UNIT 12 MATERIALS/ LOGISTICS MANAGEMENT

Structure

12.0 LEARNING OUTCOME

After going through this Unit, you should be able to:

- Provide a classification of logistics application
- Discuss the concept and techniques of inventory control; and
- Describe the logistics infrastructure in India

12.1 INTRODUCTION

In any organisation involved in manufacturing or production of goods and services, management of logistics assumes significance. Appropriate planning, implementing and controlling the flow of goods, its storage and the effectiveness with which several activities follow from the point of origin to the point of consumption occupies a significant place. The function of logistics includes sourcing, procurement, production planning, scheduling, packaging, assembly and customer services. Each one of these activities is very important. The developments in the field of transportation and communication are resulting in emergence of global supply chains and logistics processes. Technology is also having impact on logistics management. In present times, technology enables one to know where each truck and piece of freight is, till it reaches the customer at the scheduled delivery time. Hence there are several dimensions involved in the logistics management activity.

This Unit attempts to acquaint you with the meaning and significance of logistics management, techniques of inventory control and logistics infrastructure in India.

12.2 LOGISTICS MANAGEMENT: MEANING AND SIGNIFICANCE

Logistics can be viewed as a logical extension of transportation and related areas to achieve an efficient and effective goods distribution system. Logistics is concerned with getting products and services where they are needed when they are desired. It involves activities encompassing transportation, inventory, warehousing, material handling and packaging. Logistics broadly speaking is a framework for the management of material, service, information and capital.

A formal definition of logistics management can be, "Design and operation of the physical, managerial, and informational systems needed to allow goods to overcome time and space (from the producer to the consumer)". The definition implies that a number of different activities or functions may be required in an organisation in the movement of goods. In public systems management, this area has a key place as it involves interface between several players including government. Logistics management activities are wide ranging in nature. It includes transportation management, fleet management, handling of materials, warehousing, inventory management, etc.

The various components of logistics management are:

1. Product design
2. Plant location
3. Choice of markets/sources
4. Production structure
5. Distribution/dealer network design
6. Location of warehouses
7. Plant layout and logistics
8. Allocation decision
9. Production planning
10. Inventory management – stocking levels
11. Transportation-mode choice, shipment size and routing decision and transport contracting
12. Packaging
13. Materials handling
14. Warehouse operations

The significance of logistics management arises from its integrating functions that coordinates and optimises logistics activities as well as attempts to combine logistics function with other activities like sales, marketing, manufacturing, finance, etc.

12.2 CLASSIFICATION OF LOGISTICS APPLICATIONS

While examining and evaluating alternatives in logistics management, classifying the applications on various dimensions would help clarify the issues and focus our attention on its important facets. We shall discuss the various ways of classification of logistics applications as follows:

12.2.1 Decision-wise

- A manufacturer of large moulded plastic water tanks has transport costs as a significant portion of the product cost. This is because the weight-based capacity of the trucks is under-utilised by these large volume tanks. In order to build a competitive edge by reducing product cost, attempts are being made to change the product design in which the lid is a separate piece, thereby enabling smaller sided tanks to nest in larger sized ones resulting in reduced transportation costs. Since at present, the results of the research are uncertain, a location decision has been taken to manufacture the product in four regions rather than at one place.
- A few cement manufacturers are modifying their production structure in response to non-availability of covered railway wagons. Cement is being sent to the distribution centres in a granulated form so that open wagons can be used. Fine grinding is being done prior to the secondary distribution. Packaging decisions as to whether cement should be transported in bulk or in jute bag or in high-density polyethylene bags are also under consideration.
- A two-wheeler manufacturer is re-examining its distribution network design as well as its warehouse locations to ensure better response times to satisfy customer requirements and lower total product cost by optimising on costs related to primary distribution, secondary distribution, warehouse operations and sales tax.
- A manufacturer of sponge iron in western India is deciding on a movement plan for both its incoming raw material and outgoing finished product. The significant issues are the transportation mode choice, shipment size and stocking levels, especially since water, rail and road are possible alternatives. The issues are more complicated since the port serving the plant is a minor one, with limitations of vessel draft and movement being inhibited during the monsoon. Possibilities of cost savings by coordinating inbound and outbound movement add another dimension to the problem.
- Certain pharmaceuticals and chemical industries could examine their production planning with respect to their production batch size by considering the profile of orders from the dealers, thereby optimising on set-up costs, work-in-progress, inventory costs and finished goods' inventory costs. In such industries, choices can also be made regarding transportation of some products in liquid, paste or powder form. There are implications on transportation costs, conversion energy costs, packaging and loss costs.

12.2.2 Actor-wise

The key actors involved in ensuring an efficient and effective logistics system are:

I. Shippers (Users of logistics)

II. Suppliers of logistics services

a. Carriers- rail, road, air, water, pipeline, ropeway etc.

b. Terminal operators – ports, etc

c. Warehouse providers

d. Freight forwarders

III. Government (Regulator of logistics)

The very fact that there are so many actors means that there is need for better coordination among them. Often this is lacking, leading to inefficient logistics

management. Proactive managerial attention in this area by organisations will generally yield results in reducing logistics costs and improving customer services.

In the Indian context, the government plays a significant role in logistics management. Some of the important legislations that affect logistics are:

a. Central Sales Tax and Local Sales Tax

b. Consignment Tax

c. Excise Duties

d. Octroi and Entry Tax

e. Use of Packaging Material

f. Modified Value Added Tax (MODVAT)

g. Motor Vehicles Act and similar acts for other modes of transport

h. Distribution Policies.

a. Central Sales Tax (CST) is a tax on interstate commodity sales. In situations where there is a resale in the receiving state, local sales tax is also incurred. CST is not incurred if there is a branch in the receiving state for the organisation since the interstate movement, then would be considered as a stock transfer. Often, organisations set up branches in every state more as means of avoiding CST rather than as a functional requirement. Further, CST benefits the less industrialised states that earn their local sales tax due to resale.

b. Consignment Tax, which is a measure to collect tax even on the interstate stock transfers, counters the advantages that the less industrialised states have. Thus there is opposition to this tax from such states.

c. Excise duty is payable when the product leaves the factory. Excise duties have an influence of increasing finished goods inventory rather than pipeline, warehouse or dealer inventories since organisations would like to postpone the payment of this tax. A similar situation arises in the case of imports where customs duties are payable.

d. Octroi and entry taxes are levied before goods enter a city or state, respectively for sale or use therein. Shipping organisations have traditionally objected to this tax since they involve delays at the check-posts. A few states removed octroi and substituted it by the entry tax whose revenue is shared by urban administration according to an agreed formula. Some states have neither and still manage the costs of urban administration. A logistics implication of octroi and entry taxes is that warehouses and transhipment points mushroom outside the octroi / state boundaries. This results in a lot of time spent on paperwork leading to delays. The transhipment ensures that only goods that need to enter the octroi zone do so, since otherwise further delays are involved in prepaying octroi on other goods and collecting the refund later.

e. Regulations regarding use of packaging material, especially jute for commodities like food grain, sugar and cement are made to protect the jute farmers. This has implications on increased storage and transit losses since better packaging material such as high-density polyethylene cannot be much used.

f. MODVAT, which stands for modified value added tax, ensures that double charging of excise duties is prevented and eliminates the need for prepayment and future collection of refund of such duties. When a product that attracts excise is used as a component for another product, the raw material inventory costs would now be lower, thus facilitating planned procurement.

g. The Motor Vehicles Act, 1988, has brought in strict regulations to prohibit overloading of trucks and ensure better quality of drivers. This has met with a lot of resistance from the trucking lobby and also to some extent from shippers who now have to pay more for transportation.

h. Distribution policies of various kinds are imposed by the government in an attempt to meet different developmental objectives. A few examples are canalisation of imports of strategic items like crude oil and petroleum, certain kinds of fertiliser, etc; allocation of commodities in shortage like fertiliser, distribution of essential commodities for the poor, freight equalisation etc. This policy affects the demand and distribution pattern of products since the cost of transportation is equalised in every part of the country (usually at the nearest rail head or branch stocking point). For example, in the steel industry where this policy is in operation, every final customer lobbies for a stockyard near area of operation, so that the additional cost of transportation that one has to bear is minimised. Often, this lobbying is done through political channels to which the industry has to respond. Consequently, more stockyards than are functionally desirable, are set up, leading to a higher cost for the nation as a whole. Of course, an initial motive for the freight equalisation policy in many products was to induce balanced regional development. This objective having largely been met, the policy is being withdrawn in many products (eg: sugar, cement, steel).

12.2.3 Inbound Logistics and Outbound Logistics

Most organisations have to manage their outbound logistics (that is, physically distributing the products to the customers from the factory) whereas inbound logistics are limited to the purchasing function. The logistics of purchased products are generally managed by the vendors. There are exceptions to this, like the steel industry, which is integrated, thereby managing its inbound (raw material) logistics also. Managing inbound logistics to some extent has got other benefits such as better control of production planning and reducing uncertainties. A further advantage of managing both inbound and outbound logistics is the possible cost savings when the two movements are coordinated. The theme of coordinating or directly managing both inbound and outbound logistics forms one of the bases for the shift from logistics management to supply chain management.

12.2.4 Other Types of Classification

Private vs. Public Sector

The nature of ownership of the organisation would influence the objectives of the organisation and hence, logistics management. The choice of modes, transport contracting, responses to socially oriented regulations, location choices, etc., could be on different considerations. In government sector, the Railways, the Public Works Departments, the Water Supply and Sewerage Boards, and the various public sector undertakings such as Electricity Boards, Transport Authorities etc. have to have sound logistics management for both internal management efficiency as well as better services delivery to the public.

Single vs. Multiple Plants

Certain decisions like allocation decisions, coordination in production planning across plants, product-wise specialisation of plants etc, etc.,would be issues of significance in the multi-plant case.

Nature of Product

There could be various sub-dimensions here like, bulk vs. packaged products, perishable vs. non-perishable products, durable vs. non-durable products, single vs. multiple products and industrial vs. consumer products. Handling of bulk products (cement) is quite different from handling packaged products (cosmetics). Shipment size is an important decision for packaged products. In the case of perishable products (fruits), the total time from production to consumption is critical and needs to be minimised while in non-perishable products (stationery), conventional practices of inventory management would suffice. Replenishment policies and stocking levels would be more important in non-durable products (pharmaceuticals) than durable products (two-wheelers). An organisation making multiple products (finished steel), has a more significant problem in coordinating its production planning, inventories and transportation than an organisation making a single product (television). In the case of industrial products (fork lifts), the availability of the product any time when the customer wants it may not be as critical as for consumer products (thread). Further, the distribution channels could be leaner since the number of customers would be lesser than for consumer products.

Made to Stock vs. Made to Order

Decisions related to inventory, transportation and distribution network are more significant for an organisation in which the products are made to stock rather than made to order. For made to order products, it is usually the scheduling of internal operations (typically using some specialised facilities) that is the main decision area.

12.4 INVENTORY CONTROL: CONCEPT AND TECHNIQUES

Inventory is defined as the sum of raw materials, fuels and lubricants, spare parts, maintenance consumables, semi-processed materials and finished goods stock at any given point of time. The operational definition of inventory would be the amount of raw materials, fuel and lubricants, spare parts and semi-processed material to be stocked for the smooth running of the plant. Since these resources are idle when kept in the stores, inventory is defined as an idle resource of any kind having an economic value. Inventories include addition to:

1. Raw materials
2. Spare parts and components
3. Stores
4. Works-in-progress
5. Oil and lubricants
6. Semi-finished and finished goods

Inventory control system

Inventory control is a system by which material of the right quantity and quality is made available to the users, at the right time, for a given production programme, maintenance schedule or repairs with the minimum of investment. . Inventories constitute an important component of investment, which is defined as addition to

fixed assets and inventories. The implication of this distribution between fixed assets and inventories lies in the fact that where fixed assets need long-term capital, inventory needs working capital. The term lending institutions cater to first type of requirement while commercial banks meet the short-term requirements of working capital of an industrial enterprise. This necessitates the need for coordination between the operations of long-term lending and short-term financing institutions.

Inventories form a link between production and sale of a product. A manufacturing company must maintain a certain amount of inventory during production; the inventory is known as goods in process. Although maintaining other types of inventory namely in-transit raw material and finished goods is considered important, inventories are not necessary in the strictest sense; they allow the firm to be flexible. Inventory in-transit to the inventory between various stages of production or storage, permits efficient production, scheduling, and utilisation of resources. Without this type of inventory, each stage of production would have to wait for the preceding stage to complete a unit. Resultant delays and idle time gives the firm an incentive to maintain the in-transit inventory.

Raw material inventory gives the firm flexibility in its purchasing. Without it, the firm must exist on a hand to mouth basis, buying raw materials strictly in keeping with its production schedule. Finished goods inventory allows the firm to maintain flexibility in its production, scheduling and marketing. Production does not need to be geared directly to sales. Large inventories allow efficient servicing of customer demands. If a certain product is temporarily out of stock, present as well as future sales to the customer may be lost.

The efficiency of inventory control affects the flexibility of the firm. Two essentially identical firms with the same amount of inventory may have significantly different degrees of flexibility in operation, owing to differences in inventory control. Inefficient procedures may result in an unbalanced inventory-some items out of stock, others over stocked necessitating excessive investment. These inefficiencies ultimately have an adverse effect upon profits. Turning the situation around, differences in the efficiency of inventory control for a given level of flexibility affect the level of investment required in inventories. The less efficient the inventory control, the greater the investment required.

Similarly excessive investment in inventories reduces profits in the cost of carrying inventories. Importance of inventory control is all the more important particularly when raw materials, equipments and components are to be imported. Proper scheduling of imports is necessary. Since imports are shrouded by uncertainties, proper planning of imported inventories is very essential.

Thus the effects of inventory control on flexibility and the level of investment required in inventories represent two sides of the same coin.

12.4.1 Inventory Control Techniques

Economic Order Quantity

A principle that is widely accepted in the management of inventory systems is to have an Economic Order Quantity (EOQ) based on a consideration of one or more cost elements. The basic idea is that too small a batch or order quantity will involve low holding costs of inventory held ahead of demand, but will involve significant costs in ordering, setting up and transporting. Too large a quantity will swing the balance the other way.

The EOQ can be determined as

$$Q = \sqrt{2AD / iC}$$

Where

A= set up cost / ordering cost

i = inventory carrying cost (per cent per period)

C=cost of the item(unit cost)

D= demand rate

It can be seen that as inventory carrying cost or cost of the item goes up, the EOQ goes down and orders should be placed more often. Similarly if demand rate or set up/ ordering cost goes up, the EOQ goes up.

Always Better Control Analysis

One of the universal characteristics of inventory is that a small number of items carried in stock, account for a very large proportion of the total monetary value and large number of items add only marginally to the total costs. This phenomenon is revealed through an ABC analysis carried out for regular stock item on the basis of their annual consumption value.

ABC analysis popularly known as "Always Better Control" based on the principle of "Vital Few and Trivial many" is a method of grouping or dividing the regular items into three categories, 'A' (High Consumption Value), 'B' (Medium Consumption Value), and 'C' (Low Consumption Value) according to the value of annual consumption or usage in Rupees (quantity consumed per year x unit cost = annual consumption value). According to this, in an organisation for example in a hospital, there are some items that are very important, which consume a large part of the budget. These are 'A' items, while B are of medicine type of items that cost reasonable amount, while C items are those, which are not that important.

Various systems have been developed by business concerns to control their inventory. The ultimate aim of inventory control programme is to provide maximum customer service at a minimum cost. Where there are many items in the inventory, it becomes essential to have a value item analysis (popularly known as ABC analysis) which attempts to relate how the inventory value is concentrated among the individual items. This analysis is made by classifying the items into three categories- A, B and C; A being the most important and C being the least. The classification is based on value usage rates and criticality of the item. All these criteria maybe given specified weightages. Value and usage rates are easily quantifiable but its criticality is decided by judgement. After classification, the items are ranked by their value and then the cumulative percentage of total value against the percentage of total items is noted.

The importance of this tool lies in the fact that it directs attention to the key items. The term ABC means that the high value items are considered in the A Category, medium value in B Category and low value in C Category.

Vital Essential and Desirable Analysis

This analysis is made by Mechanical Engineering Departments to consider the vitality of an item and its effect on production and other services. It is used for classifying maintenance spares denoting the essentiality of stocking spares.

In order to build some technical or operational bias into ABC system and also to make the inventory control system more effective, these A, B and C categories are further classified into VED (Vital, Essential and Desirable) groups, according to their functional importance or operational criticality.

V - stands for vital items without which the functions of organisation are adversely affected

E - indicates essential items, which are necessary for an efficient and long-term performance of functions in the organisation and their absence would not cause interruption of any activity in the process. .

D – denotes desirable items which are necessary but do not cause any immediate loss in production and can be dispensed with.

12.5 LOGISTICS INFRASTRUCTURE IN INDIA

Logistics management concerns itself with two principal actors, suppliers and users. In India, the supply side to effective logistics is characterised by poor infrastructure, especially in the area of transportation and storage. While information technology infrastructure is improving at a faster pace, it is still inadequate. On the financial side, while banking services are improving, insurance is inadequate.

We now examine the status and trend of key infrastructure providers who enable physical, information and cash flows in Indian context.

The Indian Railways

In 1997-98, the Indian railways carried nearly 12 million passengers per day and lifted more than 1.2 million metric tonne of freight traffic daily on a network spread over 62,495route km covering 6995 stations. As of March 1998, there were 7200 locomotives and 264000 wagons.

Indian Railways has been affected by competition from road, often attributable to poor customer orientation. For example, although wagon utilisation is going up, the time taken for the customer to get a wagon is increasing, with attendant uncertainty. The railways do not find a place in the consumer goods and durables market. In the bulk segment it is a major player, but it could be pricing itself out because of consistent fare increases. The financial support to the railways is inadequate to meet the investment requirements for various projects. This has prompted it to look for alternative means of financing and execution of projects. At the strategic level, the restructuring of railways is an issue to facilitate revenue increases and cost minimisation.

Roadways

Roads are classified into National Highways and State Highways that carry freight traffic and a few other categories that primarily provide connectivity. Road conditions in India are amongst the worst in the world. Commercial vehicles in India are able to run only 250 km per day on an average as compared to 600 km per day in the developed countries. The accident rates per vehicle/km are amongst the highest in the world. The economic losses due to poor conditions of roads are estimated at Rs. 200-300 billion per annum.

There is a need to create expressways to allow for rapid, unhindered and safe movement of fast-moving vehicles. For medium traffic density corridors, widening of two lanes and strengthening of pavement and support infrastructure would be essential. For low traffic density roads, construction of toll roads through organisations that could be a partnership between the government and the organised private construction industry be encouraged.

Trucking companies

There are over 1.5 million trucks on the Indian roads. The industry is completely in the private sector, with there being two kinds of players- trucking companies and truck operators. The former are really organised marketing companies, while the latter are generally owner driven, operating in a cut –throat competitive environment, with low overhead costs and margins. The trucking market in India is well developed, both in terms of geographical spread and market access through a brokerage system.

Due to the low margins, truckers tend to overload for short-term financial results. Further there are inordinate delays at the checkpoints, which makes up to 50 % of the total transit time for the trucks.

There is a move towards express distribution system, wherein the ownership of trucking companies becomes an important issue. Rather than private operators owning one or two vehicles, large operators with branded service will be essential. It is to the credit of the trucking sector that on price and service dimensions, it has competed with the railways. Trucking serves the consumer goods, consumer durables and industrial products almost entirely and is taking an increasing share of the bulk goods. Reforms like removal of roadside tax collections, and more liberalised financing of trucks are thus essential for further growth of the sector.

Shipping companies

The strength of the Indian fleet is around 400 ships of just under 7-m grt (a carrying capacity of 10 million tonnes). The average age of the Indian fleet is 15 years, which compares favourably with the average age of the world fleet. The importance of shipping is due to the fact that 95 % of Indian exports and imports by volume are by sea. The shipping industry has not been recognised as an infrastructure sector, denying it various concessions. The issues facing the shipping industry are technology upgradation, increased container carrying capacity and focus on coastal shipping.

Ports

India has an extensive coastline of around 6000 km with 11 major ports and 139 operable minor ports. The major ports account for 95 % of the total traffic that is handled. The major port traffic has been growing at 10 % annually over the past few years. However the unproductive time consisting of pre-berthing delays and non-working time at the berth for the vessels accounted for about Rs 25 billion as standing charges paid by the trade. This amount thus wipes out a significant portion of the foreign exchange earnings of the shipping sector. It is therefore imperative that ports be developed in a manner that they can be more efficient in stocking, loading, unloading and evacuating cargo.

Airlines and Airports

India has eight international airports, including those in the four major metros, and 85 domestic airports. The major airports handle over 90% of the international traffic along with substantial domestic traffic. There has been a significant increase in air traffic ever since the government introduced the policy of open skies. The first segment to be liberalised under this was the air cargo service.

Growth in the aviation sector is primarily due to the private operators and air express and courier companies. It is also the result of the need for an efficient and speedy door-to-door cargo delivery requirement. In this respect, airport operations are still a bottleneck. Recently airports have also been opened up for privatisation.

Pipelines

This is an emerging mode of transport for products like petroleum, iron ore pellets, coal, etc., apart from traditional products of water and sewage. In the Indian context, petroleum transportation by pipelines is receiving significant attention. India's existing pipeline network is grossly inadequate for transporting petroleum products. The pipeline mode is preferable to the other modes as it is cheaper, safer, and more convenient and involves lesser losses, and is environmentally neutral.

The government has set up a holding company called Petronet, with equity participation by major oil public sector enterprises. As many as 18 product lines have been identified to be implemented by petronet. Private sector companies are also planning to set up their own pipeline networks.

Materials Handling and Warehouses

Scientific warehousing is largely provided by public sector organisations like the Central Warehousing Corporation (CWC) and state warehousing corporations. These are generally perceived to be only for food grains and fertilisers, since they were historically developed for the agricultural sector. However most organisations still resort to their own warehousing systems, often in privately rented premises equipped poorly, rather than public warehousing facilities.

Availability of sophisticated materials handling technologies is limited. Labour is most commonly used for materials handling. Consequently in India, the total loss of goods while transporting from the production centre to the final user is estimated to be 14%, while in developed countries it is in the range of 4-6 %. Important decisions related to warehousing are: own vs. rent, centralised vs. decentralised warehousing, number of warehouses, capacity of warehouses, location, layout and design, and level of technology, especially for materials handling.

Banks

Banks are a key infrastructure in the cash flow part of supply chain management. Quick clearance of cheques, advances against letters of credit, insurance against payment defaults, etc., are essential services. Banks are making increasing use of information technology, including mechanised clearance of cheques.

Information Technology Services

Information technology (IT) plays a key role in improving the service levels of any company. Electronic transfer of documents through electronic data interchange, on-line transaction processing and other network services are beginning to be commercially available. A new revolution in terms of e- commerce is expected to influence the nature of logistics considerably. However, adoption of IT has been slower than what is technologically possible due to lack of availability of wide communication networks in the public domain, lack of awareness on the part of users and dearth of suitable legislation for dispute settlement

12.6 CONCLUSION

Logistics management is in general concerned with operations and coordination of activities involved in materials movement. Logistics operations deal with effective movement and storage of materials. The holistic approach to logistics operations aims at integrating the physical distribution, manufacturing and procurement of materials into a simple logistical process.

The effectiveness of logistics management is measured in terms of total costs involved and the performance of the system. There is a blend of effective service delivery and balanced expenditure to achieve effective logistical performance.

12.7 KEY CONCEPTS

ABC Analysis

It is the analysis of range of items in an organisation on cost criteria. A items are considered very important which consume high costs and hence need tight controls on usage. B items are of intermediate cost centre, which require moderate control while C items are of low cost centre.

E-Commerce

Electronic commerce is defined as the conduct of financial or business transactions through electronic means. With the growth of commerce on the internet and web, e-commerce often refers to purchases through electronic means, where prices are also negotiated over an online system.

Economic Order Quantity

It implies the amount of orders that minimises total variable costs required to order and hold inventory. It is a method of comparing cost of keeping a certain inventory level with cost of frequency of ordering.

VED Analysis

It is the process of analysing the intrinsic value of the investments for achieving the objectives of the organisation.

12.8 REFERENCES AND FURTHER READING

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12.9 ACTIVITIES

1. Visit any manufacturing unit in your area and discuss the various steps involved in movement of the manufactured goods from that unit till the retail market.
2. Approach any hospital or a school dispensary or any other agency (public or private) and examine the methods of inventory control adopted by it.