is communicated quickly to those who need it for decision-making purposes. Discuss how information technology can contribute to efficiency and effectiveness in this area.* (10marks)
- ii) *Discuss various factors that influence inventory control system in a manufacturing organization.* (8marks)
- iii) *Explain how stock can be classified according to its purpose in an organization of your choice.* (6marks)
- iv) *Highlight briefly the objectives and advantages of materials management in an organization.* (6marks)

WEEK 8

CHAPTER 5

PURCHASING STRATIES AND STRATEGIC OPTIONS ON MATERIAL MANAGEMENT

Chapter objectives:

By the end of this chapter, the learners should;

- i) Explain Planning Process*
- ii) Describe purchasing strategic options.*
- iii) Understand planning system*
- iv) How to choose a particular system*

PLANNING PROCESS

Involvement in planning necessitates a grasp of the operation of the business as whole, as well as a clear relationship within the company with regard to materials, and what information is required by whom.

The following checklist indicates the kind of information which is required for effective planning:

- ***The external environment:*** What technical developments are in place in both traditional and non-traditional market sector which might affect the company's supply market during the next five years? What effects will such developments produce, either to threaten manufacturing supplies or to suggest opportunities which can be exploited? What effect will forecasted changes in the supply market have on corporate management? For example: What competition will there be for available supplies? What non- traditional supply markets will need to be utilized because a component/ material changes in the future product programme? Where a supply market is failing, will existing capacity be reduced by withdrawal of suppliers from the market? What effect will these changes have on the company?
- ***Market research:*** What arrangements exist for supply-market research?
- ***Supply strategy:*** Is there a corporate supply strategy and policy? If they exist are they clearly understood and are they being implemented? Where there is increasing competition for available resources, what steps have been taken to protect company interests? What are the anticipated supply-cost trends over the next five years? How do these projections affect strategy (e.g. vertical integration, divestment)?
- ***Product development and product life:*** In which ways can purchasing work more effectively with R&D, e.g. through providing data on supply economics at an earlier stage? Are supply

aspects considered in relation to product strategy at a sufficiently early stage? Are they given sufficient weight in that consideration?

- **Source selection:** How long have we been dealing with our key suppliers? What proportion of the business do these companies hold? When checks were last made on capacities and development plans of existing and potential suppliers.
- **Planning:** How could supply input be improved for corporate planning? What difficulties could be avoided as a result of this improved input? In which ways might we organize more effectively to give key staff more time for consideration of longer-term matters? What historic make-or-buy decisions need to be reviewed in the light of current circumstances?
- **Staff:** What are the training needs of procurement staff? How can we best satisfy these needs? How can we best develop corporate supply attitudes and skills in keeping with wider and more challenging job specifications? What added skills are required in procurement staff in order to implement the broad corporate- supply programmers'?

It is emphasized that these questions are only examples of those which might be asked of procurement. The broad implications of the task and its interrelationships with other functions demand that many more be asked. The organization, systems and procedures which are developed will reflect, for example:

- The degree of internationalization.
- The size of the company.
- The managerial style of the executives.
- The degree of centralization
- The authority extended to managers.
- The volatility of the supply market.
- The types of products and the pace of technological change which affects them
- Managerial knowledge.
- The communication system.

The planning system

Typically plans have three phases:

- 1) An annual plan
- 2) A medium-term plan (2-3 years)
- 3) A longer term plan (3 – 15 years).

The time scale for these plans differs from industry to industry and even between companies within the same industry.

Purchasing strategy

Strategy is a means of accomplishing long term goals. The Harvard Business School defines strategy as: The pattern of objectives, purposes and goals stated in such a way as to define what business the organization is in, or is to be in, and the kind of organization it is or to be.

Organizations will have single or multiple goals, which may, for example relate to:

- Profitability.
- Market penetration.
- Sales volume
- Return on capital
- Customer satisfaction
- Environmental friendly behavior.
- Social values.

Many organizations indicate the strategies they are likely to follow in their mission statements. A mission statement is a generalized objective or expression of an organization's purpose – a master strategy. Common objectives encountered in mission statements include:

- Total quality – continuous improvement.
- Satisfying or delighting the customer.
- Flexibility within the organization
- To be the best.
- World class.
- Total involvement of staff – teamwork.
- Prosperity
- Expansion
- Technological advancement.

It is from these general mission statements that organizations determine strategies.

Factors influencing choice of a strategy:

- 1) The position of the business in its supply chain.
- 2) The number of effective sources in the company's supply market
- 3) The pace of technological development in the supply and end market.
- 4) The volatility of the supply and / or end markets.
- 5) The degree of government involvement in the marketplace e.g. the defense market).
- 6) The ability of the buying company to manage a strategy e.g. the quality and number of staff in the area and the ability to influence behavior in the business.

Levels of strategy:

- 1) Corporate strategy: All embracing, linking the business together.
- 2) Business strategy: Concerned with broad issues such as, how to compete in different markets e.g. home or overseas.
- 3) Operational strategy: Concerned with functional activities such as marketing, purchasing or finance.

Review Questions

CASE STUDY

Expert Print (K) Ltd is a Kenyan business company based in Mombasa. The core business of the company is design, print and sales of birthday and Christmas cards. This is a family business with annual turn over of K.sh. 450 million. Mr. Kwetu is the founder and Managing Director. He is also the sole designer. Mr. Kwetu is planning to retire at the end of this year.

Mr. Kwetu's two sons Edward and James and his daughter Rebecca have recently joined the business after gaining qualification in design and print. The only other staffs in the company are three printers and a sales force of five employed for over the two years to cover the whole country which has been divided into eight regions. There has been a slow progression of the business with little investment in technology.

Mr. Kwetu currently funds any developments to business from profits made in previous years. He is cautious about business expansion and likes to oversee the printing and sales operations personally. Edward, the eldest son has many ideas for the business as he prepares to take over from his father.

Edward has discussed his ideas with James and Rebecca and these are some of his initial thoughts:

- *Expansion of the range of cards*
- *The introduction of new product lines*
- *An increase in sales throughout the country*
- *The development of marketing and publicity plans for the next five years*
- *The introduction of new technology in both design and print*
- *Recruitment of more staff.*
- *The re-structuring of the entire business with plans to open divisional offices in the other districts.*
- *The expansion of the business into the entire East Africa.*

Required:

- a) Identify environmental and organizational characteristics which are likely to affect future strategic decisions for the business and its supply chain.*
- b) If you were Edward, explain whether you would plan for the strategy to expand and develop the business first or whether you would re-structure the business both in Kenya and East Africa first.*

References

- i) Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
- ii) Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
- iii) Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

WEEK 9

CHAPTER SIX

PRODUCTION AND OPERATION PLANNING

OBJECTIVES OF THE STUDY:

- ✓ Student should know the components of operation planning
- ✓ The student should know aggregate planning strategies and guideline
- ✓ Master Production Schedule(MPS) and Material Requirement Planning(MRPI)
Material resource planning (MRP II)

INTRODUCTION AND MEANING

Operations planning and scheduling systems concern with the volume and timing of outputs, the utilization of operations capacity at desired levels for competitive effectiveness. These systems must fit together activities at various levels, from top to bottom, in support of one another, as shown in Fig. 5.3. Note that the time orientation ranges from long to short as we progress from top to bottom in the hierarchy. Also, the level of detail in the planning process ranges from broad at the top to detail at the bottom.

COMPONENTS OF OPERATIONS PLANNING AND SCHEDULING SYSTEM

1. The Business Plan

The business plan is a statement of the organization's overall level of business activity for the coming six to eighteen months, usually expressed in terms of outputs (in volume of sales) for its various product groups, a set of individual products that share or consume common blocks of capacity in the manufacturing process. It also specifies the overall inventory and backlog levels that will be maintained during the planning period.

The business plan is an agreement between all functional areas—finance, production, marketing, engineering, R & D—about the level of activity and the products they are committed to support. The business plan is not concerned with all the details and specific timing of the actions for executing the plan. Instead, it determines a feasible general posture for competing to achieve its major goals. The resulting plan guides the lower-level, more details decisions.

2. Aggregate Production (Output) Planning

The process of determining output levels of product groups over the coming six to eighteen months on a weekly or monthly basis. It identifies the overall level of outputs in support of the business plan. The plan recognizes the division's existing fixed capacity and the company's overall policies for maintaining inventories and backlogs, employment stability and subcontracting.

3. Aggregate Capacity Planning

It is the process of testing the feasibility of aggregate output plans and evaluating overall capacity utilisation. A statement of desired output is useful only if it is feasible. Thus, it addresses the supply side of the firm's ability to meet the demand. As for aggregate output plans, each plant, facility, or division requires its own aggregate capacity plan.

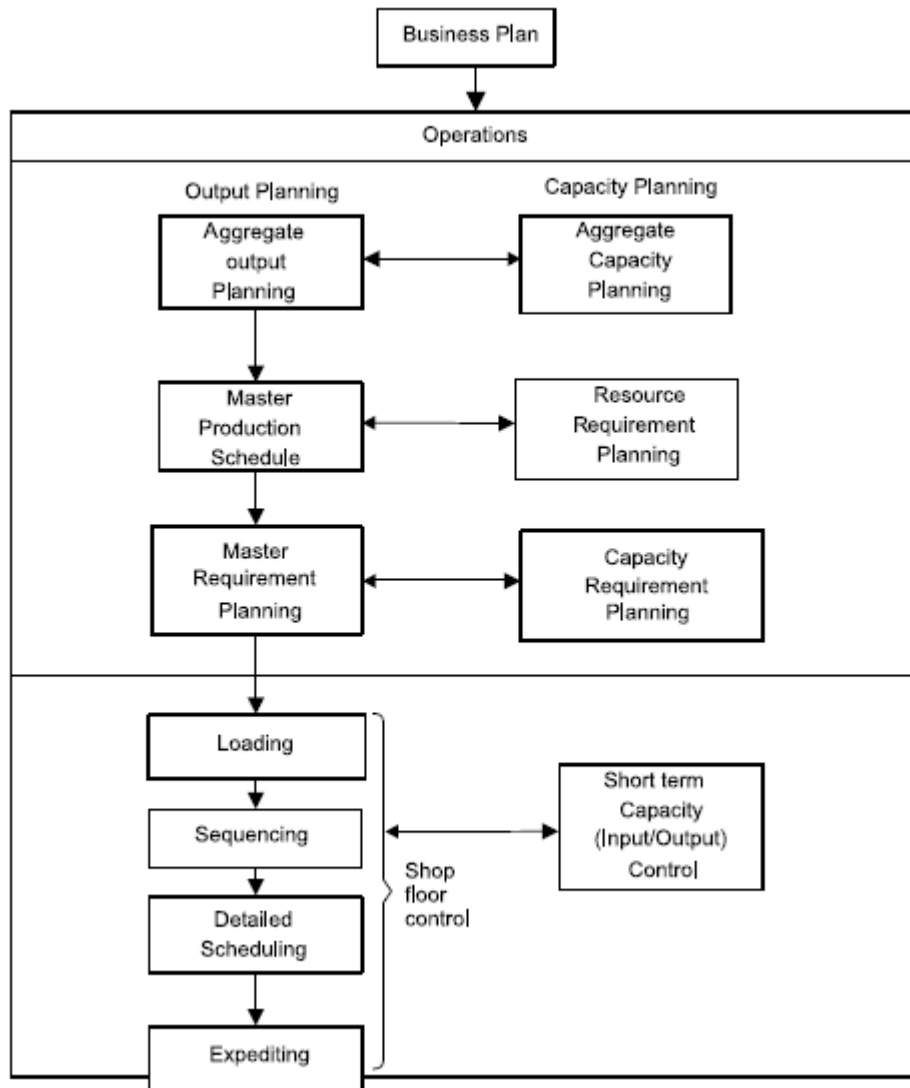
Capacity and output must be in balance, as indicated by the arrow between them in Fig. 1.5. A capacity plan translates an output plan into input terms, approximating how much of the division's capacity will be consumed.

Although these basic capacities are fixed, management can manipulate the short-term capacities by the ways they deploy their work force, by subcontracting, or by using multiple work shifts to adjust the timing of overall outputs. As a result, the aggregate planning process balances output levels, capacity constraints, and temporary capacity adjustments to meet demand and utilize capacity at desired levels during the coming months. The resulting plan sets limits on the master production schedule.

4. Master Production Scheduling (Mps)

MPS is a schedule showing week by week how many of each product must be produced according to customer orders and demand forecasts. Its purpose is to meet the demand for individual products in the product group. This more detailed level of planning disaggregates the product groups into individual products and indicates when they will be produced.

The MPS is an important link between marketing and production. It shows when incoming sales orders can be scheduled into production, and when each shipment can be scheduled for delivery. It also takes into account current backlogs so that production and delivery schedules are realistic.



5. Resource Requirement Planning

Resource requirement planning (rough-cut capacity planning) is the process of testing the feasibility

of master production schedule in terms of capacity. This step ensures that a proposed MPS does not inadvertently overload any key department, work centre, or machine, making the MPS unworkable.

6. Material Requirement Planning

Material requirement planning (MRP) is a system of planning and scheduling the time phased material requirements for releasing materials and receiving materials that enable the master production schedule to be implemented. Thus, the master production schedule is the driving force for material requirements planning. MRP provides information such as due dates for components that are subsequently used for shop floor control. Once this information is available, it enables managers to estimate the detailed requirements for each work centres.

7. Capacity Requirement Planning

Capacity requirement planning (CRP) is an iterative process of modifying the MPS or planned resources to make capacity consistent with the production schedule. CRP is a companion process

used with MRP to identify in detail the capacity required to execute the material requirement planning. At this level, more accurate comparisons of available and needed capacity for scheduled workloads are possible.

8. Shop Floor Control

Shop floor control involves the activities that execute and control shop operations namely loading, sequencing, detailed scheduling and expediting jobs in production. It coordinates the weekly and daily activities that get jobs done. Individual jobs are assigned to machines and work centres (loading), the sequence of processing the jobs for priority control is determined, start times and job assignments for each stage of processing are decided (detailed scheduling) and materials and work flows from station to station are monitored and adjusted (expediting).

9. Loading

Each job (customer order) may have its unique product specification and, hence, it is unique through various work centres in the facility. As new job orders are released, they are assigned or allocated among the work centres, thus establishing how much of a load each work centre must carry during the coming planning period. This assignment is known as loading (sometimes called shop loading as machine loading).

10. Sequencing

This stage establishes the priorities for jobs in the queues (waiting lines) at the work centres. Priority sequencing specifies the order in which the waiting jobs are processed; it requires the adoption of a priority sequencing rule.

11. Detailed Scheduling

Detailed scheduling determines start times, finish times and work assignments for all jobs at each work centre. Calendar times are specified when job orders, employees, and materials (inputs), as well as job completion (outputs), should occur at each work centre. By estimating how long each job will take to complete and when it is due, schedulers can establish start and finish dates and develop the detailed schedule.

12. Expediting

Expediting is a process of tracking a job's progress and taking special actions to move it through the facility. In tracking a job's progress, special action may be needed to keep the job moving through the facility on time. Manufacturing or service operations disruptions-equipments breakdowns, unavailable materials, last-minute priority changes, require managers to deviate from plans and schedules and expedite an important job on a special handling basis.

13. Input/Output Control

Input/output control related to the activities to monitor actual versus planned utilization of a work centre's capacity. Output plans and schedules call for certain levels of capacity at a work centre, but actual utilization may differ from what was planned. Actual versus planned utilization of the work centre's capacity can be monitored by using input-output reports and, when discrepancies exist, adjustments can be made. The important components of operations planning and scheduling system has been explained in detail in the following paragraphs.

AGGREGATE PLANNING

Aggregate planning is an intermediate term planning decision. It is the process of planning the quantity and timing of output over the intermediate time horizon (3 months to one year). Within this range, the physical facilities are assumed to –10 be fixed for the planning period. Therefore,

fluctuations in demand must be met by varying labour and inventory schedule. Aggregate planning seeks the best combination to minimise costs.

Aggregate Planning Strategies

The variables of the production system are labour, materials and capital. More labour effort is required to generate higher volume of output. Hence, the employment and use of overtime (OT) are the two relevant variables. Materials help to regulate output. The alternatives available to the company are inventories, back ordering or subcontracting of items. These controllable variables constitute pure strategies by which fluctuations in demand and uncertainties in production activities can be accommodated by using the following steps:

1. ***Vary the size or the workforce:*** Output is controlled by hiring or laying off workers in proportion to changes in demand.
2. ***Vary the hours worked:*** Maintain the stable workforce, but permit idle time when there is a slack and permit overtime (OT) when demand is peak.
3. ***Vary inventory levels:*** Demand fluctuations can be met by large amount of inventory.
4. ***Subcontract:*** Upward shift in demand from low level. Constant production rates can be met by using subcontractors to provide extra capacity.

Aggregate Planning Guidelines

The following are the guidelines for aggregate planning:

1. Determine corporate policy regarding controllable variables.
2. Use a good forecast as a basis for planning.
3. Plan in proper units of capacity.
4. Maintain the stable workforce.
5. Maintain needed control over inventories.
6. Maintain flexibility to change.
7. Respond to demand in a controlled manner.
8. Evaluate planning on a regular base.

MASTER PRODUCTION SCHEDULE (MPS)

Master scheduling follows aggregate planning. It expresses the overall plans in terms of specific end items or models that can be assigned priorities. It is useful to plan for the material and capacity requirements.

Flowchart of aggregate plan and master production schedule is shown in Fig. 5.4

Time interval used in master scheduling depends upon the type, volume, and component lead times of the products being produced. Normally weekly time intervals are used. The time horizon covered by the master schedule also depends upon product characteristics and lead times. Some master schedules cover a period as short as few weeks and for some products it is more than a year.

Functions of MPS

Master Production Schedule (MPS) gives a formal details of the production plan and converts this plan into specific material and capacity requirements. The requirements with respect to labour, material and equipment is then assessed.

The main functions of MPS are:

1. *To translate aggregate plans into specific end items:* Aggregate plan determines level of operations that tentatively balances the market demands with the material, labour and equipment capabilities of the company. A master schedule translates this plan into specific number of end items to be produced in specific time period.

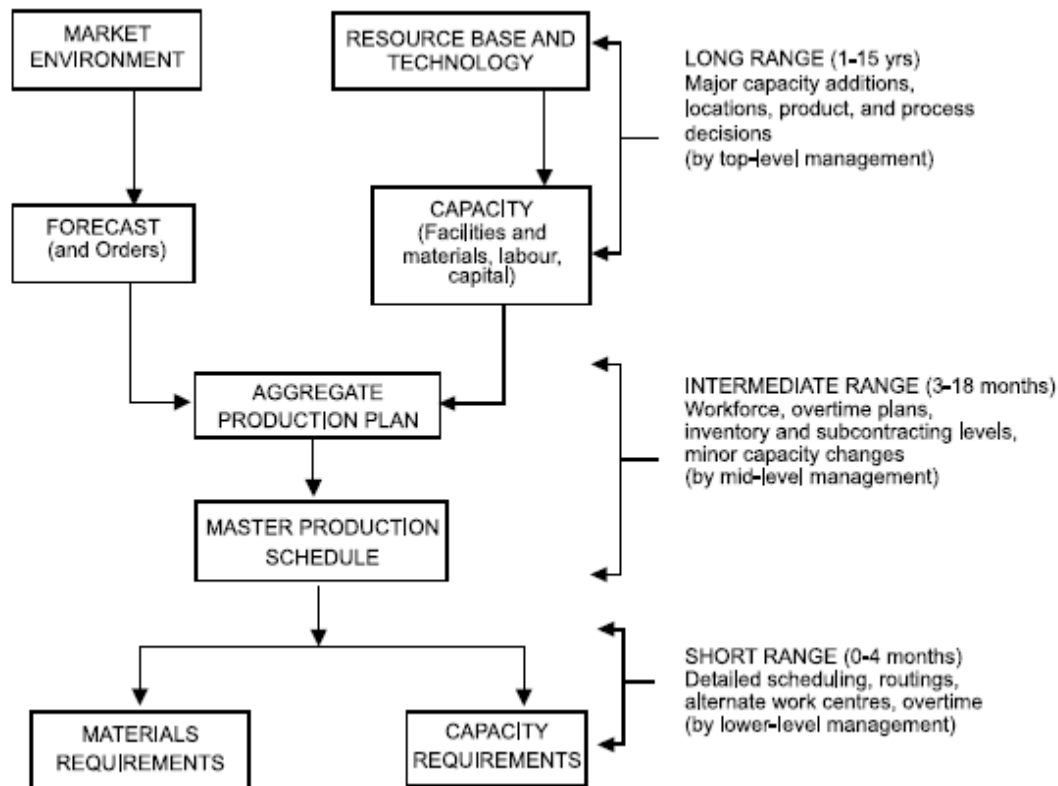


Fig. 1.4 Flowchart of aggregate plan and master schedule

2. *Evaluate alternative schedules:* Master schedule is prepared by trial and error. Many computer simulation models are available to evaluate the alternate schedules.

3. *Generate material requirement:* It forms the basic input for material requirement planning (MRP).

4. *Generate capacity requirements:* Capacity requirements are directly derived from MPS. Master scheduling is thus a prerequisite for capacity planning.

5. *Facilitate information processing:* By controlling the load on the plant. Master schedule determines when the delivery should be made. It coordinates with other management information systems such as, marketing, finance and personnel.

6. *Effective utilization of capacity:* By specifying end item requirements schedule establishes the load and utilization requirements for machines and equipment.

MATERIAL REQUIREMENT PLANNING (MRP)

MRP refers to the basic calculations used to determine components required from end item requirements. It also refers to a broader information system that uses the dependence relationship to plan and control manufacturing operations.

“Materials Requirement Planning (MRP) is a technique for determining the quantity and timing for the acquisition of dependent demand items needed to satisfy master production schedule requirements.”

Objectives of MRP

1. **Inventory reduction:** MRP determines how many components are required when they are required in order to meet the master schedule. It helps to procure the materials/ components as and when needed and thus avoid excessive build up of inventory.
2. **Reduction in the manufacturing and delivery lead times:** MRP identifies materials and component quantities, timings when they are needed, availabilities and procurements and actions required to meet delivery deadlines. MRP helps to avoid delays in production and priorities production activities by putting due dates on customer job order.
3. **Realistic delivery commitments:** By using MRP, production can give marketing timely information about likely delivery times to prospective customers.
4. **Increased efficiency:** MRP provides a close coordination among various work centres and hence help to achieve uninterrupted flow of materials through the production line. This increases the efficiency of production system.

MRP System

The inputs to the MRP system are: (1) A master production schedule, (2) An inventory status file and (3) Bill of materials (BOM).

Using these three information sources, the MRP processing logic (computer programme) provides three kinds of information (output) for each product component: order release requirements, order rescheduling and planned orders.

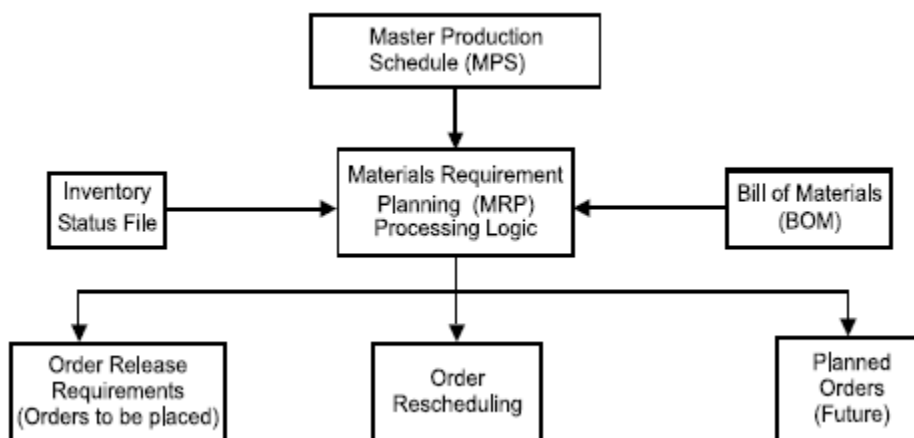


Fig. 1.5 MRP system

1. Master Production Schedule (Mps)

MPS is a series of time phased quantities for each item that a company produces, indicating how many are to be produced and when. MPS is initially developed from firm customer orders or from forecasts of demand before MRP system begins to operate. The MRP system whatever the master schedule demands and translates MPS end items into specific component requirements. Many systems make a simulated trial run to determine whether the proposed master can be satisfied.

2. Inventory Status File

Every inventory item being planned must have an inventory status file which gives complete and up to date information on the on-hand quantities, gross requirements, scheduled receipts and planned order releases for an item. It also includes planning information such as lot sizes, lead times, safety stock levels and scrap allowances.

3. Bill Of Materials (Bom)

BOM identifies how each end product is manufactured, specifying all subcomponents items, their sequence of build up, their quantity in each finished unit and the work centres performing the build up sequence. This information is obtained from product design documents, workflow analysis and other standard manufacturing information

1.1 REVIEW QUESTIONS

1. What do you mean by aggregate planning?
2. Discuss the operations planning and scheduling systems.
3. Discuss the aggregate plan and master schedule.
4. Discuss the MRP system and explain the objective of MRP.
5. Explain the functions of master production schedule.

SUGGESTED BOOKS FOR FURTHER READING:

- Adams E. E. (2007), production and operations management, 5th Edition, Prentice Hall, Chicago
- Barey Render (2004), *Principles of operations Management*, Prentice Hall, New Jersey
- Franklin G. Moore (2002), *Production Operations Management*, Irwin, Illinois

WEEK 10

CHAPTER 7

COST MANAGEMENT IN SUPPLY CHAIN.

Chapter objectives:

By the end of this chapter, the learners should;

- i) Understand different categories of cost*
- ii) Differentiate between Price and cost analysis*
- iii) Learning curves and application in supply chain*
- iv) Activity based costing / Management.*

Categories of Cost

Variable Manufacturing Costs

These are items of costs that vary directly and proportionally with the production quantity of a particular product. Variable manufacturing costs include:

- Direct labour (unless fixed by contract)
- Direct materials (includes raw materials, sub-assemblies etc)
- Variable manufacturing overheads (e.g. plant utilities if they vary with machine use/output)

Variable costs may decrease because of economies of scale (e.g. purchase discounts on direct materials) and increase because of discrepancies of scale (e.g. too many workers in a confined workshop)

Variable costs also exist in selling, general and administrative areas. Thus variable costs are fixed per unit but vary in total as the activity level changes.

Fixed Manufacturing Costs

Fixed costs do not vary with volume but change over time. They are a function of time and are not influenced by the volume of production. They generally represent either money the seller has already spent for the buildings and equipment (e.g. depreciation) or money the seller will have to spend for unavoidable expenses (e.g. rent and insurance) regardless of the production volume.

Fixed costs are fixed in total, but vary per unit as the activity level changes (fixed costs per unit decreases as more units are produced).

Semi-Variable or Mixed Manufacturing Costs

They fall somewhere between fixed costs and variable costs such as maintenance, utilities and postage which are all partially variable and partly fixed.

Each is like a fixed cost, because its total cannot be tied directly to a particular unit of production. Yet it is possible to sort out specific elements in each of these costs that are fixed as soon as the plant begins to operate.

Total Production Cost

This is the sum of the variable, fixed and semi-variable costs. As the volume of production increases, total costs increases. However the cost to produce each unit of product decreases.

Direct Costs

Are costs specifically traceable to or caused by a specific project or production operation. The two major direct costs are direct labour and direct materials. It relates to traceability of costs to specific operations while variable costs relate to the behaviour of costs as volume fluctuates.

Indirect Costs (overhead)

Are costs associated with or caused by two or more operating activities “jointly” but are not traced to each of these individually

They can be fixed or variable, depending on their behaviour [property taxes are fixed, but the portion of energy consumption that varies with the level of production is variable]

Price and cost analysis

Price analysis

Price analysis is the examination of a seller’s price proposal (bid) by comparison with reasonable price benchmarks, without examination and evaluation of the separate elements of the cost and profit making up the price.

Tools for conducting price analysis

- Analysis of competitive price proposals
- Comparison with regulated, catalog or market price
- Comparison with historical prices
- Use of independent cost estimates which must be fair and reasonable

If price analysis is impractical or if it does not allow the buyer to reach a conclusion that the price is fair and reasonable, then cost analysis should be employed.

Cost analysis

Cost analysis is a review and an evaluation of actual or anticipated costs. The analysis involves the application of experience, knowledge and judgment to data in an attempt to project reasonable estimated contract costs. The purpose of cost analysis is to arrive at a price that is fair and reasonable to both the buyer and the seller.

Some of the most important elements affecting costs include:

- ***The capabilities of management:*** The skill with which a firm carries out the function of management determines its efficiency.
- ***The efficiency of labour:*** Buyers are well rewarded for pinpointing suppliers with efficient labour forces.
- ***The amount and quality of sub-contracting:*** Sub-contractor prices and performance directly influence the prices the buyer pays the prime contractor.
- ***Plant capacity:*** A buyer must be alert to detect firms whose operations are adversely affected by size, over or under- utilization of facilities is not cost effective.

LEARNING CURVES AND APPLICATIONS IN SUPPLY CHAIN

Definition:

It's a graphical representation of the rate at which skills or knowledge is acquired over a period of time.

Basics of the Learning Curve

“Skills to do come by doing”. A task performed more quickly with each repetition until a point is reached where no further improvement is possible and performance levels out. In industry, cost reduction arising from ‘learning’ is due to the following factors:

- Less time required for the operators’ to ‘weigh up’ the job.
- Improved speed and proficiency in performing the actual operations.
- Reduction in scrap and rectification.
- Improved operational sequencing.
- Improved tooling as a result of production experience.
- The application of value engineering and value analysis.
- Larger lot sizes with reduced setting up costs.

Learning curves are developed on the basis of the following assumptions

- The direct labour required to produce the $(n+1)$.The unit will always be less than the direct labour required for the n th unit.
- Direct labour requirements will decrease at a declining rate as cumulative production increases
- The reduction in time will follow an exponential curve

The Application of Learning Curves

Price Determination: It indicates the areas on which to concentrate when conducting a price analysis in order to obtain the greatest savings

Make-or-Buy decisions: In comparing the costs of making or buying, the effect of learning on each production run should be determined and taken into consideration as well as the quantity under consideration

Delivery Times: Knowledge of the learning curve principle can enable a supplier to offer improved delivery time.

When Not to Use Learning Curves

When learning is not constant

- Where the direct labour content of the job is small
- Where the cost/volume does not justify the high expense of periodic time studies or job costing required to obtain the data from which the learning is constructed
- When production is largely automated so that human input is relatively small

Activity- Based Costing (ABC) /Management

ABC Analysis

The ABC analysis is a business term used to define an inventory categorization technique often used in materials management. It is also known as *Selective Inventory Control*. It stands for Always Better Control.

Policies based on ABC analysis: A ITEMS: very tight control and accurate records B ITEMS: less tightly controlled and good records C ITEMS: simplest controls possible and minimal records

The ABC analysis provides a mechanism for identifying items that will have a significant impact on overall inventory cost, while also providing a mechanism for identifying different categories of stock that will require different management and controls.

The ABC analysis suggests that inventories of an organization are not of equal value. Thus, the inventory is grouped into three categories (*A, B, and C*) in order of their estimated importance.

- 'A' items are very important for an organization. Because of the high value of these 'A' items, frequent value analysis is required. In addition to that, an organization needs to choose an appropriate order pattern (e.g. 'Just- in- time') to avoid excess capacity

- 'B' items are important, but of course less important than 'A' items and more important than 'C' items. Therefore 'B' items are intergroup items.
- 'C' items are marginally important.

It is a method of charging overheads to cost units on the basis of benefits received from the specific indirect activity – e.g. ordering, planning, setting up machines, materials handling etc. ABC seeks to attribute overheads to product costs on a more realistic rather than simply production volume and also attempts to show the relationship between overhead costs and the activities that cause them.

Steps Followed in ABC

- Identify the main activities in an organization e.g. production planning, material ordering, purchasing, material handling, dispatching etc
- Identify the factors which determine the cost of an activity i.e. cost drivers
- Collect the cost of each activity into a cost pool (=> cost center) - similar to cost center in a conventional cost accounting.
- Charge the support overheads to products on the basis of the usage of the activity expressed as a proportion of the chosen cost driver

NB: ABC cuts across the chain of command

In ABC, overheads can be classified into;

Short-term variable overheads – these are costs that vary with production volumes and therefore would be classified as variable overheads in the traditional absorption costing method, e.g. cost of power, cost of indirect materials, cost of indirect labour etc => should be traced to products using production/volume related costs drivers –

Long-term Variable Overheads – these are overhead costs which do not vary with the production volume but vary with other measures of activity usually not immediately e.g. cost of support activities e.g. stock handling costs, production scheduling, machine setup costs etc.

These costs are fixed in the short term but vary in the long term according to the range and complexity of product manufactured. ABC requires that these costs be traced to products by transaction-based cost drivers

Fixed Overheads – these are cost that do not vary for a given time period with any activity indicator e.g. MDs salary, Mgt's salaries. Such overheads are written off in the period in which they are incurred.

Note:

For each cost pool, you must come up with the appropriate cost drivers.

Illustration

<i>Cost Pool</i>	<i>Cost drivers</i>
Production scheduling-----	No. of production runs
Set up costs-----	No. of production runs.
Material handling-----	No. of material compounds.
Stock handling and dispatch-----	No. of orders received.
Purchasing cost-----	No. of orders made
Raw materials and stock handling costs-----	No. of orders made.

ABC Analysis Categories

There is no fixed threshold for each class, different proportion can be applied based on objective and criteria. ABC Analysis is similar to the Pareto principle in that the 'A' items will typically account for a large proportion of the overall value but a small percentage of number of items. Examples of ABC class are

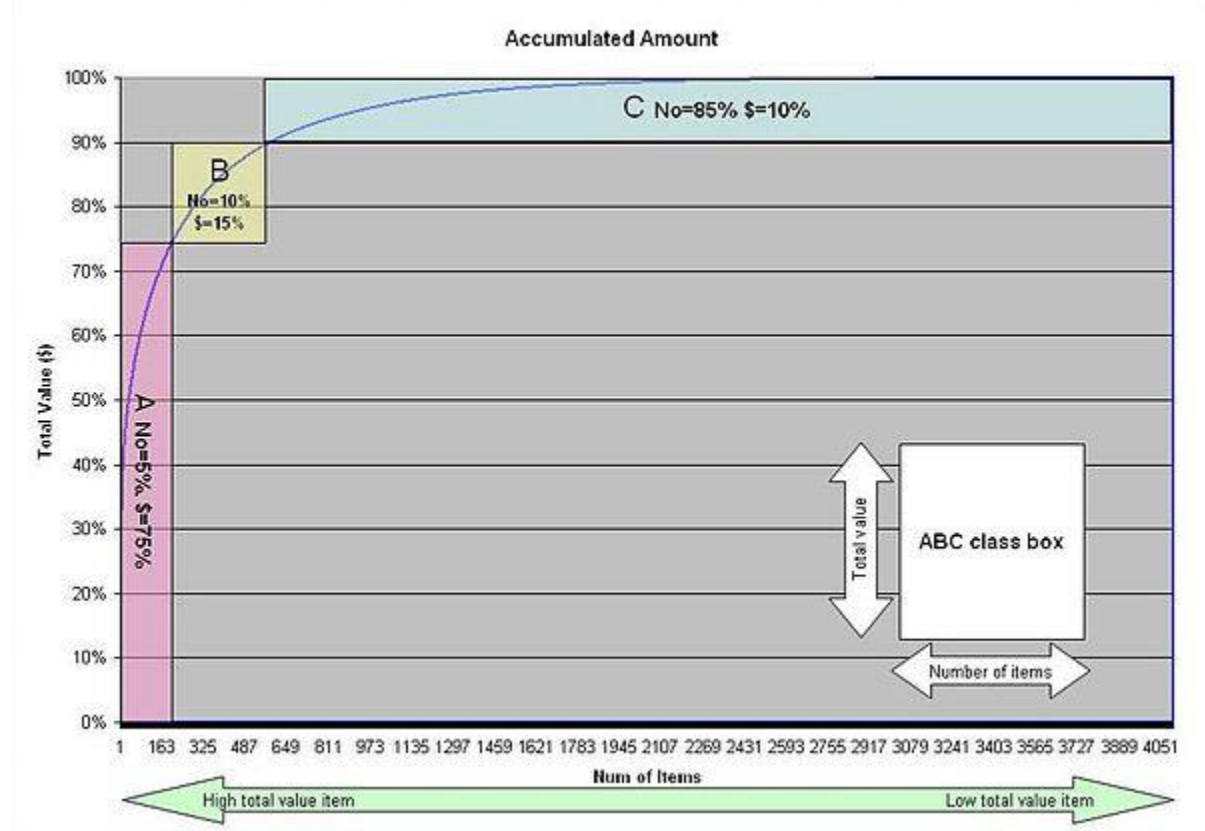
- 'A' items – 20% of the items accounts for 70% of the annual consumption value of the items.
- 'B' items - 30% of the items accounts for 25% of the annual consumption value of the items.
- 'C' items - 50% of the items accounts for 5% of the annual consumption value of the items.

Another recommended breakdown of ABC classes:

1. "A" approximately 10% of items or 66.6% of value
2. "B" approximately 20% of items or 23.3% of value
3. "C" approximately 70% of items or 10.1% of value

Example of the Application of Weighed Operation based on ABC class

Actual distribution of ABC class in the electronics manufacturing company with 4051 active parts.



Distribution of ABC class

ABC class Number of items Total amount required

A	5%	75%
B	10%	15%
C	85%	10%
Total	100%	100%

Merits of Adoption of ABC

- More realistic product costs are provided especially for advanced manufacturing technology
- Where support overheads are a significant proportion of total cost.
- More overheads can be traced to a product – i.e. in modern factories there is a growing number of non-manufacturing activities.
- ABC focuses attention on the real nature of cost behaviour and helps in reducing costs and identifying activities which do not add value to the product.
- ABC recognizes the complexity and diversity of modern production by use of multiple cost drivers many of which are transaction-based rather than volume-based.
- ABC provides a reliable indication of long-run variable product costs which is relevant to strategic decision making.
- ABC is flexible enough to trace costs to processes, customers, and areas of managerial responsibility as well as product costs.
- ABC provides financial measures e.g. cost drivers rates and non-financial measures like transaction volumes.

Demerits of ABC

- A full ABC system with numerous cost pools is understandably more complex than traditional systems and will thus be more expensive to administer.
- ABC is not applicable/suited to organizations with low levels of technology.
- Many practical problems are unresolved e.g. common costs, cost driver selection, non-linearity of cost driver rates etc

Review Questions

- i) Describe the application of learning curves and activity based costing / management in procurement.*
- ii) Explain the application of price and cost analysis principles in negotiations for price.*
- iii) Briefly highlight the categories/classifications in ABC analysis and each category should be controlled*
- iv) Discuss the merits and demerits of adopting ABC analysis in material management to control cost.*
- v) Discuss the concept and utility of ABC analysis as applied to inventory control*

References

- i) Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
- ii) Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
- iii) Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

WEEK 11

CHAPTER 8

MATERIAL/ STORES AUDIT

Chapter objectives:

By the end of this chapter, the learners should:

- i) Know The Purpose of Stock Records in the Stores*
- ii) Explain the Information Required On A Stock Record*
- iii) Understand stock levels*
- iv) Know how to Control of Stock-Methods*

INTRODUCTION

The Control of Stock – Stock Records

The activities involved in the overall function of the control of stock function of business include:

- Deciding the range of times to be held in stock.
- Deciding the amounts of each item to be held.
- Determining the stock levels for control purposes
- Providing the most satisfactory means for identifying, classifying and coding stocks.
- Regulating and recording the movement of materials and supplies into and out of stock.
- Checking, reconciling and reviewing stocks.

The Purpose of Stock Records in the Stores

Stock records are needed for the following reasons:

- To identify materials and their locations.
- To record information about stock movement such as receipts, allocations, issues and transfers.
- To provide a basis for replenishment of stocks.
- To indicate the amount of stock if any item at any time without it being necessary in the stock to be counted physically.
- To provide a basis for stock checking/stocktaking.
- As a basis for costing of materials or evaluation of stock.
- As a basis for stores accounting.
- To provide management information.

The stock recording system should be designed not only to provide for the various needs (purpose of stock records). It may be required to satisfy, but also keeping in mind this method that might be considered most suitable in the circumstances.

Information Required On A Stock Record (Stock Cards, Bin, Etc)

The information required will depend upon the needs that the recording system is required to satisfy, but there is a range of standard items of information usually found on such a record.

The permanent or semi-permanent information is usually shown on the heading of the stock record and may include the following:

- The part number or code number of the item.
- A full description of the item, this may also involve some specification details.
- The unit of quantity applicable (each, dozen, kgs, etc)
- Stock levels maximum, reorder, hastening and minimum (these may be reviewed periodically)
- The pricing details – actual standard or average, depending upon the pricing method in use.
- The physical location of the item. The variable information or that which changes day by day is usually recorded in columnar form and may include:
 - A date column showing when a transaction occurs.
 - Quantities ordered from suppliers.
 - Receipt of items.
 - Quantities allocated to stock jobs but not issued yet.
 - Balance available or free stock (where items are allocated but not issued).
 - Issues of items.
 - Balance in stock. Analyses of stock usage maybe be maintained at the bottom of each record card on a month by month basis. This information is often useful to review stock levels.

STOCK LEVELS

For the effective control of stock, certain points of reference (stock levels) must be determined to trigger action. The levels are as follows:

- Minimum – the safety or buffer level below which stock should not be allowed to fall. This level will only allow sufficient time for purchasing to expedite delivery of outstanding orders.
- Re-order – this is a quantity in excess of “minimum” which includes the requirements needed to cover the delivery period (lead-time) plus the minimum or safety stock.
- Hastening – is the amount expressed in units of issue at which it is estimated that hastening action is necessary to request suppliers to make early delivery. It is fixed between the minimum and the ordering levels.
- Maximum – this restricts the quantity held to that which the organization is prepared to finance and involves consideration of working capital available, stocking space, importance and usage of the item, stockholding costs, obsolescence/deterioration and possible quantity discounts.

The Control of Stock-Methods

Range Of Methods

- Physical control
- Visual control
- Stock recording

Physical Control Methods

Physical control will involve the following considerations and various methods involved:

- Unloading and receipt of goods
- Quaranting awaiting inspection
- Movement of goods into stock
- Stockholding to prevent loss of deterioration
- Storage for ease of recognition
- Storage for ease of holding
- Storage for ease of location

Visual control Methods

This is a simply a method of controlling stock quantities as an alternative to or in addition to, stock recording. Physical stocks are so arranged in their location as to enable the storekeeper to determine visually the stock position of each item. Different types of stock location or different types of items.

Stock Records Cards

The most common form of stock recording as they provide a central pool of information.

Advantages

- Can identify a wider range of objectives
- Can be maintained by clerically trained staff
- Can be kept secure in binders or containers in an office
- Can also be used for costing or accounting purposes.

Disadvantages

- Are never completely up-to-date.
- Cost money to set up and maintain
- Are still subject to inaccuracies due to loss of documents, clerical errors, etc.

Stock Check or Review Cards - used for stock taking or stock checking purposes only, where information is required at one point in time. Normal stock record cards cannot be used for this purpose because they are in continual use and cannot be released for use by accounting, data processing and other departments.

Stock Tabulations – where stock records are maintained on a computer, the information is normally contained on punched cards or magnetic tapes and not available for day to day reference. A “hard copy” record of the information can be provided by a printed tabulation. Alternatively information can be obtained in visual form the computer on a visual display unit (VDU)

The Control of Stock- Stocktaking and Stock Checking

The purpose of stock counting

Whilst stock taking, stock checking, stock auditing, and the reviewing of stocks are similar in nature, and indeed are frequently confused with one another, each as its specific purposes as follows:

- **Stocktaking:** Organizations are required, by law, to prepare year-end accounts in which an accurate evaluation of stock is a most important component part. So this is the primary purpose of stock taking.

As stocktaking provides an accurate and up-to-date record of all stocks at one point in time, and has a cost, a considerable amount in money and time to carry out, management will obviously make the best of it in other directions.

- To check and amend stock records
 - To check for weaknesses in the recording system.
 - To highlight significant losses and investigate the reasons.
 - To review stocks for slow movement, obsolescence, etc.
-
- **Stock checking** Stock checks are usually necessary to verify quantities of individual items or a particular range of items in the following circumstances:
 - When inaccuracies have resulted in shortages.
 - When items are issued in standard quantities and actual usage is not known.
 - When batches of items are frequently removed from stock for processing and losses may occur in the process.
 - When finished goods being “phased-out” and it is vital to balance existing stocks of parts and materials.
 - When for any other reason management has reason to doubt stock records.

Stock checking therefore is a process which takes place as and when required, it has nothing to do with the official stock taking.

- **Review of stocks:** In organizations where many design changes or modifications are likely, material and components may become slow moving, obsolescent, or redundant. This will result in the following problem:
- Money tied up in useless stock.
- Space occupied by useless stock.
- Records being maintained unnecessarily
- Items of stock which could be used as alternatives are ignored.
- Valuable materials may deteriorate to the point at which they become valueless.

Stock reviews should ideally take place when new finished products are introduced, or design changes take place.

PERPETUAL INVENTORY (CONTINUOUS STOCK TAKING)

Continuous stocktaking or perpetual inventory is a system whereby all stocks are counted throughout the year to a carefully planned programme. Such a system must meet the following requirements if it is to be accepted by external audits and tax authorities as an alternative to year-end stocktaking.

- Items of different values and usages must be checked on acceptable number of times throughout the year to agreed programmes.
- An efficient stock recording system must be maintained and amended at each stock check.
- Special personnel must be selected and trained to carry out the stock.
- Stock record cards must be made to the perpetual inventory personnel as required.
- Discrepancies must be investigated as they arise and the necessary adjustment must be made to the designs for the job.
- A suitable procedure and documentation must be designed for the job.
- An accurate record must be maintained of work-in progress otherwise this must be counted at year-end.

Advantages of perpetual inventory

Perpetual inventory (continuous stocktaking) offers considerable advantages over the periodic methods of stock taking (which includes year-end stocking as well as intermittent stock taking procedures).

The main advantages include:

- It satisfies the needs provided for all other stock counting and checking methods in a single exercise.
- It does so without the necessity of interrupting normal operations in the business.
- It avoids using inexperienced or untrained staff in the stock counting, or investigation of discrepancies.
- Discrepancies come to light and can be investigated more thoroughly.
- Records are more likely to be accurate throughout the year.
- Stock valuation for year-end accounting purpose can begin much earlier as many items will have had their final check weeks for the year-end date.
- It therefore avoids lengthy reconciliation procedures which after result in many unresolved discrepancies.
- A continuous watch is maintained over the storekeeping and stock recording practice, and problems can be highlighted before they create major difficulties.
- Although special personnel must be employed throughout the year, it still avoids many special stock counting exercises during the year and a major stock taking at year end, all of which interrupt operations and cost money.

Review Questions

- i) Design a stock record card capable of providing all the information*
- ii) What are the purposes of stock records?*
- iii) What are the main responsibilities of the stores function?*

References

- i) Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
- ii) Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
- iii) Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

WEEK 12

CHAPTER 9

MATERIALS HANDLING EQUIPMENT

Chapter objectives:

By the end of this chapter, the learners should;

- i) Explain Principles of Materials Handling*
- ii) Know the Indicators of Poor Material Handling*
- iii) Describe the Types of Materials Handling Equipment*

INTRODUCTION

Definition

Materials handling has been defined as “techniques employed to move, transport, store or distribute materials with or without the aid of mechanical appliances”

The above definition implies a “system” view that encompasses material handling storing, physical distribution and all other closely related activities as one, all-encompassing system.

This view involves as much more broader consideration of the movement of all materials from all sources of supply and all handling activities both within and around the plant itself and the distribution of goods to customers.

Materials handling consists simply of picking up, and moving things every operation say, in a plant involves:

- Picking up
- Moving or
- Lowering any material or product is a source for possible material handling improvement

Most industrial work consists of:-

- Make –ready – concerned with moving the material and equipment necessary to perform the job to the work place.
- Do- this is the actual work
- Put away – concerned with moving the part and materials from the work place. The greatest part of all manual work consists of the make ready and put away aspects. In fact, it has been estimated that from 60 to 80 percent of the average employees time is spent in handling materials, with only 20 to 40 percent spent in the actual work.

Moving and storing materials, is one of the costliest operations. It is now seen as the third most expensive cost of doing business, with only labour and materials cost exceeding it.

Picking up and moving a thing is obviously extensive and expensive. In a large percentage of industries, moving and handling materials is the heart of their manufacturing processes.

Materials handling however is more costly than simply labour and equipment costs would reflect, harder costs such as:-

- Ineffective plant utilization
- Wasted employee time
- Extended inventory of both goods in process and raw materials.
- Excess damages charges and
- Product quality must be recognized

Objectives of Materials Handling

- Reduced costs
- Increase capacity
- Improve working conditions
- improve customer service

Principles of Materials Handling

- Planning Principle : Achieve the maximum overall efficiency by planning all material and storage activities.
- Systems Principles – devise a coordinated system of operations which integrates procurement receiving storage, production, quality control inspection, packaging, warehousing transportation to the customer.
- Materials flow principle –Optimize materials flow by dressing the most effective and efficient operation sequence and equipment layout. A subsidiary principle is the straight line principle – whenever possible, materials should flow in a straight line.
- Simplification principles - reduce or eliminate unnecessary movement \s and / or equipment, thereby simplifying handling.
- Gravity principle – whenever practical, use gravity to move materials.
- Space utilization principles – Make optimum use of the building cube utilize height as well as floor space.
- unit size Principle – Increase the flow rate and quantity size or height of unit loads – it is quicker to move a lot of items as a unit than it is to move each one of them individually.
- Automation Principle – Apply automation whenever possible to handling and storage functions.
- Standardization Principles - Standardize handling method as well as handling equipment.
- Adaptability principle – where special purpose equipment is not justified, use methods and equipment that can perform a variety of tasks
- The Dead weight principle – reduce the ratio of dead weight of mobile handling equipment to the load carried.
- Safety Principle – Provide safe handling methods and equipment.

Effects of Good Material Handling (Benefits)

A well –m planned and integrates system of materials handling can contribute to effective plant operation in the following ways

- Lower handling costs - Almost all improvement in materials handling methods can reduce costs usually loads faster with less labour.
- More output per square foot – Utilizing space more effectively especially overhead space by the use of conveyors and high tiering has doubled and tripled output per square foot and has made possible on increase in building capacity. This increase in capacity is especially true in storage and warehouse arrears where goods can be stocked higher with greater efficiency while at the same time using considerable less square footage of floor space.
- Decrease in non productive time – Idle time for the worker and equipment is reduced to a minimum by the relatively constant flow of goods from machine. In addition, the make-ready and put away aspects are reduced, thereby increasing as employer's productivity.
- Increased Safety - improved employee safety and improved product safety with less manual lifting required accidents are reduced to a minimum and insurance rates can be lowered from a product safety standpoint, mechanized handling is usually more consistent and therefore less subject to variations causing product damage. In addition, a reduction in handling individual pieces reduces breakage during storage and or shipment handling several units of a product at a time by mechanized means rather than handling each unit individually also reduces the chances of individual loss and damage.
- Reduced fatigue – fatigue offer causes a slowdown in movement and productive output. Minimizing non productive materials handling work by using hosts or other handling devices reduces the amount of time spent in fatiguing materials handling operations – in addition, good materials handling practices reduce the needless rehandling of individual pieces with its resulting fatigue.
- Improved labour relations: - labour generally prefers to work with labour saving materials handling equipment rather than move materials by manual, offer hazardous means.
- Reduced cost of finished product: - This may be brought about by any one or any combination of the above six effects.

Indicators of Poor Material Handling

- employees waiting around trilling to food something to do
- Cluttered shipping and packaging areas.
- poor floor upkeep
- Aisles to narrow to permit free movement of materials handling equipment.
- Improver utilization of overhead space by not stocking pallets or using rocks that go up to the height reached by the materials handling equipment.
- Productive stored in individual rather than unit form, or units other than that in which they are shipped.
- No indication as to the ceding and floor load limits
- Materials and parts projecting into aisle.
- Cluttered walkways and aisle
- production areas cluttered with parts and materials awaiting movement
- Moving materials more than once in receiving.

- Poorly labeled pallets
- Delicate parts damaged in transit
- Railroad cars and trucks awaiting for material to be placed in them etc

Types of Materials Handling Equipment

Various methods of handling goods are used in warehousing, from manual through to automated or robotic systems, and a broad categorization could be.

- hand-operated equipment
 - hand trucks and sock barrows
 - Selector trucks
 - Stillage trucks
 - Pallet trucks
 - Hand stockers
 - Pallet blocks
 - Monorails
 - Chutes
 - Roller conveyor
- Power – driven equipment
 - Fork – lift trucks
 - Counterbalance trucks
 - Side –loading trucks
 - Turret trucks
 - Fork-lift truck attachment
 - (i) Order Pickers
 - (ii) Platform trucks
 - (iii) Tractor
 - (iv) Cranes
 - (v) Powered conveyor
 - Roller conveyor
 - Belt conveyor
 - Overhead trolley conveyor
 - Automated guided vehicle

Review Questions

- i) *Explain why accommodation might be a problem in the physical storage of goods*
- ii) *Explain the main problems likely to be encountered when using outside facilities for storing goods*
- iii) *Discuss the benefits that the introduction of mechanised handling equipment brings to stores.*

References

- i) *Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
- ii) *Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
- iii) *Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

WEEK 13-14

CHAPTER 10

IDENTIFICATION OF MATERIALS AND CODING SYSTEMS

Chapter objectives:

By the end of this chapter, the learners should;

- i) Know how identification of material is done*
- ii) Explain the characteristics of codes*
- iii) Describe the ,methods of coding materials*
- iv) Understand types of codes*

Introduction

Materials are a general term describing goods which are held by organization. The bulk of these goods are usually intended for use in connection with:

- Production
- operating activities

But the expression materials also cover finished products;

- Awaiting dispatch to customers
- Goods awaiting at a point of sale or are display
- Scrap as others arising and packages held pending return to suppliers e.g. samples, by products, off cuts.

Common Terms Used To Describe Various Kinds of Materials

- ***Stock in trade*** – material held by a wholesale, retail or other trading concern usually bought in quantity at a low price to be sold as units at a higher price. E.g sugar, bread utensils.
- ***Raw materials*** – these undergo, changes through manufacturing process in the course of being incorporated into finished products e.g. coal, rubber, cotton, timber. The finished product of one industry may be raw material of another. Raw materials of right quality are most important in processing industries.
- ***Piece parts*** – small components manufactured from raw materials
- ***Bought parts*** – finished parts or assemblies purchased from outside suppliers by a manufacturer either to be incorporated into his / her own product or to be sold as spares or accessories.
- ***Equipment and spares***- This include machines installations and vehicles as well as their associated spare parts.

- **Tools**- include hand tools (hammer, screw drivers) used on machines such as milling cutters.
- **Gauges** – devices for measuring dimensions of shapes of material or components e.g. plug, screw etc.
- **Jigs and fixtures** – pieces of equipment especially designed for holding materials or parts while undergoing machining, fitting and assembly or other.
- **WIP** – comprises incomplete items in the course of manufacture
- **Packaging material** – everything used for packing including wrapping materials e.g. paper, straw, rope.
- **Scrap and residue** – waste, used or surplus materials or parts arising out of manufacturing process or other activities.
- **Free issue material** – materials or components provided by a customer in connection with some equipment or commodity being manufactured by him/ hers they are delivered to the supplier's factory but remain the customer's property and are not paid for or charged by the manufacturer. They are usually but not exclusively associated with goal contracts and are sometimes described as embodiment loan items.
- **General materials** – All goods which do not fall within any other category e.g. cleaning materials, Protective clothing, paints, nuts, belts, greases etc. these are frequently called maintenance repair and operating (MRO) items e.g.

Identification of Material (Coding Of Materials)

The normal way of identifying an article is by simple description. This by itself is not entirely satisfactory for stores purposes several different names may be used for the same thing e.g. a dust bin may also be called refuse container or rubbish receptacle.

Again in order to identify same articles/items accurately a very long and complicated description is required.

Example

Everyone knows what a chair is but there are many kinds of chairs and to identify only one of them properly, it's necessary to say it's an arm chair with frame made of beech, Polished, curved without the spring seat, back and arms, finished in sage- green leather and fitted with two forms rubber – cushions; this is not the whole story, for nothing has been said about the quality of material or the dimensions or various parts.

For that reason it's necessary to have some logical basis of identification which is more precise and less cumbersome. This can be done by using letters or figures or a combination of both.

In summary Coding is a system of words, letters or combination of both that entails brief information pertaining various materials. Coding is a logical way of describing materials and it is used specifically to identify items exactly.

Characteristics of Codes

- **Uniqueness:** Each item should have one code
- **Distinctiveness:** To avoid errors, codes representing different items should be distinctive.

- **Clarity:** Code should be entirely Alphabetical or Numerical
- **Brevity:** Codes should be brief but consistent with the requirement
- **Expandable:** codes should be able to cope with new additional items
- **Unambiguous:** Codes with similar letters should be avoided
- **Significant:** The code should signify something about the coded item

Advantages of a Coding System

- ***Avoids repeated use of long descriptive titles*** e.g. a very simple item like a writing pad might be described as faint ruled pad, 30 cm by 2 bound along the narrow edge of paper. Each line is 7.5 mm apart except for a margin of 20mm at the top of each sheet paper and a margin of 10mm
- ***Accurately identifies all items.*** A separate code symbol is available for every individual type of item of materials in different sizes indicating there are an approved specification and any special character.
- ***Prevents duplication of items*** – all items are arranged in same order. It therefore follows that similar stores will be grouped together and when an item is coded once it should not be given any alternative code number.
- ***Assists standardization and variety reduction.*** This is one of the most important and profitable uses of a code. the grouping of like items together makes it easy to examine complete range of any given type of items and consider whether the number of varieties used can be reduced and standardization achieved on the minimum number of the most suitable types.
- ***Provides a foundation for an efficient purchasing organization.*** Apart from the fact that a coding system improves stock recording and control, it enables buying instructions to be conveyed easily and quickly. Grouping of items with codes facilitates the purchasing organization or department into commodity sections each engaged on the buying of a particular range of items/store. This is especially important where the is a central buying office serving several dispersed units because demands for materials from units can be programmed to deal with the same commodity group for all concern at the same time thus enabling the buyer to hence full advantage of quantity discount.
- ***Simplify manual recording-*** Forms a convenient basis for sorting and recording of documents sheets and in fact, basic materials document enables them to be sorted into the number order. Then they are easily posted to the records which are arranged in the same order.
- ***Simplifies mechanical records*** It would be practically impossible to employ computers for material recording in the absence of coding systems. The limitation of the equipment prohibits the use of long descriptions because of the it would take do input necessary data.
- ***It's convenient for central analysis of unit store house records*** where there are a number of outlined store houses, and records a where there are a number of outlined store house and records are kept at central point, a code is a necessity to make sure that same item

has the same identification in every unit. The central stock records can therefore be kept in a code number order showing how much is in stock and what the movement is for each stock holding point separately with a total for the organization as a whole. This act not only facilitates economical savings but enables the central office to arrange for the transfer of material from one unit to another as and when required.

- ***Can be employed as a basis for stock control account.*** This also is usually arranged to correspond with the commodity groups or laid down coding system.
- ***Simplifies pricing and costing*** – price list consisting all of the materials are cumbersome and reference to them is difficult and slow. The use of codes and numbers automatically provides a reliable index for all items. This feature of coding is emphasized in the case of production material code number may be arranged so as to correspond with cost headings thus simplifying materials costing.
- ***May be used as store house location system-*** its clearly desirable that goods in the store house are arranged in an orderly manner. One way is to arrange items in the sequence of stores coding system as far as practicable.

Disadvantages of Stock Coding

- The process of preparing stock codes is tedious
- It requires a lot of memorizing
- It complicates the storage function further
- It may lead to a proliferation of jargon making it difficult for outsiders to understand.

Methods of coding materials

- ***By nature of item:*** This is coding of items according to their inherent characteristics. Similar items into a series of main groups then each group is further subdivided into sub groups or sections
- ***By the end use of the item:*** This is coding of items according to or to correspond with the purposes for which the items will eventually be used.
- ***By the location of the item:*** This is the coding of materials on the basis of the location within the store where the materials are to be found e.g. the gangways, shelves, pallets etc.
- ***By source of supply:*** Here materials are coded according to the supplier or origin. If there are three suppliers the coding would be 1,2,3 or A, B,C. Coding of materials may be in accordance to local or international sources
- ***By the customer who will buy the end item:*** here materials are coded according to the final consumer who will eventually buy the end product e.g. individual consumer, industrial consumer, institutional consumers or resell government bodies.

Types of Codes

- Numeric e.g. 05/09/2009
- Alphanumeric e.g. PE/0721
- Alphabetical e.g. M/N/Z

Interpretation of Codes

The logical development of a coding system is for every symbol employed to have a significance (conveying some information about the item) so that in theory at least, it should be possible for inspection of the code letters or numbers to say exactly what item is represented giving sufficient details in each case to identify the article precisely.

Illustration

Let us consider the coding of copper rod by this system using numerical only as symbols. To do this we must begin at the point where the total stock is divided into its main groups and follow the splitting up of these main groups through various sub divisions until we arrive at individual item.

The first digit indicates the segregation of a total range of numbers used by a production engineering factory into the following main classification

1. Raw materials
2. Bought at parts
3. Tools
4. Gauges
5. Fixtures
6. Machinery spares
7. Piece
8. Scrap
9. General stores
10. Finished product

The second digit shows the first sub-divisions of this classification. Selecting classification to illustrate this significance of 2nd digit in this code is

Timber 01- rubber 02- metal 03- textile 04- plastics 05 – paper 06- glass 07 – leather 08- paint 09- chemical

The 3rd digit divides again fencing

0.2 Metals as example

02.0 ferrous 02.1 Non- ferrous metals to

The other numbers in this sequence 02.2 to 02.9 are not in use all metals are covered by the two categories of ferrous and non – ferrous

The 4th digit makes another split in the case of 02.1 none ferrous

- 02.1 Aluminum

- 021.4 Lead
- 021.2 Zinc
- 02.13 Nickel
- 02.14 Copper

The 5th digit operates as follows

02.14 copper – 02.14.0 lugot
 02.141 plates
 02.142 Sheer

CODE SYMBOLS

- Alphabetical e.g. ABCD
- Numerical e.g. 05,6,1,2
- Alpha numerical e.g. p2

Review Questions

- i) Discuss the advantages in adopting a logical coding system in a store.*
- ii) What are the objectives of codification, standardization and simplification? How does standardization lead to variety reduction? Discuss the advantages and disadvantages of Standardization*

References

- i) Nair N. K. (2002), Purchasing & Materials Management, Tata McGraw Hill, New Delhi*
- ii) Katoch S. (2000), Materials Management, PVT publishers, New Delhi*
- iii) Starr M. K. (2009), Production & Operations Management, McGraw Hill, New York*

MT KENYA UNIVERSITY



SPM411: MATERIAL MANAGEMENT

SAMPLE OF MAIN EXAMINATION

DATE: DECEMBER

TIME: 2 HOURS

INSTRUCTIONS:

Answer **QUESTION ONE** and any other **TWO QUESTIONS**.

QUESTION ONE (30 MARKS)

- A. It the responsibility for maintaining the quality of the product and incurring less cost on its production is the responsibility of the production/operation" and deciding the price of the product and finding the customers that will buy it comes under "marketing", what does the 'materials management function" do? [10MARKS]
- B. What is the need for International Purchase? Discuss the procedure and problems in International Purchase. [10MARKS]
- C. Differentiate between independent and dependent demand inventory. Dependent demand inventory items do not need to be forecast. Why not? Explain with the help of examples? [10MARKS]

QUESTION TWO

If you reduce WIP then you expose many organizational bottlenecks." Comment on this statement. Also, state the reasons for your agreement/disagreement.

What are the objectives of codification, standardization and simplification? How does standardization lead to variety reduction? Discuss the advantages and disadvantages of Standardization.

QUESTION THREE

- 6. Explain how a performance appraisal system can be used in the context of materials management. What are the metrics of performance appraisal in materials management?

QUESTION FOUR

Write short notes on any four of the following: [20 MARKS]

- (i) Integrated Materials Management
- (ii) Problems and risks in vendor networking
- (iii) Manufacturing Resources Planning (MRP II)
- (iv) Use of OR techniques in Materials Management
- (v) Losses due to shrinkage's/pilferage's
- (vi) Theory of the super organization

QUESTION FIVE

List the major advantages and shortcomings of FIFO, LIFO, and Average methods of stores evaluation. Under what conditions are the three inventories flow methods essentially equivalent.
[20MARKS]

MT KENYA UNIVERSITY



SPM411: MATERIAL MANAGEMENT ASAMPLE SPECIAL/SUPPLIMENTARY EXAMINATION

DATE: DECEMBER

TIME: 2 HOURS

INSTRUCTIONS:

Answer **QUESTION ONE** and any other **TWO QUESTIONS**.

QUESTION ONE (30 MARKS)

- A. What is the scope of materials management? Define the various roles of materials management in the context of internal and external interfaces to a materials management system. [5MARKS]
- B. Briefly explain the reason for the evaluation of manufacturing resources planning (MRP II) from material requirements planning (MRP). How does MRP II differ from MRP? Explain the difference with the help of a flow diagram. Also explain how just-in-time production system (JIT) differs from MRP II. [10MARKS]
- C. Discuss the various losses in warehouses. What are the reasons of their generation? Discuss the procedure of preventing and controlling losses in a warehouse. [5MARKS]
- D. Discuss various ways of minimizing or controlling redundancy: [5MARKS]
- E. With examples highlight various ways which organization may dispose redundant/obsolete materials. [5MARKS]

QUESTION TWO

What are the objectives of codification, standardization and simplification? How does standardization lead to variety reduction? Discuss the advantages and disadvantages of Standardization. [20MARKS]

QUESTION THREE

- i) Explain the main problems likely to be encountered when using outside facilities for storing goods. [8MRKS]
- ii) Discuss the benefits that the introduction of mechanized handling equipment brings to stores. [12MRKS]

QUESTION FOUR

- A. Discuss the primary and secondary objectives and advantages of materials management in an organization. [10MRKS]
- B. Highlight briefly the objectives and advantages of materials management in an organization. [4MRKS]
- C. With examples, briefly discuss the internal interfaces and role of material management. [6MRKS]

QUESTION FIVE

- A. Logistics is the key to the success of the supply chain of a business firm'. Explain.[10marks]
- B. Supply chain management can be used for gaining competitive advantage to deliver superior customer service. Discuss. .[10marks]