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## UNIT 1 LOGISTICS AND SCM : AN INTRODUCTION

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### Objectives

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

- define Logistics and Supply Chain Management (SCM);
- understand the development of logistics and its role in the economy; and
- discuss Physical Distribution Management (PDM) and its components.

### Structure

- 1.1 Introduction
- 1.2 Logistics and SCM
- 1.3 Development of Logistics
- 1.4 The Role of Logistics in the Economy
- 1.5 Logistics and Competitive Performance
- 1.6 Physical Distribution Management (PDM)
  - 1.6.1 Components of PDM
  - 1.6.2 The Systems or “Total” Approach to PDM
- 1.7 Summary
- 1.8 Self Assessment Exercises
- 1.9 References and Suggested Further Readings

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### 1.1 INTRODUCTION

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There is a great deal of material that is moved in any organization. Organizations collect raw materials from suppliers and deliver finished goods to the customers. It is logistics that executes this function. In other words, logistics is the function that moves both tangible materials (e.g. raw materials) and intangible material (e.g. information) through the operations to the customers (as a finished product). In continuation to this explanation, we would introduce what a supply chain means. “A supply chain consists of a series of activities involving many organizations through which the materials move from initial suppliers to final customers. There may be different supply chain for each product. The chain of activities and organizations is named differently as per the situation. If the emphasis is on operations then it is called process; if the emphasis is on marketing then it is called logistics; if the emphasis is on value-addition then it is called value-chain; if the emphasis is on meeting customer demand then it is called demand chain; if the emphasis is on movement of material then we use the most general term i.e., supply chain. This unit will introduce you with the concept of a supply chain.

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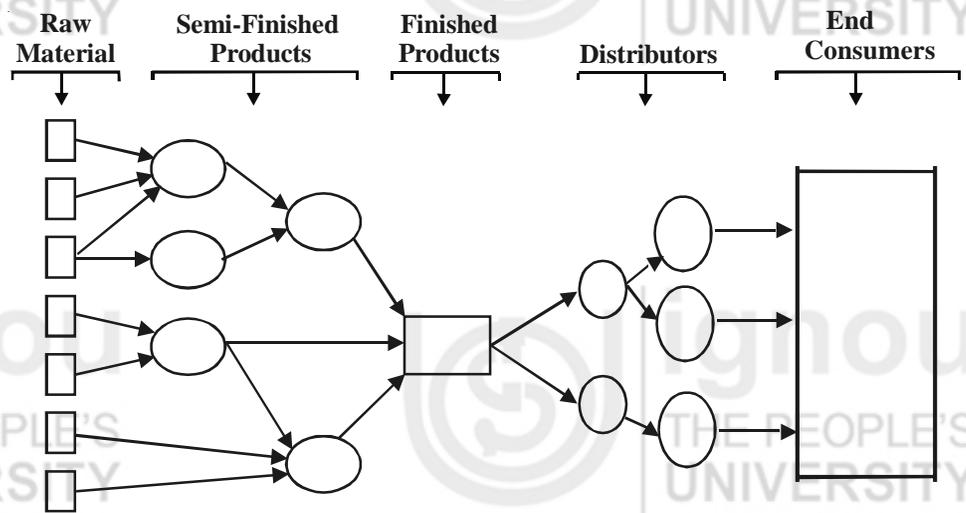
### 1.2 LOGISTICS AND SCM

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A *supply chain* may be considered as a group of organizations, connected by a series of trading relationships. This group covers the logistics and manufacturing activities from raw materials to the final consumer. Each organization in the chain procures and then transforms materials into intermediate/final products, and distributes these to customers.

The supply chain can be defined as the integral management (within the company and through other companies) of the company's various logistical stages such as materials procurement, production, storage, distribution and customer service. The Supply Chain concept should be seen as a whole, that is, the entire system from the origin of procurement to the final consumption of goods or services.

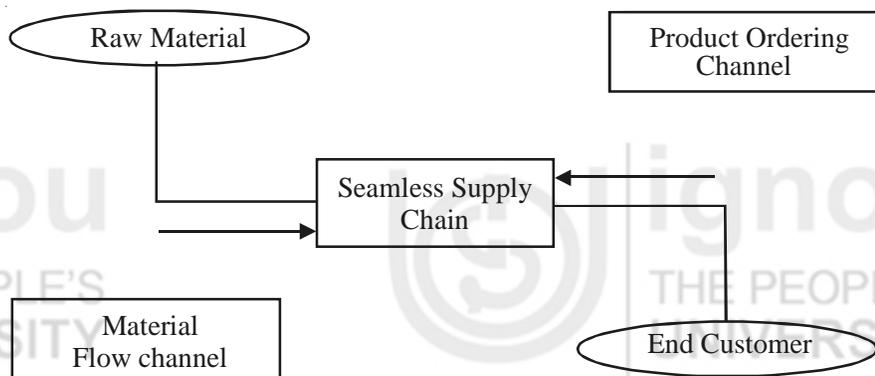
In supply chain network we must include all the organizations involved in the production of certain goods or services (from the origin of procurement to final consumption), and each of the logistical stages within these organizations. Thus, the supply chain is a network linking and interweaving different supply chains of all the companies involved in a production process. A diagram depicting the typical supply chain is shown in Figure 1.1.



**Figure1.1: Typical Supply chain**

The supply chain activity therefore constitutes complex objects, as it involves decision-makers from many different companies, who sometimes have no direct relationship and are placed in very different geographical locations; yet the decisions they make are mutually dependent upon each other. Hence, there is a need for an information system capable of linking together the different members of the chain so that there is an open communication between them.

The concept of supply chain is not new. Historically we have moved from physical distribution to logistics management and then to supply chain management. This major difference seems to be that supply chain management is the preferred name for the actualization of "integrated logistics", with it acting as an enabler, it is now possible to have an integrated process view about the logistics and all allied processes related to business. Ideally the supply chain should be a "seamless" chain as shown in Figure 1.2.



**Figure 1. 2: Seamless Supply Chain**

*Source: Sahay B.S., 1998*

The importance of logistics can be gained from the fact that logistics and supply chain management costs are in range of 10 to 15 of the GDP for developing countries while it is around 18 to 20 per cent for developed countries. The concept of integrated logistics consists of two interrelated efforts:

- **Logistics operation:** Logistic operation can be basically clubbed into physical distribution management, materials management and internal inventory transfer.
- **Logistic coordination:** Logistic coordination pertains to forecasting, order processing, operational planning and product procurement or MRP. This integration is effected through effective information flows.

### Definitions

Forrester (1961) suggested that the five flows of any economic activity — *money, orders, materials, personnel* and *equipment* are interrelated by an information network, which gives the “system,” which is now called as supply chain due to its own character.

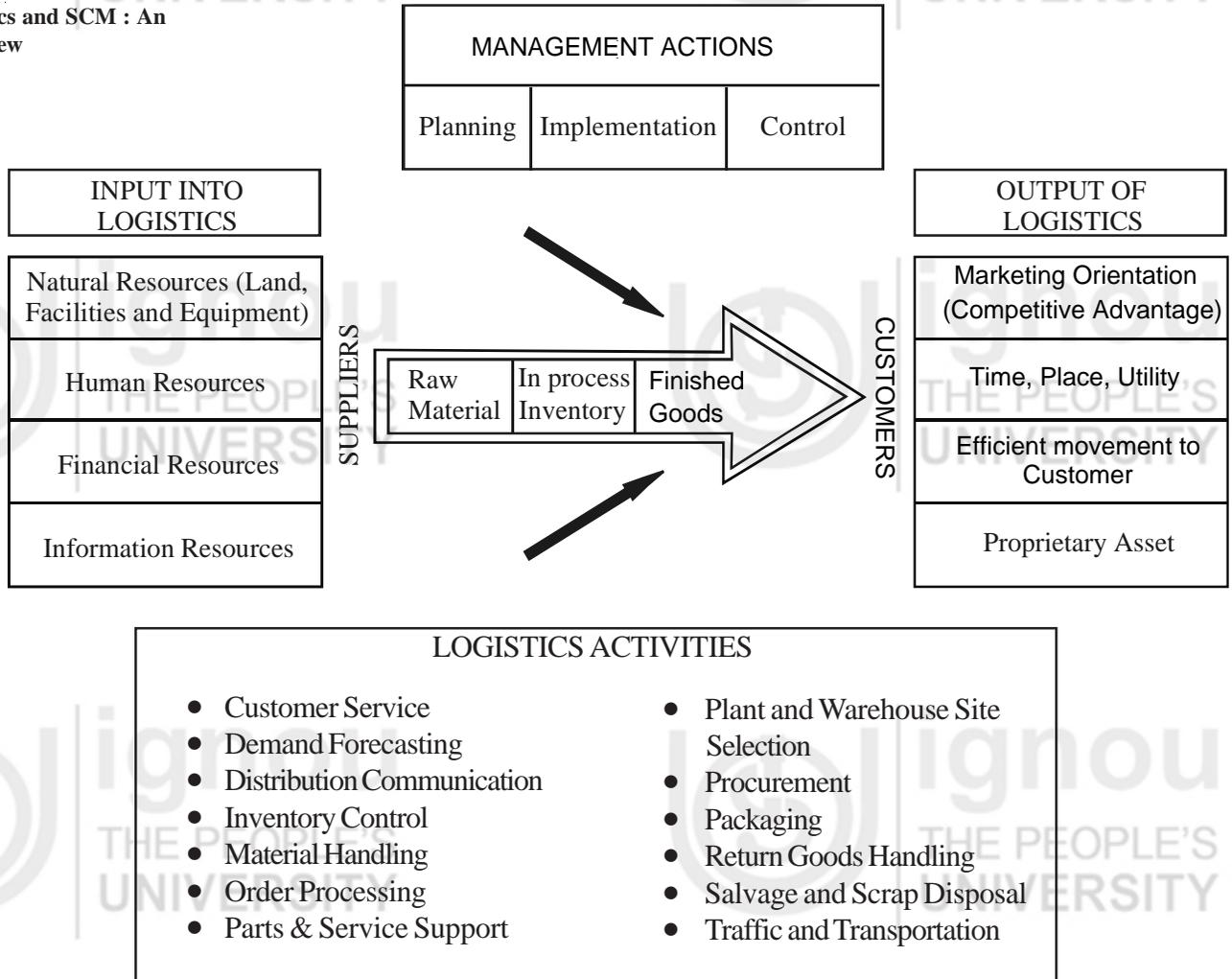
According to Christopher (1992) supply chain is network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer. Managing these linkages and delivering the product/service to the customer in a cost effective way is SCM. Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilize their suppliers’ processes, technology and capability to enhance competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency.

Supply Chain Management is a set of approaches utilized to efficiently integrate supplier, manufacturer, warehouse and stores so that merchandise is produced and distributed at the right quantities, to the right location and at the right time, in order to minimize system under costs while satisfying service level requirements (Levi (2000)).

The common thread in these definitions is that supply chain management seeks to integrate performance measures over multiple firms or processes, rather than taking the perspective of a single firm or process.

Supply chain management has provided the next logical stage in the evolution of competitiveness for the manufacturing organization and added, importantly, a concern for the flow of materials to and from the organization. Supply chain management integrated suppliers to the end consumers and emphasized the need for collaboration to optimize the whole system. As such, supply chain management is the process of designing, planning and implementing change in the structure and performance of the ‘total’ material flow in order to generate increased value, lower costs, enhanced customer service and yield a competitive advantage. In effect, the addition of supply chain management to the marketing model created a truly ‘systems’ approach to the organization and its direct and indirect trading relationships

The content of supply chain management within a firm varies considerably with the type of business. Figure 1.3 shows the different components of logistics management.

**Logistics and SCM : An Overview**

**Figure 1.3: Components of Logistic Management**

(Source: Douglas M. Lambert, 1998, Pg-5)

A representative list of logistic element for a firm is given in Table 1.1.

**Table 1.1: Logistic Element**

<b>Facility Location</b>	Determining location, number and size of facilities needed. Allocation demand to facilities
<b>Transportation</b>	Mode and service selection Carrier routing Vehicle scheduling
<b>Inventories</b>	Finished goods stocking policies Record keeping Supply scheduling Short term sales forecasting
<b>Customer Service</b>	Cooperate with marketing in: determining customer needs and wants for service determining customer response to service
<b>Order Processing and Information Flows</b>	Sales order procedure Information collection, storage and manipulation Data analysis
<b>Warehousing and Material Handling</b>	Space determination Stock layout Material handling equipment selection Stock storage and retrieval Equipment replacement policies
<b>Protection Packaging</b>	Design for: handling, storage, protection
<b>Product Scheduling</b>	Co-operate with production in : specifying aggregate production quantities sequencing and timing of production

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### 1.3 DEVELOPMENT OF LOGISTICS

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Logistic activity is literally thousand of years old, dating back to the earliest form of organized trade. As this area of study however it first began to gain attention in the early 1990s. More emphasis has been given to logistics after the Gulf war in 1990-91 when the efficient and effective distribution of store supplies and person were the key factors for success. With rising interest rates and increasing energy cost logistics received more attention as a major cost driver. Logistics cost became a more critical issue for many organization because of globalization of industry. This has affected logistics in two primary ways. First, the growth of world-class competitors from other nations has caused organization to look for new way to differentiate their organizations and product offerings. Second, as organizations increasingly buy and sell offshore, the supply chain between the organizations becomes longer, more costly and more complex. Excellent logistics management is needed to fully leverage global opportunities. Information technology input has given a next boom to logistics management. This gave organization the ability to better monitor transaction intensive activities such as ordering movement and storage of goods and materials. Combine with the availability of computerized quantitative models; this information increased the ability to manage flows and to optimize inventory levels and movement.

Other factor contributing to the growing interest in logistics include advances in information technology, increased emphasis on customer service, growing reorganization of the system approach and total cost concept. The profit leverage from logistics and realization that logistics can be used as a strategic weapon in competing the market place.

The system approach is a critical concept in logistics. Logistics is in itself a system. It is a network of related activities with the purpose of managing the orderly flow of material and personal with in the logistic channel. The system approach simply states that all functions or activities need to be understood in terms of how they effect and are affected by other elements and activities with which they interact. The idea is that if one looks at action in isolation, he or she will not understand the big picture or how such action affects or are affected by other activities. In essence the sum or outcome of a series of activities is greater than its individual parts.

#### Activity 1

Every organization has to move materials to support its operations. What do service companies like Internet Service Providers move? Is the concept of supply chain relevant for these companies?

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### 1.4 THE ROLE OF LOGISTICS IN THE ECONOMY

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Logistics play a key role in the economy in two significant ways. First, logistics is of the major expenditures for business. Logistics expenditure accounts for around 15-20% of GDP. Thus by improving the efficiency, logistics make an important contribution to the economy as a whole.

Second, logistics support the movement and flow of many economic transactions; it is an important activity in facilitating the sale of virtually all goods and services. To understand this role from a system perspective, consider that if goods do not arrive on time, customer can not buy them. If goods do not arrive at the proper place or in the proper condition, no sale can be made. Thus all economic activities throughout the supply chain will suffer.

One of the fundamental ways that logistics add value is by creating utility. From an economic stand point utility represent the value or usefulness that an item or service has in fulfilling a want or need. There are four types of utilities namely; Form, Possession, Time and Place. Form utility is the process of creating the good or service or putting them in proper form for the customer to use. Possession utility is value added to a product or service because the customer is able to take actual possession like credit arrangement and loans. These two utility are not directly related to logistics but these are not possible without getting the right item needed for consumption or production to the right place at the right time and in the right condition at the right cost. The time and place utility are directly related to logistics. Time utility is the value added by having an item when it is needed. Place utility is the item or service available where it is needed. The five rights of logistics are the essence of the two utilities provided by logistics time and place utility.

### 1.5 LOGISTICS AND COMPETITIVE PERFORMANCE

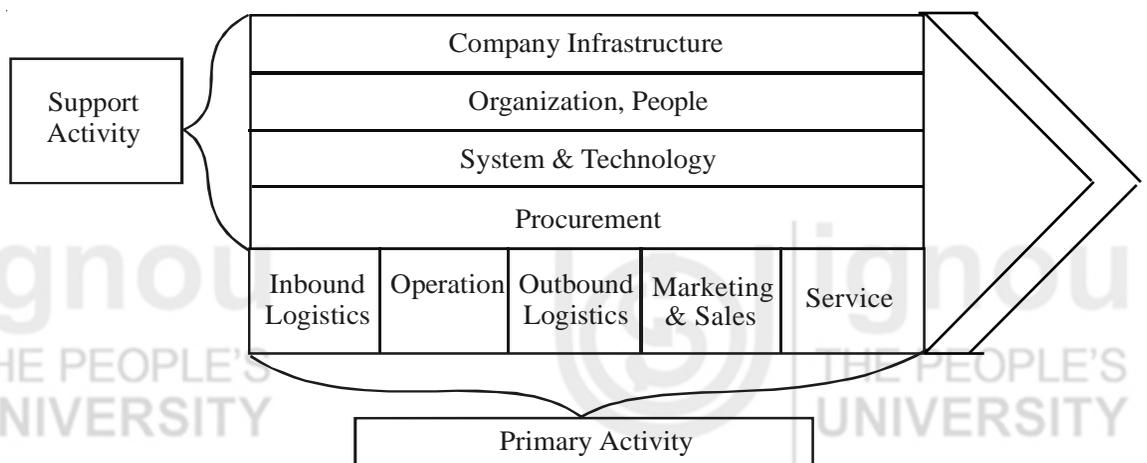
Today logistics department appears on the organization charts of many large organizations. Linking logistics activities directly to organization strategic plan can work effectively to support their organization for achieving competitive advantage.

Porter use a tool called the value chain as shown in the Figure 1.4 to separate buyers, supplier and a firm into the discrete but interrelated activities from which value stems. The value chain concept may be used to identify and understand the specific source of competitive advantage and how they related to buyer value. Value is the amount a customer is willing to pay for the products, services provided by an organization. Value added is the difference between what the customer pays and the cost to the organization in providing that product or service. Porter defines the five categories of primary activity involved in competing in any industry.

**Inbound logistics:** Activities associated with receiving, storing and disseminating input to the product.

**Operation:** Activity associated with transforming input into the final product form.

**Outbound logistics:** Activity associated with collecting storing and physical distribution of the product to buyers.



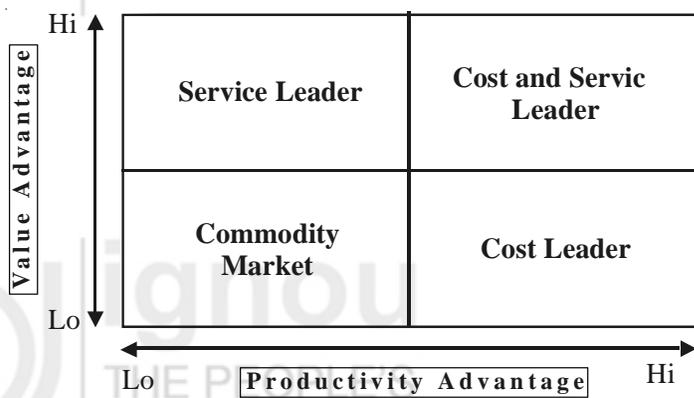
**Figure 1.4: Porter Value Chain**

*Source: Porter, Michael E., "Competitive Advantage". 1985, the Free Press. New York)*

**Marketing and Sales:** Activities associated with providing a means by which buyers can purchase the product and inducing them to do so such as advertising, promotion etc.

**Service:** Activity associated with providing service to enhance or maintain the value of the product such as installation, repair etc.

The effective logistics management can provide a major source of competitive advantage. The source of competitive advantage is found firstly in the ability of the organization to differentiate itself in the eyes of the customer from its competitor and secondly by operating at a lower cost and hence at greater profit. There are two bases of success in any competitive context. One is the cost advantage and second is the value advantage. Cost advantage is achieved through greater productivity and value advantage is pursued through a different plus over competitive offerings.



**Figure 1.5: Competitive Matrix**

*Source : Christopher, M., 1992, Logistics and Supply Chain Management*

From the matrix shown in Figure 1.5 it is clear that successful companies will often seek to achieve a position based upon both a productivity advantage and a value advantage. Logistics management can play a critical role to gain both advantages. In many industries logistics cost represents such a significant proportion of total cost that it is possible to make major cost reduction through fundamentally reengineering logistics process. In term of value advantage, companies can gain through service differentiation. Today markets have become more service sensitive. Customer in all industries are seeking greater responsiveness and reliability from suppliers, they are looking for reduced lead time, just in time delivery and value added services that enable them to do better job of serving their customers.

Traditionally most organizations have viewed themselves as entities that exist independently from others and indeed need to compete with them in order to survive. However such a philosophy can be self-defeating if it leads to an unwillingness to cooperate in order to compete. Behind this seemingly paradoxical concept is the idea of supply chain integration. Supply chain integration links a firm with its customers, suppliers and other channel members. As such it integrates their relationships, activities, functions, processes and locations. The purpose is to improve the effectiveness and efficiency of SC for ultimate consumers.

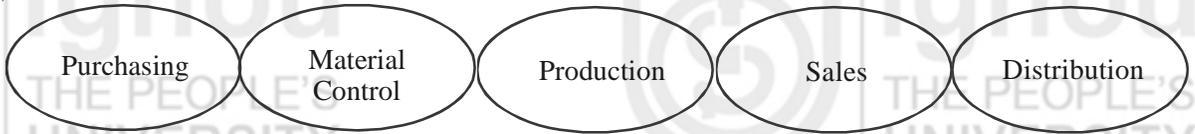
A model of the evolution of supply chain is shown in Figure 1.6 Integration starts with the 'baseline' organization (**Stage 1**) with a reasonably informal approach to management by departments. This level of evolution involves the processing of material requirements and planning routines that are short term in nature. The material inventories simply arise in response to reactive management practices. The key requirement of employees is to react to failure and manage as best that they can.

The Stage 2 organization reflects the traditional form of supplier management. The business departments tend to operate autonomously. The Stage 2 organization is

focused on the annual budget allocation and departmental cost management. For the purchasing function this implies seeking out the lowest price provider of material requirements often through a process of tendering, the use of 'power' and the constant switching of supply sources to prevent 'getting too close' to any individual source.

The Four stage of Development

Stage 1: Baseline



Stage 2: Functional Integration



Stage 3: Internal Integration



Stage 4: External Integration



**Figure 1.6: Supply Chain Integration**

The Stage 3 organization is internally integrated and has a much greater level of interest in material flow processes from suppliers to customers rather than the 'grenade over the all' approach of the earlier two forms. The organization has integrated the aspects of the internal supply chain that it can influence and control. In parallel, planning systems operated throughout the organization are integrated and demand information, production schedules and material requirements are synchronized by teams of individuals that were once subordinates of separate departments. For this company, the demand and material flow drive the entire system in an end-to-end supply chain and the organization makes use of Just in time materials management techniques.

The **Stage 4** company has begun to realize the benefits of true supply chain management and the ability to synchronize all activities within the factory and to interface the factory with its suppliers and customers. Under these conditions, the collaborative and participative internal environment is extended upstream and downstream and the planning of supply chain management is recognized formally. The factory is 'customer oriented' instead of product oriented and seeks to partner with key customers and suppliers in order to better understand how to provide value and customer service. This form of company has full improvement processes within the organization that are encapsulated in medium term plans for the organization and its supply chain. The organization makes most use of information systems to enhance the responsiveness of the organization and supply chain to deliver products and has

also developed a capability in terms of product design that includes customer and supplier involvement. To enhance the nature of collaboration the organization rewards supplier partnerships with sole sourcing agreements in return for a greater level of support to the business and a commitment to on-going improvement of material flow and relationship management. The model provides a useful means of analyzing the current state of the organization and understanding where the next interventions would be needed in order to improve performance.

### Activity 2

Describe the Supply Chain for a paper manufacturing organization.

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## 1.6 PHYSICAL DISTRIBUTION MANAGEMENT (PDM)

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There are many decisions that must be taken, when a company organizes a channel or network of intermediaries, who take responsibility for the management of goods as they move from the producer to the consumer. Each channel member must be carefully selected and the company must decide what type of relationship it seeks with each of its intermediate partners. Having established such a network, the organisation must next consider how these goods can be efficiently transferred, in the physical sense, from the place of manufacture to the place of consumption. Physical distribution management (PDM) is concerned with ensuring the product is in the right place at the right time.

It is now recognised that PDM is a critical area of overall supply chain management. Business logistical techniques can be applied to PDM so that costs and customer satisfaction are optimised. There is little point in making large savings in the cost of distribution if in the long run, sales are lost because of customer dissatisfaction. Similarly, it does not make economic sense to provide a level of service that is not required by the customer but leads to an erosion of profits. This cost/service balance is a basic dilemma that physical distribution managers face.

The reason for the growing importance of PDM is the increasingly demanding nature of the business environment. In the past it was not uncommon for companies to hold large inventories of raw materials and components. Although industries and individual firms differ widely in their stockholding policies, nowadays, stock levels are kept to a minimum wherever possible. Holding stock is wasting working capital for it is not earning money for the company. To think of the logistical process merely in terms of transportation is much too narrow a view. Physical distribution management (PDM) is concerned with the flow of goods from the receipt of an order until the goods are delivered to the customer. In addition to transportation, PDM involves close liaison with production planning, purchasing, order processing, material control and warehousing. All these areas must be managed so that they interact efficiently with each other to provide the level of service that the customer demands and at a cost that the company can afford.

### 1.6.1 Components of PDM

There are four principal components of PDM namely; Order processing, Stock levels or inventory, Warehousing and Transportation.

### **Order processing**

Order processing is the first of the four stages in the logistical process. The efficiency of order processing has a direct effect on lead times. Orders are received from the sales team through the sales department. Many companies establish regular supply routes that remain relatively stable over a period of time ensuring that the supplier performs satisfactorily. Very often contracts are drawn up and repeat orders (forming part of the initial contract) are made at regular intervals during the contract period. Taken to its logical conclusion this effectively does away with ordering and leads to what is called 'partnership sourcing'. This is an agreement between the buyer and seller to supply a particular product or commodity as and when required without the necessity of negotiating a new contract every time an order is placed. Order-processing systems should function quickly and accurately. Other departments in the company need to know as quickly as possible that an order has been placed and the customer must have rapid confirmation of the order's receipt and the precise delivery time. Even before products are manufactured and sold the level of office efficiency is a major contributor to a company's image. Incorrect 'paperwork' and slow reactions by the sales office are often the unrecognised source of ill will between buyers and sellers. When buyers review their suppliers, efficiency of order processing is an important factor in their evaluation. A good computer system for order processing allows stock levels and delivery schedules to be automatically updated so management can rapidly obtain an accurate view of the sales position. Accuracy is an important objective of order processing, as are procedures that are designed to shorten the order processing cycle.

### **Inventory**

Inventory, or stock management, is a critical area of PDM because stock levels have a direct effect on levels of service and customer satisfaction. The optimum stock level is a function of the type of market in which the company operates. Few companies can say that they never run out of stock, but if stock-outs happen regularly then market share will be lost to more efficient competitors. The key lies in ascertaining the re-order point. Carrying stock at levels below the re-order point might ultimately mean a stock-out, whereas too high stock levels are unnecessary and expensive to maintain. Stocks represent opportunity costs that occur because of constant competition for the company's limited resources. If the company's marketing strategy requires that high stock levels be maintained, this should be justified by a profit contribution that will exceed the extra stock carrying costs.

### **Warehousing**

Many companies function adequately with their own on-site warehouses from where goods are dispatched direct to customers. When a firm markets goods that are ordered regularly, but in small quantities, it becomes more logical to locate warehouses strategically around the country. Transportation can be carried out in bulk from the place of manufacture to respective warehouses where stocks wait ready for further distribution to the customers. This system is used by large retail chains, except that the warehouses and transportation are owned and operated for them by logistics experts. Levels of service will of course increase when number of warehouse locations increases, but cost will increase accordingly. Again, an optimum strategy must be established that reflects the desired level of service.

### **Transportation**

Transportation usually represents the bulk of distribution cost. It is usually easy to calculate because it can be related directly to weight or numbers of units. Costs must be carefully controlled through the mode of transport selected amongst alternatives, and these must be constantly reviewed.

The patterns of retailing that have developed, and the pressure caused by low stock holding and short lead times, have made road transport indispensable. When the

volume of goods being transported reaches a certain level some companies purchase their own vehicles, rather than using the services of haulage contractors. However, some large retail chains have now entrusted all their warehousing and transport to specialist logistics companies.

For some types of goods, transport by rail still has advantages. When lead-time is a less critical element of marketing effort, or when lowering transport costs is a major objective, this mode of transport becomes viable. Similarly, when goods are hazardous or bulky in relation to value, and produced in large volumes then rail transport is advantageous. Rail transport is also suitable for light goods that require speedy delivery (e.g. letter and parcel post). Except where goods are highly perishable or valuable in relation to their weight, air transport is not usually an attractive transport alternative. For long-distance overseas routes air transport is popular. Here, it has the advantage of quick delivery compared to sea transport, and without the cost of bulky and expensive packaging needed for sea transportation, as well as higher insurance costs.

The chosen transportation mode should adequately protect goods from damage in transit (a factor just mentioned makes air freight popular over longer routes as less packaging is needed than for long sea voyages). Not only do damaged goods erode profits, but frequent claims increase insurance premiums and inconvenience to customers, endangering future business.

### 1.6.2 The Systems or 'Total' Approach to PDM

PDM has been neglected in the past; this function has been late in adopting an integrated approach towards its activities. Managers have now become more conscious of the potential of PDM, and recognize that logistical systems should be designed with the total function in mind. A fragmented or disjointed approach to PDM is a principal cause of failure to provide satisfactory service, and causes excessive costs.

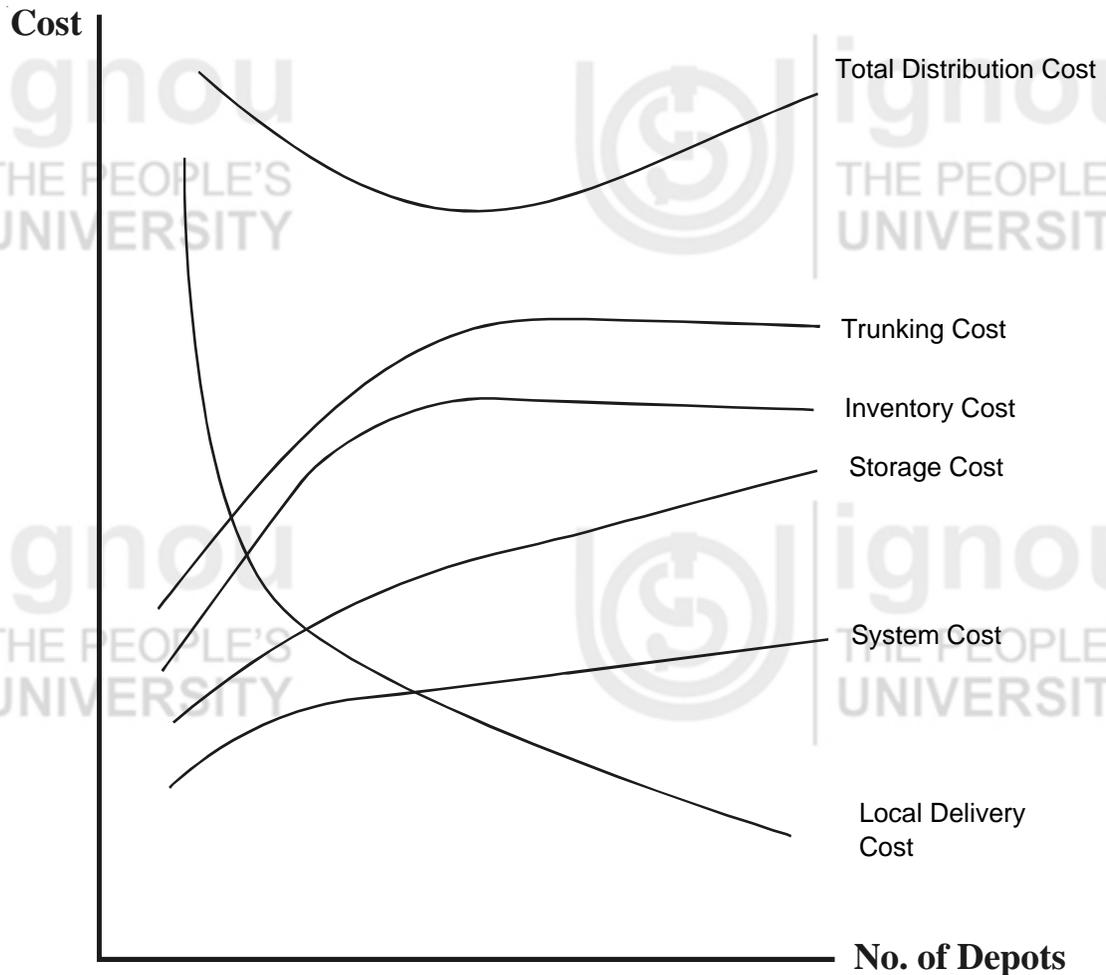
PDM is concerned with ensuring that the individual efforts that go to make up the distributive function are optimised so that a common objective is realised. This is called the 'systems approach' to distribution management and a major feature of PDM is that these functions be integrated.

To plan an efficient logistics structure it is necessary to be aware of the interaction between the different distribution costs and how they vary with respect to the different depot alternatives (number, size, type and location).

Figure 1.7 demonstrates how the individual distribution and logistics cost elements can build up the total logistics cost.

- **Storage Cost:** Storage cost will increase as the number of depots will increase because there will be a need for more stock coverage, more storage space, more management etc.
- **Delivery cost:** This will concern with the secondary transportation cost i.e. cost of delivery from the depot to the consumer. The greater the number of depots, the lesser is the secondary mileage and the delivery cost.
- **Trunking Cost:** This is the primary transport cost in the supply of products in bulk to the depots from the central finished good warehouses or production points. As the number of depots increases this cost will also increase.
- **Inventory Cost:** The main elements of inventory holding costs are:
- **Capital Cost:** The cost of physical stock. This is the financing charge, which is the current cost of capital to a company.

- **Service Cost:** That is stock management and insurance cost
- **Risk Cost:** Which occur through pilferage, deterioration of stock, damage and stock obsolescence.
- **System Cost:** These costs represent a variety of information or communication requirements ranging from the order processing to load assembly lists.



**Figure 1.7: Total Logistics Cost**

*Source: Croucher Phil et al, The handbook of Logistics and distribution Management Page No .123*

The top line on the graph shows the overall distribution cost in relation to the number of depots in the network. The minimum point on this curve represents the lowest cost solution. The result will depend on a number of factors –product type, geographical area of demand, service level requirements etc.

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## 1.7 SUMMARY

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Supply chain is 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 consumer. Logistics expenditure accounts for around 15-20% of GDP. Thus by improving the efficiency of logistics operations, logistics can make an important contribution to the economy as a whole. Factors contributing to the growing interest in logistics include advances in information system technology, an increased emphasis on customer service, growing reorganization of the system approach and total cost concept. Supply chain management seeks to integrate performance measures over multiple firms or processes, rather than taking the perspective of a single firm or process. Supply chain integration links a firm with its customers, suppliers and other channel members. As

such it integrates their relationships, activities, functions, processes and locations. Physical distribution management (PDM) is concerned with ensuring the right item needed for consumption or production to the right place at the right time and in the right condition at the right cost

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## 1.8 SELF ASSESSMENT QUESTIONS

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- 1) “Logistics is the function that is responsible for the flow of materials into, through and out of an organisation”. Elaborate?
- 2) “These are many possible structures for SC, but the simplest view has materials converging on an organising through tiers of suppliers and products diverging through tiers of customers”. Elaborate.
- 3) It is said that the overall aim for logistics is to achieve high customer satisfaction or perceived product value. This must be achieved with acceptable costs. How would you find the best balance?
- 4) What is Physical Distribution Management? Describe its components? Also, elucidate the “total approach” to PDM.
- 5) Describe the evolution of Supply Chain concept. What in your opinion is the most important stage?

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## 1.9 REFERENCES AND SUGGESTED FURTHER READINGS

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