POST GRADUATE DIPLOMA

IN

SUPPLY CHAIN MANAGEMENT

SEMESTER - I

FUNDAMENTALS OF LOGISTICS

Course Material

CONTENT DEVELOPED BY

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CHAPTER 1: LOGISTICS ROLE IN THE ECONOMY/ORGANIZATION

The scope and influence of logistics has evolved in the late 1940s. In the 1950s, and 60s, military was the only organization which used logistics. The scope of logistics has been extended beyond the army, as it has been recognized as one of the important tools for developing competitiveness. Competitive advantage means the company has the ability to differentiate itself, in the customer's eyes, and also is operating at a lower cost and greater profit.

Logistics facilitates in getting products and services as and when they are needed and desired to the customer. It also helps in economic transactions, serving as a major enabler of growth of trade and commerce in an economy.

Logistics has come to be recognized as a distinct function with the rise of mass production systems. Production and distribution were earlier viewed as a sequential chain of extremely specialized activities. The role of logistics is to ensure availability of all the required materials before every step in this chain. Obviously inventory of raw materials, semi-finished and finished goods is a must across this chain to ensure its smooth functioning.

The concept of logistics has its base upon the systems approach. There is a single chain, with flow of materials starting from the supplier, then to the plant and finally to the end customer, and also these activities are done sequentially in order to achieve customer satisfaction at low cost. For this to be successful there has to be co-ordination in the activities of the department.

With reference to an organization, an organization gets a concrete shape due to its structure. In the earlier times, the suppliers in distribution activities were spread across the entire structure, thus resulting in an overlapping of activities and finally in unaccountable authority and responsibility. In today's process driven organization, where the focus has shifted from functions to process, logistics has become an essential part of the process.

Definitions of logistics:

The American Council of Logistics Management defines logistics as "the process of planning, implementing and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customers' requirements".

Philip Kotler defines logistics as "planning, implementing, and controlling the physical flows of materials and finished goods from point of origin to point of use to meet the customer's need at a profit".

Logistics is all pervasive. Some excellent examples of value adding logistics services are:

Dabbawalas of Mumbai: Reliable, foolproof logistics system of delivering lunch boxes to over 5,00,000 office goers every day without letting the wrong lunch box reaching the wrong office and also ensuring the boxes reach on time.

The Indian Postal Services: One of the largest logistics network in the world today, which delivers letters in the most cost effective manner across six lakh villages, one hundred and twenty cities and several thousand mofussil towns covering the length and breadth of the country within twenty-four to forty-eight hours and serving more than hundred and seventy countries with Indian source stations/ customers and/or destinations as mentioned earlier.

Objectives of logistics:

Logistics has the following objectives:

Reduction of inventory: Inventory is one of the key factors, which can affect the profit of an enterprise to a great extent. In the traditional system, firms had to carry lot of inventory for satisfying the customer and to ensure excellent customer service. But, when funds are blocked in inventory, they cannot be used for other productive purposes. These costs will drain the enterprise's profit. Logistics helps in maintaining inventory at the lowest level, and thus achieving the customer goal. This is done through small, but frequent supplies.

Economy of freight: Freight is a major source of cost in logistics. This can be reduced by following measures like selecting the proper mode of transport, consolidation of freight, route planning, long distance shipments etc.

Reliability and consistency in delivery performance: Material required by the customer must be delivered on time, not ahead of the schedule or behind the schedule. Proper planning of the transportation modes, with availability of inventory will ensure this.

Minimum damage to products: Sometimes products may be damaged due to improper packing, frequent handling of consignment, and other reasons. This damage adds to the logistics cost. The use of proper logistical packaging, mechanized material handling equipment, etc will reduce this damage.

Quicker and faster response: A firm must have the capability to extend service to the customer in the shortest time frame. By utilizing the latest technologies in processing information and communication will improve the decision making, and thus enable the enterprise to be flexible enough so that the firm can fulfill customer requirements, in the shortest possible time frame.

The various functions of logistics are as follows:

1. **Order Processing**: Processing the orders received from the customers is an activity, which is very important by itself and also consumes a lot of time and paperwork. It involves steps like checking the order for any deviations in the agreed or negotiated terms, price, payment and delivery terms, checking if the materials is available in stock,

producing and scheduling the material for shortages, and also giving acknowledgement to the owner, by indicating any deviations.

2. **Inventory Planning and management:** Planning the inventory can help an organization in maintaining an optimal level of inventory which will also help in satisfying the customer. Activities like inventory forecasting, engineering the order quantity, optimization the level of service, proper deployment of inventory etc. are involved in this.

3. **Warehousing**: This serves as the place where the finished goods are stored before they are sold to the customers finally. This is a major cost center and improper warehouse management will create a host of problems.

4. **Transportation**: Helps in physical movement of the goods to the customers place. This is done through various modes like rail, road, air, sea etc.

5. **Packaging**: A critical element in the physical distribution of the product, which also influences the efficiency of the logistical system.

Value delivery in the supply chain

The world has become a global village where due to liberalization and globalization, business organizations are forced to supply products beyond their national boundaries. Thus in such situations, the role of logistics is to provide time and place utility of the products to customers.

Also businesses are striving to attain competitiveness. In their struggle to survive, their focus has shifted to supply chain, and to deliver value for money for their customers. Logistics plays an important role in the process of delivering value and how successful the supply chain management is greatly depends on logistics planning and support.

Nowadays, the trend is to outsource. Organizations continue to outsource their operations because it is better to outsource the functional areas to experts who can do this job at a lower cost. This is one way of adding value.

Logistics delivers value to the customer through three main phases:

a. Inbound logistics: These are the operations, which precede manufacturing. These include the movement of raw materials, and components for processing from suppliers.
b. Process logistics: These are the operations, which are directly related to processing. These include activities like storage and movement of raw materials, components within the manufacturing premises.
c. Outbound logistics: These are the operations, which follow the production process. These include activities like warehousing, transportation, and inventory management of finished goods.

Logistics Solution:

Generally, the in-house logistics departments in manufacturing organizations take care of all aspects of logistics. But this is not an area of core competency of manufacturing or trading organizations. Today, a lot of successful business corporations across the world are outsourcing logistics to the third party logistics providers, who are having the necessary infrastructure and expertise to do the job in a better manner. Complete logistics solutions to manufacturers and traders is provided by the third party logistics providers, and they help in integrating various logistics operations, thus ensuring speedy and uniform movement of materials across the supply chain.

Logistics is nowadays widely used in virtually every area. The success of a logistics service providing company depends on how they conceptualize and implement the logistics solution, and also tune to the requirements of the customer.

Future of Logistics

Nowadays corporations look only for sustainable competitive advantage, not only for growth, but also to survive. There is so much killing competition that corporations are compelled to review their business process while they deliver the products and services to customers, who are looking for more and more value for the money that they are spending. The focus of competition has shifted from the product to the supply chain.

Today, logistics management is based on the system concept and cost approach. Transportation, warehousing, handling of material, inventory management and order processing are the major logistics activities, which impact the customer cost and operation. Integrated logistics helps in taking the cost out of the supply chain and also enhance the customer service level.

When looking at the macro level, a growth of a country's economy depends on the availability of excellent logistics infrastructure. The speed of the movement of goods depends to a great extent on the various modes of transportation like rail, road, air, and sea.

Logistics has a bright future, especially in India, but certain pressing issues like abolition of octroi levy, rationalization of customs formalities, improvement in road and rail infrastructure, creation of modern warehouse facilities etc, have to be taken care of. The geographical position of India also is well positioned to emerge as an excellent hub for a variety of products.

CHAPTER 2: LOGISTICS AND CUSTOMER SERVICE

Customers are the focus of any activity. The primary reason behind this being that ultimately every product, service or idea finally needs to cater to the customer's requirements.

According to Lalonde Bernard J, "Customer service as a complex of activities involving all areas of the business which combine to delver and invoice the companies product in a fashion that is perceived as satisfactory by the customer and which advances the companies objective". Customer service, as a concept has many aspects to it. Logistics management has a major role in enhancing the customer satisfaction and also retention and thus creating a lifetime customer value.

In other words, customer service as a combination of activities enables a business firm to add more value to the buyer. It is a key element of the product or service, which is offered to the customer. With good customer service, the existing customers are satisfied and this attracts new customers through word-of-mouth communication. Customer Service is not just a function or an activity. It is a philosophy, and attitude. With so much importance given to customer service, companies are trying to increase the level of customer service and scale up to the expectations of the customer. Unless the products are in the hands of the customer at the time and place of requirement, products do not have any value attached to them. To attain a commendable service level, the firm has to plan a closely integrated logistics strategy.

In today's market, customers are so much demanding, not only in the quality aspect but also with regard to the service aspect. Customers form a few perceptions in relation to the various aspects of customer service like reliability, competency, responsiveness, trustworthiness etc. With the help of these cues, customers evaluate the firm's services and conclude whether they are satisfied or not. Physical distribution plays a major role in delivering customer service.

As there is an increase in the competition, and there is advancement in technology, companies today are faced with the mounting pressure to develop even more innovative strategies for customer service.

Two key factors that have contributed maximum for the growing importance of customer service as a competitive weapon are the continuous development of customer expectations and the gradual shift of customers from branded products to local unbranded products. A very good example would be the personal computer market, where the buyer finds it difficult to make a difference between a branded version and an unbranded one. The rapidity of technological change and a decreased product life cycle has further developed the importance of customer service.

The following are the elements of customer service:

Order Delivery Cycle Time:

The general tendency for a manufacturer to look into is the physical delivery of the product when the orders are not delivered on time. So, when orders are not delivered on time and customer complaints are received, the manufacturer looks into the physical delivery of the product to the customer and tries to solve this problem by bringing the product closer to the client. Thus, there is a tremendous increase in the stock-holding points for the manufacturer. When the manufacturer examines this closely, he will realize that physical delivery is not the most time consuming element of the order-delivery cycle time, but there are a host of other activities like transmission of the order, processing the order, etc which also affect the delivery. In fact an activity like the order processing itself consists of a series of activities like the registering the order in supplier's system, allocation of material from work – in – progress, warehousing and distribution centers, packing the materials, dispatch of material etc.

Reliability of inventory:

When a specific item is out of stock, which is interpreted as a loss of sale and if these stocks out conditions take place frequently, these will influence the customer service levels. And would further lead to a loss of credibility for the company.

Consistency and frequency in delivery:

The firm must ensure the maintenance of a same or similar delivery period over a period of time to deliver material to the customer. This means the firm must have the ability to co-ordinate the various logistics arms, and also the efficiency and effectiveness of the entire chain.

Also, the frequency of delivery is an important part of the customer service. Usually, a customer does not prefer to stock huge quantities of particular items, and would prefer smaller quantities in smaller lots. Eventually there is an increase in the transportation cost, but the inventory cost reduces and there is a net effect in the entire supply chain. When there are multiple orders from small clients, there is congestion in the logistics pipeline, and thus this reduces the ability of the company to serve its larger clients more efficiently. Also the logistics costs for small orders are more than the large orders and also they would swallow up the profit on the large orders. To avoid such hassles, and to avoid additional costs, the frequency of delivery and minimum orders are being used as limitations imposed on suppliers as an effort to reduce normal tendency of most clients.

Other factors

Apart from the regular factors there are also others like the transmission of order collection, frequency of visit of salesman to customers, invoicing and collection systems, communications level between customers and suppliers which can be of more importance to certain organizations.

Phases in Customer Service:

a) **Pre transaction phase**: In this phase, the service level and other related activities are defined on a policy level in both qualitative and quantitative measures. It is the creation of a service platform to serve the customer, so as to build up credibility in the market and create a good image amongst the existing and prospective customers. In other words, this refers to those elements, which determine the capability of service before they are provided.

Pre – transaction elements are usually relate to corporate policies or programs, written statements of service policy, adequacy of organizational structure and system flexibility.

The following are the important elements of the pre-transaction phase:

- **Customer Service Policy Statement**: This gives the service standards for the company. For example, company X, a leading automobile spare part manufacturing company, makes a policy commitment to deliver the spare parts to its customers within 48 hours of placement of the order.
- **Accessibility**: This refers to the ease with which customers can contact the firm.
- **Building the organization**: In order to implement the policy derivatives on customer service, the firm must formalize the reporting structure, delegate authority and also allocate responsibility. Also, a proper reward system will motivate employees who are involved in customer service to interface efficiently with the customer.
- **Structuring the service**: The expectations of customers, the industry standards, and the standard of service the firm would like to maintain influence the basic structure of any service. For sustaining the competitive advantage, innovation in service is very much necessary. Innovation adds to the value of the offerings made to customers. Another key aspect to service structure is the delivery. Two important aspects of delivery are place and time.
- **Educating the customer**: This is important because this can reduce the customer complaints on deliveries of products, their operations and maintenance etc., Usually customers are educated through manuals training, seminars workshops etc.
- **System design and flexibility**: While designing the system, care should be taken that all the possible queries, which the customers can ask, must be answered. The system may be manual or fully automatic, similar to e-commerce. Also the adaptability of the service delivery systems to meet a particular customer need is essential.

b) **Transaction phase**: During this phase, the customer service is associated with the routine tasks, which have to be performed in the logistics supply chain. Those variables directly involved in performance of the logistics functions, for example, availability of product, order cycle time, reliability of delivery etc. The following are the various service elements associated with this phase:

- **Reliability of order fulfillment**: This is a key factor. There needs to be reliability in fulfilling the order within the agreed time frame and also with respect to the quantity and quality of the material ordered.
- **Order convenience**: The ease with which customer can place an order. There are various barriers to this like the paper work required by the supplier, compliance to various procedures, complex payment terms, poor communication network at suppliers end etc.
- **Order postponement**: Sometimes, the customer may postpone an entire order or some parts of it. This means customer has to reschedule his requirements. In some other case, due to availability of a certain product category in the future, the seller can allow the buyer to place the order immediately and he would ship the product when it is available on future dates.
- **Consistency of delivery**: Delivery consistency of repeat orders is important.
- **Product substitute**: There may be some situations in which the product ordered couldn't be shipped due to certain manufacturing or quality problems. In such cases, the seller can offer a substitute product and honor his commitment.

c) **Post transaction phase**: This is a phase where customer satisfaction and building up of a long-term relationship with the customer are involved. It involves commitment of resources to offer the desired level of service. These measure the customer satisfaction on the basis of the expected results. Generally supportive of the product in use, for example: warranty of products, parts and repair service, procedures for complaints of customer and replacements of products. The following:

- **Information of order status**: In B2B transactions and e-commerce, the customer after payment of part value (sometimes full value) of the product as an advance, requests feed back on the status of the shipment on a continuous basis.
- **Customer complaints, claims, and returns**: The seller's responsibility will not be over once the product is dispatched to client. Sometimes, the products damaged during transit, or the product may not be according to the functional requirements of the customer. For this, there must be a policy for product return and this is usually done through reverse logistics system.
- **Product installation, commissioning and technical snags**: This is part of the after sales service, as complex products may sometimes develop technical snags during the warranty period. The after sales department takes care of all these issues.
- **Customer awareness and training**: A key aspect of service element in this phase. For technically complex products, it is necessary for the seller to train or educate the user regarding its operation.

Customer Retention – An Extension of customer service:

It is the totality of the 'offer', which delivers value to the customer. An illustration to highlight this can be a comparison between a product in the warehouse and a product in the hands of the customer. The value addition here is the fact that the product is in the hands of the customer.

According to the 80/20 Pareto (The Italian economist, Pareto) rule, 80 per cent of a company's profits come form 20 per cent of the customers. A further dimension to this would be to say that 80 per cent of the total costs to service would be generated from 20 per cent of the customers.

Thus identification of the real profitability of customers and then develop strategies to develop services that will improve the profitability of all customers is essential.

While 'getting and retaining customers' is the main focus of marketing, in practical terms, organizations put in more effort in getting the customers rather than retaining them. Organizations have to make a conscious effort in understanding how many of the customers they had a year or six months ago are still with them as customers. The retained customers can be more profitable than the new customers in the cost perspective. Also the word-of-mouth communication happens through existing customers.

The principle of 'Relationship Marketing' is rapidly gaining popularity. A high level of customer satisfaction must be created so that they don't consider any alternative suppliers or offers.

There need to be certain pre-determined standards for controlling the service performance. There are various standards available like order cycle time, order-size constraints, technical support, order convenience, frequency of delivery, claims procedure etc.

Conclusion:

The basic purpose of providing services is to deliver value to the customer for the money he is spending for the product. Customer service means all customers must be treated equally and also to extend service to build a fundamental business relationship. Also, a step ahead of offering basic services is to offer zero defect services. Repetitive operations have to be performed without errors by using automated systems.

Another possibility is to provide value added service, which are basically unique and add efficiency and effectiveness to the basic service capabilities of the firm. These value added services have evolved due to forced innovation due to differentiated offering, for growing and surviving in competitive markets.

CHAPTER 3: PROCUREMENT AND OUTSOURCING

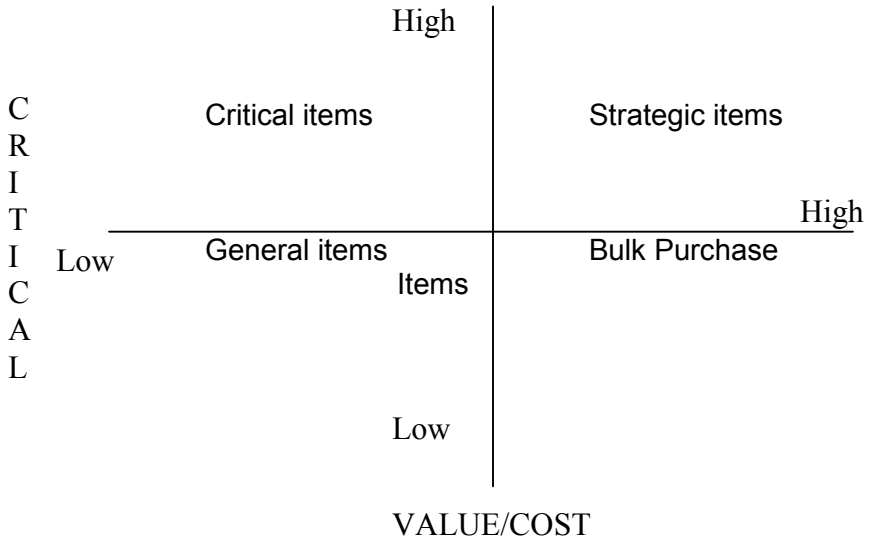
Procurement is usually done in order to meet the needs of the manufacturing function or other internal functions for which buying is made. It enables access to external markets, supplier development and relationship management and also relationship to other functions

It is the buyers and suppliers who are usually engaged in procurement transactions, which usually begins with the buyer receiving and paying for the order. When designing the procurement process, it is important to consider goods that the process will be used to purchase. The two main categories of purchased goods are direct material and indirect materials. Direct materials are components like used to make finished goods. Indirect materials are goods used to support the operations of a firm. Indirect materials are components used to make finished goods. Indirect materials are goods used to support the operations of a firm. All procurement processes within a company relate to the purchase of direct and indirect materials.

The procurement process for direct materials should focus on improving coordination and visibility with the supplier. The procurement process for indirect materials should focus on decreasing the transaction cost for each order. The procurement process in both cases should consolidate orders to take advantage of economies of scale and quantity discounts.

In addition to the categorization of materials into direct and indirect, all products purchased may also be categorized on basis of value/cost and how critical they are:

Product Categorization by Value and Criticality



Making or Sourcing Decisions:

1. **Use multifunctional teams**: The strategy, which is developed, must be in collaboration with the various functions like engineering, purchase, manufacturing, engineering etc which will help in identifying the correct drivers in the total cost.

2. **Ensure that there is appropriate co-ordination across regions and business units**: Ensuring that there is enough co-ordination across all the regions and business units, which will allow a firm to maximize economies of scale.

3. **Evaluating the total cost of ownership**: Price reduction need not be the sole objective of an effective sourcing strategy. Total cost of ownership is also influenced by other factors, which have to be identified and used for selecting suppliers. By focusing on the total cost of ownership, also allows a buyer to identify opportunities for having a better collaboration in terms of design, planning, and fulfillment.

4. **Building long-term relationships with key suppliers**: Basically, when buyer and supplier work together, more opportunities for saving will be generated that the two parties working independently. A long-term relationship will encourage the supplier to expand greater effort on the issues that are key from the point of view of the buyer.

Logistics Outsourcing

Today, business organizations across the world are struggling for competitiveness, not only for growth but also for survival alone. The factors responsible for this are liberalized economies of the countries across the world. Moreover, the customers have become more demanding and look for value added services from prospective suppliers, as he wants value for the money he is spending. In such a situation, business organizations across the world have started reviewing their business processes and have realized that cost cutting and differentiation in value delivery are solutions to the current problem

Outsourcing is the transfer of a function previously performed in-house to an outside provider.

Outsourced providers are often referred to as contractors or "third parties." When "outsourced" work is contracted out, the outsourcing business or agency still provides oversight.

Once it is decided to outsource, identifying a short list of partners can be a daunting task. Though many options exist it is essential to sort them. The following can facilitate in sorting them:

1. Identify areas of opportunity:

Gaining the ability to enter new markets without building a costly distribution infrastructure is one great reason to outsource. Establishing a team to look at current and future requirements of a business, and assess the ability to meet those needs. This team should consist of key members of the logistics organization and such other areas

as marketing and customer service. These other departments can provide insight into growth projections and shortcomings in existing processes.

2. Assessing the Strengths and Weaknesses

Having an understanding in what the company is good at and not--will enable to find an appropriate partner. Potential partners also have distinct strengths and weaknesses. For example, some logistics partners are better at warehousing than transportation. Others may be great at managing the import process but less skilled in such functional areas as order management.

3. Decide what to outsource

Once a team has identified partnering opportunities, it needs to be determined which functions to cede to the partner. Such functions as warehousing and transportation affect how customers view a company's ability to execute. The success of an outsourcing project depends, in part, on the company's comfort level with the partner's ability to execute on the company's behalf.

4. Identify a Short List of Providers

Several strategies can help in selecting the right partner. Creating and distributing a request for information that asks potential partners about their capabilities can be done. A list of providers who have experience in the industry can be developed.This process will reduce the number of potential partners quickly. The network infrastructure of the remaining companies also needs to be examined. It may also be helpful to initiate a logistics network optimization effort to identify optimal locations for distribution. The company's geographic needs may require a nationwide network or be more focused on specific regions. Comparing requirements with the capabilities of potential providers and assessing their technological capabilities is essential.

5. Consider the Human Element

Successful outsourcing projects have one element in common: nurturing relationships between key people on both sides. Ensuring not only a fit between corporate cultures but also chemistry between individuals. This is especially important during implementation and ongoing operations.

Outsourcing – A value proposition

Logistics service providers help the business corporation in achieving two goals, i.e., reducing operating cost and increasing revenue. As the service provider organizes the required logistics assets, the investment in owning the logistic assets on the part of the customer is reduced, this in turn allows the firm to invest in more productive activities and get more returns on the remaining assets, enhancing the return on stockholders' investment. Alliances with service providers will free the company's manpower for more productive work, concentrate on their area of core competence, and increase the company's returns. The firm gains in knowledge because of exposure and acquaintance with the best available practices

and technologies used by the service providers. These value propositions justify logistics outsourcing.

Benefits of Logistics Outsourcing:

In logistics, considerable quantities of materials are required to be transported and stored at various locations. Raw materials and components are to be moved over long distances from vendor supply points to production centers. These materials have to be stored for some time as raw materials and later as finished goods. Finished goods need to be transported to the point of consumption. With so much to be done, the critical reasons why companies outsource logistics activities are:

a. Better focus on core competencies
b. Cost saving resulting from better management of supply chain
c. Cross pollination of better available practices
d. Wider and better geographical coverage by access to specialist world class capabilities
e. Improved re-engineering benefits
f. Lesser internal resources

Critical Issues in Logistics Outsourcing:

The following are a few major issues that need to be addressed and examined before deciding on a 3 PL or 4 PL partner:

- **Switching Cost**: By outsourcing logistics services, there is a re-organization of the existing assets of the company. It includes activities like:
  a) Managing the existing assets, by the service provider
  b) Deploying the existing assets on lease to the service provider
  c) Divesting of the existing assets and also switching over fully to the usage of a logistics infrastructure provided by the service provider
- **Degree of control:** The firm, which is outsourcing must be particular about the degree of control over the service provider's activities, so that they get the service desired by the end user. Having a direct control over the activities of the employees of the service provider is not possible, but service provider should ensure that the information is available on time in order to monitor the activities.
- **Human and electronic interface:** A proper interface between employees of two organizations is important to resolve the issues, which are raised out of misunderstanding or miscommunication. The job of co-coordinators of both organizations is important to formulate the policies and guidelines for a smooth operation of the outsourcing firm and also the service provider.
- **Tuning logistics services to the needs of channel partners**: For an efficient channel management, logistics is a key enabler. Actually, channel and logistics management have to go hand in hand for an efficient as well as effective physical distribution system. The major areas of interface between channel and logistics management is defining the logistics standards as required by the channel members, designing the logistics programmes by standards, implementing the programmes, and also monitoring the programmes.

- **Degree of outsourcing:** The various business organizations resort to logistics outsourcing depends on the following factors like existing logistics infrastructure of the company, company's product portfolio, management t policy for third party involvement.

Conclusion:

Logistics service providers basically help the organization achieve two major goals: reducing the operating cost and also increases the revenue. When the service provider organizes the required logistics assets, the customer's investment in owning the logistics assets is reduced and thus the firm can invest in more productive activities and also get more returns on the remaining assets. There is a knowledge gaining activity on the firm's part because of the exposure and acquaintance with the best available practices and techniques utilized by the service providers.

CHAPTER 4: INVENTORY ROLE & IMPORTANCE OF INVENTORY

Introduction

Inventory refers to the stock of materials of any kind stored for future use, mainly in the production process. Semi-finished goods, which are awaiting use in the next process, or finished goods, which are waiting for sale, are also included in this broad category. But these are practically idle resources. Thus inventories are materials / resources of any kind having some economic value, either awaiting conversion or use in future.

Inventory is a key determinant of profitability. Inventory velocity turns assets into profits. The faster inventory turns, the greater the profitability. Inventory is the key issue to supply chain management success. Customers demand that their orders be shipped complete, accurate and on time. That means having the right inventory at the right place at the right time. Excess of inventory within the pipeline increases the overall working capital requirements of the pipeline and places a large cost burden on the agents of the chain. The levels of inventory need to be reduced throughout the logistics pipeline, which will lead to an effective operation.

Today the focus is on retailers and their distribution services. Inventory aims to reduce costs and simultaneously improve service. Thus the need to reduce costs as against improving service becomes the key issue and the role played by successful inventory management is becoming more apparent.

Role of Inventory

Inventory is critical to supply chain management because it directly impacts both cost and service. Certain amount of inventory is inevitably required somewhere in the chain to provide adequate service to the end customer, as demand is mostly uncertain and it takes time to produce and transport product. Inventory typically generates an incremental cost of 20 to 40 cent per year for the company. Increasing supply chain inventories typically increases customer service and consequently revenue, but it comes at a higher cost.

Today, inventory investment is viewed as a supply chain cost driver rather than a material asset. Hence, a lean supply chain operating on material requirement planning (MRP), distribution requirement planning (DRP), or Just – in – time (JIT) system are preferred to ensure maximum inventory turns (ratio of sales to average inventory), reduction of cost on inventory investments, and enhancement of the bottom line and return on investments.

Importance of Inventory

Management of inventory is a powerful driver of financial performance. Improper management of inventory leads to slow growth and pressure on profitability. Thus companies aim at improving the efficiency of inventory cycle. This helps the firm from

locking up of capital, which can be invested elsewhere, and improve financial performance and create competitive advantage in delivering goods at lower prices.

Functions of inventory

Inventory management is an area which has strategic importance in logistics operation and thus impacts the efficiency and effectiveness of the overall supply chain system. In order to get over the uncertainties in demand and supply, goods need to be kept in stock. This is because the cycle of production and consumption never matches. However, higher inventory levels will affect the bottom line of the company. It is important to strike a balance between the two extreme goals of lower cost and higher levels of customer service, as it is a high risk and high impact area.

Companies block sizeable funds in inventories, which would otherwise have been invested in other important and productive areas. Inventories are held in the categories like Raw material and components, work in progress, finished goods, maintenance, repairs and operating supplies, in-transit inventory etc.

Functions of Inventory

1. Striking a balance between supply and demand:
It is very difficult to achieve a match between the production and consumption cycle. Whenever there is a sudden requirement of product in large quantities, it is not possible to produce such quantities immediately. Thus, products are manufactured in advance, and kept in stock during the peak period to avoid any shortage.

2. Minimize costs at acceptable inventory levels:
When inventories are replaced in extremely small quantities, they result in low investments but high ordering costs. There has to be a point where, the total carrying cost of inventory is minimum but the level of inventory is such that it doesn't affect production.

3. Provide the desired customer service levels:
Customer demands are satisfied through inventory. The location of inventory determines time in which customer will be served, the company's policies concerning the economic order quantity, safety stocks, etc will determine the cost at which customer is getting served.

4. Protecting the operating system:
Inventory ensures that the operating system does not have any disruption. For example, if a worker in one work center falls sick or if there is a machine breakdown, the work need not be affected if the inventory is available and others can continue the work.

5. Advantage of quantity discounts from suppliers: Inventory helps the firms in getting the advantage of quantity discounts from suppliers.

The following are the costs for holding Inventory

An inventory manager's job is to balance the conflicting cost and the pressures of determining the appropriate level of inventory. The reason behind keeping the inventories low is that firms must pay interest on the investment made on inventories.

Inventory holding (or carrying) cost is a variable cost on items such as storage and handling, taxes, insurance, interest on capital and shrinkage cost. The annual cost to maintain one unit in inventory typically ranges from 20 to 40 percent of its value.

Illustration:

If a firm's holding cost is 30 percent. If the average value of total inventory is 20 percent of sales, the average annual cost to hold inventory is 6 percent {0.03(0.20)} of total sales.

This cost is significant in terns of gross profit margins, which often are less than 10 percent.

The various costs in inventory are broadly classified as follows:

Interest or Opportunities Cost A company may obtain a loan or forgo an opportunity to invest in an attractive return. Interest or opportunity cost whichever is higher is the largest component of holding cost.

Storage and Handling Costs This cost is incurred when a firm rents out space. Here again there is an opportunity cost, as the firm can utilize the storage space productively for some other purpose.

Taxes, Insurance and Shrinkage When inventories are high, the insurance on the assets (i.e. Inventories) also increases. Shrinkage takes place in three forms.

- Pilferage or theft of inventory by customers or employees.
- Obsolescence occurs when inventory cannot be used or sold to the full value due to change in model, engineering modifications or low demand.
- Deterioration through physical spoilage or damage results in lost value.

Ordering Cost This refers to the cost involved in the ordering process. The paperwork faxes, phone calls etc. will add to inventory related costs.

Carrying cost Also called holding cost, carrying cost is the cost associated with having inventory on hand. It is primarily made up of the costs associated with the inventory investment and storage cost. For the purpose of the EOQ calculation, if the cost does not change based upon the quantity of inventory on hand it should not be included in carrying cost. In the EOQ formula, carrying cost is represented as the annual cost per average on hand inventory unit. Below are the primary components of carrying cost.

Out of stock costs Incurred when the order placed by the customer cannot be filled from the available inventory.

Over stock costs Incurred when the company is having some stock in hand even after the demand for the product has been terminated.

Reasons for Carrying Inventories

Carrying Inventory can be classified under four heads

- Cycle Inventory
- Safety Stock Inventory
- Anticipation Inventory and
- Pipeline Inventory

Cycle Inventory: Raw materials, components, parts are required for production. This is cycle plays a crucial role in keeping the production cycle continuous. The work in progress inventory is a major part of production related inventory. Determining how frequently to order and in what quantity is called ***Lot sizing***.

Safety Stock: In order to avoid customer service problems and the hidden costs of unavailable components, companies hold safety stock. This gives a cushion against uncertainties in demand, lead-time, and supply therefore ensuring that operations aren't disrupted.

Illustration:
Suppose the average lead-time from a supplier is three weeks but a firm orders five weeks in advance just to be safe. This policy creates safety stock equal to a two weeks' supply (5-3).

Anticipation Inventory: This term refers to the inventory that is used to absorb uneven rates of demand or supply that businesses face. Manufacturers of air conditioners, for example, experience 90 percent of their annual demand during just three months of a year. Hence anticipation inventory helps in evening out the volatility in demand and supply. A company may stock up on certain items if its supplier threatened with a strike or have severe capacity limitations.

Pipeline Inventory: Inventory moving from point to point in the materials flow system is called *pipeline inventory*. Materials move from suppliers to a plant, from one operation to the next in the plant, from the plant to a distribution center or customer, and from distribution center to a retailer. Pipeline inventory consist of orders that have been placed but not yet received. Therefore stocking locations, improving materials handling and delays in distribution should be overcome.

Inventory Levels

There are three basic types of Inventory: Raw Material, Work in Progress, and Finished Goods.

Raw Material

This includes all the purchased parts and direct materials that go into the end product. This type of material has value added to it as it flows together as subassemblies, assemblies and finally into the shippable product.

Work-in-Process

Refers to the inventory waiting in the process for being assembled into final products.

Finished goods

These refer to the inventory, which are ready for delivery to the distribution centers, retailers, and wholesalers or to the customers directly.

Inventory Efficiency in the Supply Chain

Lowering inventories is one of the quickest ways to substantially decrease working capital needs. The drive for working capital use efficiency with the need to more quickly respond to changes in customer demand, with shorter and shorter order-to-delivery cycle times is challenging to many manufacturers. In times past, manufacturers would stockpile large quantities of raw materials; load-up the shop floor with work-in-process; and, pack warehouses with finished goods. Not only do those old ways increase working capital needs, they are a big factor in contributing to erratic and longer lead times as well as increasing overall costs.

The pressures to reduce inventories, and therefore working capital requirements, are increasing even in times of relatively low interest rates. The opportunities to use a finite source of capital, not just more efficiently but in ways that yield high rates of return for employing the essentially idle capital elsewhere in the business. For example, reducing inventories could provide the necessary capital to finance such things as: new product development, expanded marketing and sales, modernization, business process redesign, improved supply chain management, expansion, acquisitions, debt reduction among others.

Inventory Control: Improving the Bottom Line

Inventory control requires the tracking of all parts and materials purchased, products processed, and products stored and ready for shipment. Having a sophisticated tracking system alone does not improve your bottom line; it is how you use the information that your system provides.

One should know how critical the function is to business success and the complexities involved in planning, executing and controlling the supply chain network

From a financial perspective, inventory control is no small matter. Oftentimes, inventory is the largest asset item on a manufacturer or distributor's balance sheet. As a result, there is a lot of management emphasis on keeping inventories down so they do not consume too much cash. The objectives of inventory reduction and minimization are more easily accomplished with modern inventory management processes that are working effectively.

Need for inventory control:

1. **Increase in the size of manufacturing units:** With the increase in the size of manufacturing units, there is a necessity to have sufficient inventory control so that increasing inventories do not become non-value added expenditure. In fact, increasing inventory can erode the profits of the company and the possibility of inventory control arises.
2. **Wide variety and complexity of the requirements:** The requirements of the modern industry have necessitated the need for conscious inventory management.
3. **High idle time cost of machine and men:** If men and machines are kept idle, it is highly uneconomical for the firm. Inventory levels have to be managed keeping this factor in mind.
4. **Liquidity:** There is an increased stress on liquidity in today's organizations, where it becomes a necessity to maintain liquidity at the levels of nearly 10-20 per cent of the total capital invested in finished goods.

Inventory Control Problems

In actual practice the vast majority of manufacturing and distribution companies suffer from lower customer service, higher costs and excessive inventories than are necessary. Inventory control problems are usually the result of using poor processes, practices and antiquated support systems. The inventory management process is much more complex than the uninitiated understand. In fact, in many companies the inventory control department is perceived as little more than a clerical function. When this is the case, the fact is the function is probably not very effective.

The likely result of this approach to inventory control is lots of material shortages, excessive inventories, high costs and poor customer service. For example, if a customer orders a product that requires a manufacturer to acquire 20 part numbers to assemble a product and then, only 19 of the 20 part numbers are available, there are nineteen part numbers, which are excess inventory.

Certain Performance Indicators for Inventory:

- ABC analysis of the assortment categorized by stock value/volume
- Variance in throughput time of the product group in totality
- The number of damages/claim
- Mean throughput time of the product group / vendor wise/ location wise
- Reliability of the inventory regarding quantity and correct place.

Conclusion

Thus, inventory management decisions involve trade-offs among the conflicting objectives of low inventory, high resource utilization and good customer service. For making supply chain leaner, firms are using selective control techniques like EOQ, ABC, etc. and inventory control models like MRP, DRP, JIT, AITS. Therefore, inventory should be held only when the benefits of holding it exceeds the cost of carrying the inventory.

REFERENCE:

1. Lambert, Stock, Elram et al, Fundamentals of Logistics Management, McGraw Hill, New York.
2. Wood D.F., A. P. Barone, P. R. Murphy, D.L. Lardlow, International Logistics, 2nd Ed., AMACOM, New York, 2002.
3. E H Frazelle, Supply Chain Strategy, Tata McGraw Hill, New Delhi,
4. Kapoor, S., and Purva Kansal, Marketing Logistics – A Supply Chain Approach, Pearson Education, New Delhi, 2002.
5. Sunil Chopra, Peter Mendl, Supply chain Management , Pearson Education, New Delhi, 2004.
6. Christopher Martin, Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service, 2nd Ed., Person Education, New Delhi, 2004.

CHAPTER 5: INVENTORY MANAGEMENT

Inventory decisions are high – risk and high – impact in nature from the logistics perspective. Inventory Management is an integrated process, which aims to operationalize a firm's as well as the value chain's inventory policy. It is a strategic area in logistics and has an overall impact on the efficiency and effectiveness of the entire supply chain. It is basically a practice of planning, directing and controlling inventory so that it contributes to the profitability of business.

Since it is necessary to have an optimum minimum of multiple types of inventory, inventory management is essential.

There are three methods for inventory management – The first one being a reactive or pull approach, which uses the customer demand to pull the product through the distribution channel. Another philosophy is the planning approach, which proactively schedules the product movement and also its allocation through the channel according to the demand forecast. The final approach, hybrid logic combines the former versions and results in an inventory management philosophy, which responds to product as well as market environments.

Characteristics of Inventory:

- Once an investment has been made in inventory, it cannot be reversed and that fund cannot be utilized to obtain other assets to improve corporate performance. Thus investments in inventory are risky.
- There are a lot of chances for the inventory to be pilfered or to become obsolete.

The magnitude of risk varies according to the position of the enterprise in the distribution channel:

a) **Manufacturer**: For the manufacturer, there is a longer dimension of risk. Starting with the raw material, and component parts, the risk includes work – in – progress, and finally the finished goods. It doesn't end here, as the inventory needs to be transferred to warehouses in close proximity to the wholesalers and retailers. Though, the product line may be narrower, the risk element is deeper and of longer duration.

b) **Wholesaler**: The wholesaler handles more product lines than the manufacturer. He purchases in bulk and distributes in smaller lots to the retailers. Also these small lots are in assortment. Especially, when the product lines are more in number, there is a grave problem. The problem escalates for a seasonal product where the wholesaler has to stock much in advance of the sale.

c) **Retailer**: The risk for a retailer is wider and not deeper in the sense he stocks a wide variety of products. The number of Stock Keeping Units within a Supermarket is enormous. The risk is primarily of marketing in nature. The enormity of risk faced by the retailers makes them push the risk towards manufacturers and wholesalers by pressing them to assume greater inventory responsibility.

The need for inventory and its control

Inventories of materials are necessary by all manufacturing organizations. Materials and inventories serve some social purpose in industries, which stems from some economic motives. The motive behind inventory is the following:

- **Meeting the production requirements**: A manufacturing organization needs to keep stock of raw materials, components and parts required for producing finished goods to meet the continuous production requirements.

- **Support in operational requirements**: Inventories are required for repairs, maintenance as well as operational support. Inventory for this purpose include production machinery spare parts, chemicals, lubricating oils, welding rods etc.

- **Customer Service**: Customer satisfaction is used as a tool for competitive advantage. To ensure customer satisfaction, it is necessary for suppliers to maintain parts in order to extend after sales service to their clients.

- **Speculation**: Provides ample scope for holding large amount of inventories, but this inventory is not important for industrial purpose.

- **Precaution**: Arises out of the inability to predict future demands precisely and getting the materials in time, without incurring extra costs.

Importance of Inventory Management in the Supply Chain

Managing inventory has become important due to the following factors:

- Availability of resource (such as finance and space) has made the management to consider lowering the levels of inventory within the supply chain management systems to maintain margins
- Latest concepts like Just in Time (JIT) applications and lean manufacturing have reduced the need for inventory as an insurance buffer within the overall logistics activity
- Many companies have realized that a greater return on investment (ROI) can be obtained by developing the core business, and investment in working capital items, like inventory and debtors give lesser returns.
- With the advent of Information technology (IT), inventory management has become essential which can be used to reduce inventory. Better the information, lower is the inventory.

Types of Inventory

a) **Raw materials and production inventories**: Raw materials and other supplies, parts and components, which enter into the product during the production process and usually form part of the product.

b) **In-process inventories**: Semi – finished, work – in – progress and partly finished products formed at various stages of production

c) **MRO Inventories**: Maintenance, repairs and operating supplies consumed during production process and usually not a part of the product itself (eg: oils and lubricants, machinery and plant spares, tools and fixtures, etc.)

d) **Finished goods inventories**: Completed products ready for sale.

e) **Movement or transit inventories**: Arise, as there is time involved while moving stocks from one place to another.

f) **Let-size inventories**: Large quantities than necessary are stocked to keep costs of buying, receiving, inspection and handling low.

g) **Fluctuation inventories**: Maintained as a cushion against unpredictable fluctuations in demand.

h) **Anticipation inventories**: Inventories carried to meet predictable changes in demand.

Inventory Control

This is a mechanical procedure, which helps in implementing an inventory policy. Control procedures are devised to implement the desired inventory management policies. Procedures for inventory control can either be perpetual or periodic. In a perpetual control process, inventory status is reviewed daily in order to determine the needs of replenishment. To ensure proper implementation of this system, there is need to have accurate accountability of all stock keeping units, apart from proper computer assistance. In a periodic review, the inventory status of an item is reviewed at regular time intervals, maybe weekly or monthly.

Types of Selective Inventory Control Techniques

ABC Analysis

Relates to the annual usage cost of a particular item. Generally 10 per cent of items account for nearly 70 per cent of usage value, Another 20-30 percent may account for 20 per cent of usage value and the balance 60 – 70 per cent accounts for 10 per cent of the usage value. Items are classified as per their usage value.

'A' items costs approximately 60 – 70 per cent of the total inventory cost while they are less in number. 'B' items cost 20-30 per cent of the total inventory cost while 'C' class items are greater in number and carry less than 10 per cent of the cost of the entire inventory.

VED Analysis

Related to the Vital, Essential, and Desirable status of inventory items. As the term implies, certain parts and items are considered to be vital for meeting operational requirements and this aspect is taken into consideration while making a forecast. While making a forecast, certain items and parts, which are considered as vital for meeting operational requirements, are considered. The modified version of this is the ABC analysis. VED analysis, takes into consideration both the value and criticality of each item. Continuous review is necessary for high value and critical items and thus is ordered in low quantities. Low value, least critical items are reviewed periodically and ordered in large quantities and have lower safety stock requirements.

SAP analysis

Refers to Scarce, Available and Plenty analysis which allows to build into provision forecasts. The ordered quantity is governed by the scarcity factor. The guideline for procurement policy decisions would be the limitations in supply or the obsolescence of the firm in the near future.

FSN analysis

The Fast, Slow or Normal analysis determines the consumption pattern of each item. However, a realistic picture for procurement action will not be available from a consumption pattern where the production run is slowed down due to various other reasons.

SDE Classification

Classification based on the availability of an item. S items are scarce items, which needs to be imported and thus take a long time to obtain. D items are difficult to obtain, and E items are easily obtainable.

Inventory Planning Models:

1. **Economic Order Quantity (EOQ)**: This is the replenishment order quantity, which minimizes the combined cost of inventory maintenance and ordering.

Assumptions Of Basic EOQ Model

- Demand is known with certainty
- Demand is relatively constant over time
- No shortages are allowed
- Lead time for the receipt of orders is constant
- The order quantity is received all at once

In this model, the inventory holding/carrying cost is taken to be proportional to the average inventory held during a period. Thus, by reducing the inventory, its carrying cost can be reduced. On the other side, smaller lot sizes will increase the number of lot sizes per annum to cover the annual demand and thus the cost of ordering will be more. Thus the economic lot size must balance both these opposing costs.

The mathematical formula for economical lot size is:

$$Q = \sqrt{2DS/HC}$$

Where:
Q = Order quantity in units
S = Cost of placing an order in rupees
D = Average annual consumption in units
H = Percentage of inventory cost vis a vis unit cost
C = Cost per unit

2. Material Requirement Planning (MRP)

Materials Requirement Planning (MRP) is a scheduling procedure for production processes that have several levels of production. MRP determines a schedule for the operations and raw material purchases, given information describing the production requirements of the several finished goods of the system, the structure of the production system, the current inventories for each operation and the lot sizing procedure for each operation.

3. Distribution Requirement Planning (DRP)

This is a sophisticated planning approach, which consider multiple distribution stages and the characteristics in each stage. It is a logical extension of MRP. While MRP is determined by a production schedule, which is defined and controlled by the enterprise, a DRP is guided by customer demands, which cannot be controlled by the enterprise. A DRP allocates inventory from the mother warehouse to the various distribution centers based on the following:

a) Pattern of demand
b) Provision of safety stock
c) Quantity ordered
d) Re-order point
e) Average performance cycle length

DRP also coordinates the finished goods requirement across the distribution network.

Major benefits of using DRP

a) Improved customer service level with increased on-time deliveries.
b) Efficient and effective marketing efforts for high stock items.
c) Reduced inventory levels and thus lower carrying costs.
d) Reduced inventory and thus lesser warehouse space requirements.
e) Reduced customer freight costs due to fewer back-orders.
f) Improved budgeting capability where DRP can simulate inventory and transportation requirements under multiple planning scenarios.

4. Just – in – Time System (JIT)

Just In Time (JIT) is a manufacturing philosophy, which leads to Production of necessary units, in the necessary quantities at the necessary time with the required quality. It is an approach to achieving excellence in the reduction or total elimination of waste (Non-Value Added Activities). The JIT-technique is a "Pull System", based on not producing units until they are needed. The Kanban Card is used as a signal to produce. Overproduction, Unnecessary Inventory, Defective Products, Transport and Waiting Time are some examples of waste according to JIT. The benefits of JIT include:

- Better quality products.
- Higher inventory turnover.
- Higher productivity.
- Lower production costs.

4. **Vendor Management Inventory (VMI)**

In VMI, the supplier takes charge of the inventory management of the product and also manages the replenishment process based on the customer's consumption pattern. EDI or other inter – organizational software packages are used.

Inventory Management Strategy Development Process

This process consist of three steps:

a) **Market / Product Classification**: Also known as ABC classification, this groups products and markets with similar characteristics to ease inventory management. The objective of this classification is to focus and to refine the inventory management efforts. Classification can be based on a variety of measures like sales, contribution of profit, inventory value, nature of the item etc.

b) **Segment Strategy**: In the second step, the integrated inventory strategy for each product or market group or segment is defined. Various aspects of the inventory management process like service objectives, forecasting methodology, management technique and the review cycle are included in this strategy.

c) **Operationalized policies and parameters**: Finally, the focused inventory management strategy has to be implemented which involves clearly defining the detailed procedures and parameters. The procedures have to define the data requirements, software applications, performance objectives, etc. The parameters give the actual numeric values like the length of the review period, service objectives, percentage of inventory carrying cost, order quantities and re-order points.

Improved Inventory Management

Certain additional initiatives need to be taken to improve the effectiveness of inventory. These are a number of policies and procedures that form guidelines for inventory – related decisions are incorporated in inventory management.

Performance Measures: Clear and consistent measures of performance are necessary for the inventory management process. These measures must bring out the trade – offs between service and inventory level. For example, if the performance measure of the planner focuses only on inventory level, then the planner will have a tendency to minimize the inventory levels, which might have a potential negative impact on the service level. On the contrary, if the planner's single focus is on service, it will lead the planner to disregard the inventory level.

Training: Inventory management is complex owing to the number of factors involved. The interface between the inventory management in the enterprise and also other entities within the value chain needs to be understood. Thus the firms need to increase not only the amount, but also the sophistication of training in order to improve inventory management decision-making. Planners must understand how certain inventory parameters like service

objectives, review periods, order quantity, safety stock etc, influence inventory operations and performance etc. Also, planners must understand how their inventory management decisions will affect other members in the value chain.

Integration of Information: Effectiveness and performance of inventory can be increased substantially and the uncertainty can be decreased by integrating the information requirement related to forecasts, orders, marketing plans, status of inventory, shipment etc across the enterprise and also among the channel partners. Exchange of information using global networks, forecasts and also a reliable measure of inventory reduce the uncertainty between the enterprise systems and thus result in lesser need for buffer inventory.

Application of Expert Systems: These expert systems utilize a computerized knowledge base to share inventory management expertise among the enterprise. This expertise can provide a lot of support for the training and awareness and thus lead to substantial improvements in productivity and performance of inventory.

Conclusion

Supply Chains being complex, inventory plays a key role in managing them. Inventory managers need to provide for stocks, whenever necessary in order to utilize the available storage space efficiencies such that stocks do not exceed the storage space available for them, and at the minimum inventory cost. There is a need for trade – offs to be achieved amongst the various costs so that the production and marketing functions of inventory are fulfilled.

CHAPTER 6: MATERIALS MANAGEMENT

Materials Management is the process of management which co-ordinates, supervises and executes the tasks associated with the flow of materials to, through, and out of an organization in an integrated fashion. There is maximum utilization, conservation, elimination of wastes, and thus avoidance of unnecessary delays.

Objectives of materials management

- Economical procurement of materials
- Issuance and timely distribution
- Store accounting
- Record keeping
- Stores control
- Looking at new supply sources
- Development of vendors
- Value engineering
- Coordinating smooth flow of materials

Materials Planning

This is a scientific technique of determining in advance, the requirements of raw materials, ancillary parts and components, spares, etc. given by the production programme. The overall management planning and control system is a broad perspective within which material planning functions, and materials budgeting are an exercise translated in money terms for its effective functioning, control as well as execution.

The actual planning starts with the information gathered from the annual sales forecasts, production and general business forecast. Forecasts provide the means for satisfying locational needs, and the general business forecasts provide the means to estimate in advance the trends in prices, wages and costs of other services. While breaking down broad forecasts into specific plans, the next step is to make the price and supply available to confirm to the specific plan. The materials consumption estimation is broken down into specific periods. The quantities are checked against the inventory control procedure, by taking into account the safety stock and lead-time requirements.

Purchasing

Refers to the exchange of goods or services for cash. In other words, it provides the right materials, at the right price, of right quality and quantity at the right time and, from a right source.

Objectives of purchasing:

- ❖ To maintain a continuous supply of materials to support production as well as the schedule
- ❖ Avoidance of duplication of purchases, wastes, obsolescence and delays
- ❖ Adopting proper standards of quality on the basis of suitability
- ❖ Procurement of materials at the lowest possible cost, at the same time ensuring that it is consistent with quality and service requirements
- ❖ Maintenance of the company's competitive position in the market

The purchasing department has the following functions:

- Selection of suppliers
- Analyzing bids
- Price negotiations
- Issuing purchase orders
- Follow – up actions
- Cost – analysis and study of market conditions
- Maintenance of price catalogues, information library, etc.

Inventory Management and Control Systems

Inventory refers to the stock of materials of any kind stored for future use, mainly in the production process. Inventory is critical to supply chain management because it directly impacts both cost and service. These are the prime ingredients for any logistical system. They also have an influence over the other activity centres of logistics such as customer service, transportation, warehousing, order processing and material handling. At least a certain amount of inventory is inevitably required somewhere in the chain to provide adequate service to the end customer, as demand is mostly uncertain and it takes time to produce and transport product.

It is necessary to have an optimum minimum of inventories, where the inventories are minimum and the chances of stock out also minimum. A Company achieves this through inventory management.
Inventory has various functions like striking a balance between demand and supply; minimize costs at acceptable inventory levels, providing the desired customer levels, availing quantity discounts etc.

Inventory control is a scientific method of storekeeping and considerably brings down the acquisition and retention costs of materials. It is concerned with maintaining the optimum level of stock and also recording its movement. The need for inventory control arises due

to many factors such as increase in the manufacturing units, growing complexity of the modern industry, higher idle time cost of machine and men and a higher degree of stress on liquidity.

There are several inventory control mechanisms such as ABC, VED, SAP, and FSN analysis.

The various inventory models are Economic Order Quantity (EOQ), Materials Requirement Planning, Just – In – Time, and Distribution Requirement Planning.

Stores Management and Operation

The three main storage systems on a broad view are receipts, physical upkeep and maintenance system. The system must be flexible enough to change with the change in the environment as well as production demands.

The key activities of stores are as follows:

- ❖ Receipt of materials, checking the quantity, co – ordination for inspection and the preparing the goods receipt note
- ❖ Accepting the checked materials, preparing rejection notes and thus completion of formalities for payment of bills
- ❖ Taking stock of the accepted materials and storing them in their respective locations
- ❖ Preparing issue vouchers, making actual issues for disposals and accounting for the same
- ❖ Ensuring proper sharing of information with the purchase departments through regular reports
- ❖ Ensuring the storage place is clean to facilitate handling, movements and observing all safety and security measures.

Having a key role to play in the success of warehousing operations, the storage system should be designed in such a way that it accommodates the inflow of inputs of materials and bought out components from the outside sources, in – process inventories and the outflow of finished goods to the ultimate customers. The design, size and location of a storehouse must be an important part of the management strategy.

Three basic ways of storage are as follows:

- **Fixed Location**: Stock can be found easily without any complex system of recording, but there is a considerable wastage of space.
- **Random Location**: Space is better utilized, but there is a need to keep good and elaborate records for the location of materials.
- **Zoned Location**: Goods of a particular group are stored together in a given area.

Warehousing

An element of strategic importance in the logistics system. A proper decision making regarding warehouse is necessary to ensure effectiveness of marketing. The warehouse acts as an important link in the supply chain of a manufacturing company. It serves as the interface area for production, market, customers and suppliers. Functionality of warehousing covers operations like holding, consolidating break bulk, cross docking, postponement, mixing, packaging, and information handling. Public, private and contract storage are the different types of warehousing operations.

While making the warehouse selection, factors like nature of the product, access, availability, infrastructure, market, regulations and local factors influence.

Warehouse network planning is a complex activity, and whose decision upon the number is dependent on a number of factors such as product characteristics, objectives of logistics, and availability of resource. Performance parameter ratios such as stock turnover, cost to sales, occupancy rate etc enable in successful management of a warehouse.

Material Handling and Storage Systems

Every operation in materials management involves the raising, lowering or moving an item, which is termed as materials handling. The management of materials handling activities brings about a host of specialty disciplines and responsibilities like mechanical, electrical, hydraulic means and electronic devices.

Basic Principles of Material Handling

- **Best handling is least handling**: As handling does not add any value to the product, it is advisable to keep the handling cost minimum
- **Use of standardized equipment**: The material handling equipment must be chosen in such a manner as to afford flexibility and also be capable of performing multiple standardized operations.
- **Minimum use of specialized equipments**: Though it is desirable to have specialized equipment, the cost of acquisition, cost of operation, maintenance, repair etc needs to be taken into consideration
- **Payload**: The selection of equipment needs to be made after careful consideration of the cost of moving. The economics can be measured by studying the cost of operation involved in handling in each move.
- **Standardized methods**: When the methods of picking, carrying and settling down are fixed, the wastage in time, labour and equipment will be eliminated.
- **Capacity of equipment**: The capacity needs to be examined carefully, as any over loading causes undue wear, and also results in excessive maintenance.
- **Loading and unloading**: A major portion of Material handling activity is in the loading and unloading and thus this function needs a lot of attention.

Types of material handling equipments

Pallets: Specially designed platform, which is built to dimension to suit forklift operations. These are designed out of hardwoods, though in some cases, steel pallets may also be used. The supplies are loaded onto the pallets, transported and stored in warehouses.

Forklift trucks: Move loads of master carton horizontally and vertically. The master cartons are stacked upon the pallet, which forms a platform. There are many types of forklift trucks, which are available for handling a variety of products. Though these trucks can be used to load and unload other vehicles too apart from transporting material, they are not economical for long distance horizontal movement due to the high ratio of labour per unit of transfer.

Cranes: These are power – driven, self – propelled units fitted with a boom mounted on a mobile chassis.

Conveyors: These enable straightforward transportation as rehandling before each and every activity is eliminated. Nowadays these are loaded and unloaded automatically. The cost increases with the distance to be traveled and thus it makes them more attractive for high –volume throughputs overshooting the distances.

Elevators: Contains an endless chain or a belt which runs over two – terminal pulleys or sprocket – wheels fixed at different levels on a vertical plane.

Tractors: Used as a substitute for forklift trucks, which are uneconomical for long distance movements.

Towlines: Consist of either in – floor or overhead – mounted drag devices and are used in combination with four – wheel trailers on a continuous power basis.

Carousels: Operates on a different concept than other equipments. The desired item to the order selector is delivered by using a number of bins mounted on an oval track. The logic behind carousel systems is to reduce walking length/paths and time.

Containerization

Unifies a number of shipments, which then move as individual units. Used to handle bulk commodities as well as merchandise. Benefits include door-to-door shipment, reduced freight costs, higher labour productivity, lesser documentation, reduced warehousing costs, environmental control and better utilization of capital equipment.

Roll On/Roll Off Ferries (RORO)

A lorry is loaded at the manufacturer's workstation driven on to a ship and then driven off at the end of the voyage directly to the consignee, using the ship as the moving bridge.

LASH (Lighters Aboard a Ship)

LASH barges are loaded at Inland River and shallow ports. Then, the barges are towed to ocean port's fleeting areas to meet the LASH mother vessel. On arrival, the mother vessel's crane lifts LASH barges onto the ships. The same crane lifts outbound barges, which are placed in the water, and then towed, to their final destination. LASH cargo does not require transshipment, as the movement from origin to destination with a single bill of loading.

Material Storage Systems

The storage system in a warehouse has a key role to play in the total cost and the efficiency of warehouse operations. The manner in which inventories are handled rather than how they are stored is very important. An efficient usage of material handling equipment is possible if the storage system allows easy access and retrieval of inventory. Selecting a storage system for a specific application depends upon the following factors:

- **Nature of the product**: Products, which have a higher risk of contamination, will have to be isolated from other product groups. For example hazardous chemicals can cause damage to other products.
- **Configuration**: While uniform products may be stored in stacks or in an enclosure, products, which are in odd shapes and sizes, need more space.
- **Perishability**: Perishable products are stacked in such a manner that consignments, which come in first, are distributed first.
- **Product variety**: When a variety of products are stored together, there needs to be segregation for easy identification for storage and retrieval.

Transportation

With the environment becoming very competitive over the past 10 to 15 years, speed has become an unmistakable competitive advantage for firms. Transportation helps an organization to achieve this advantage by ensuring that the right product reaches the right place and at the right time. Achieving this competitive advantage require effective functioning of transportation activities.

There are various modes or transport like road, rail, air, pipeline etc, the transit time being an important consideration. After the mode has been chosen, the logistics manager can choose the type of transport mode, i.e., whether to opt for common carriers, contract carriers, exempt carriers, private carriers or freight forwarders. Transportation management not only deals with settling an efficient transportation activity center but also continuous evaluation and management activity of the transport department.

Conclusion:

Most of the businesses arise out of the idea, which is much, more fundamental than mere profit making. The ultimate product or service is of great importance. Materials Management involves much more than cost – reducing techniques and includes cost control, cost reduction, work simplification and value analysis.

The professional materials manager needs to judge the right procedures, tools and techniques before approaching the job. Control of materials function is a primary task. In future, the materials managers have to be well equipped to face the challenge the modern days have posed to them.

CHAPTER 7: TRANSPORTATION

Transportation is basically the movement from one location to another as it makes its way from the beginning of a supply chain to the customer's hands. Transportation not only ensures movement of people but also goods from one place to another thus assisting the economy in the growth of trade and commerce. Being one of the most visible elements in the logistics operations, this function has gained a lot of importance and interest from the logistics perspective.

Transportation plays an important role in each and every supply chain because products are usually not produced and consumed in the same location. The third P in the marketing mix, 'Place' is of importance here. In fact, transportation costs occupy a significant part of the total costs in most supply chains.

With the growth in industry and commerce, transportation facilitates in achieving the social and economic objectives. As times are changing and according to the requirements, the mode of transportation is changing to keep pace with the growth of science and technology across the globe. The degree of sophistication of the various transportation equipment in use varies according to the level of economic condition and growth of any particular region / country. As the economy has transformed from subsistence agriculture to commercial agriculture, and also with the spurt of manufacturing activities, the scope of development of transportation modes has widened. In the olden days, the various modes of transportation like human beings, camels, horses, donkeys, carts and ships were being used. Today, these have paved way to newer modes of transportation to suit the needs of the modern world. In spite of the emergence of sophisticated modes of transportation, older modes continue to serve the society, but in a smaller way.

Transport, being the main component of logistics, plays an important part in all management decisions within the organization, from strategic decisions to everyday operations. Day to day management decisions also relies on transport, as "Just in Time" methods for both production and distribution have become the standard. With the growth in e-commerce, resulting in more and more home delivery of products, transportation costs have become very significant in retailing. Especially for products sold online, transportation cost is a larger fraction of the total delivery cost.

The appropriate use of transportation is the key to any supply chain's success. For eg: Wal-Mart uses a responsive transportation system to lower overall costs. Wal-Mart uses the technique of aggregation for products leaving for different retail stores on trucks leaving to a supplier. At distribution centers (DCs), Wal-Mart uses cross – docking, where product is exchanged between trucks such that each truck going to a retail store has products from different suppliers.

Basically, transportation serves two main purpose:

- **Product movement:** The primary function of transportation is the forward and backward movement of the product in the value chain. It is necessary that product be moved only when they are necessary and there is an enhancement in the product value. This is because transportation utilizes the financial resources for expenditure like driver's labor, operation cost of the vehicle, and other administrative expenditure. The environmental resources are utilized both directly and indirectly. An example of direct usage can be the fuel and oil costs and an indirect usage can be the environmental expense caused by air, noise pollution in the environment.

- **Product Storage:** Temporary storage for in – transit goods is expensive. But in circumstances where the warehouse space is limited, utilizing the transportation vehicles may be a better option. One option is where the product is loaded on the vehicle and then it takes a round about or indirect route to its destination. The vehicle can be used as a temporary storage option where the origin or destination warehouse has limited storage capacity. Another option is to take a diversion. This is done when there is an alteration in the shipment destination while the delivery is in transit. While, telephone was used for diversion strategies originally, today satellite communication handles this task efficiently.

A transportation strategy to be successful, should recognize the following:

- **Customer requirements.** The supply chain involves continuous and efficient movement of product from vendor to manufacturer to customer. Thus the transportation program must reflect and meet the customer's needs. The vital aspects are time and service.
- **Timely movement of shipments.** Customers demand their shipments be delivered as they require - on the date needed, by the carrier preferred, both shipped complete and delivered complete and in good order. A transportation program, which can do this, can provide customer satisfaction and give a competitive edge.
- **Mode selection.** Selecting the mode of transport is an important consideration. The transit time has to be considered while doing so.
- **Carrier relationships.** Volume catches the attention of the carrier of forwarder. The carrier attention with volume creates a competitive interest in a business. Another side to this attention is that the business cannot be divided among many carriers. The chief reason being that responsive transportation can create a competitive advantage and this can be done only with a focused relationship with a carrier.
- **Measuring/benchmarking.** There is a necessity to know about the performance of the strategy as well as the carriers. Measuring and benchmarking can be of assistance to this. Measuring means comparing performance versus standards. Benchmarking means learning what other companies do--the best practices. Benchmark needs to be done with a company in the same industry.

- **Flexibility.** As change is happening everywhere, the strategy has to be ready to change. There is a constant change in the customers, products, business, suppliers and the overall corporate emphasis, which can dramatically change the company's strategy. It is important to recognize that change will occur. Just as times are changing, the strategies will also keep changing. A company must adapt itself to such an environment.

Participants in the Transportation Decisions:

Primarily there are five key parties in transportation decisions. Each of these parties has a role in the transportation environment.

Shipper: The party, which requires the movement of the product between the two points in the chain. The shipper's objective is to fulfill the customer order with responsiveness but at the minimum cost.

Consignee: The destination party or receiver. The consignee also has the similar objective of receiving the goods at a lowest cost and with maximum responsiveness.

Carrier: The party, which moves or transports the product with an objective of maximizing the revenue at the least cost. Carriers have a tendency charge a higher rate and reduce their costs by trying to consolidate various individual loads into economical loads and thus would seek flexibility in pick up and delivery with the client. This motive is in conflict with the manufacturer's objective of reducing total transportation costs.

Government: The Government has a high interest level in the transactions because a stable and efficient transportation environment is necessary to sustain economic growth. To facilitate this, carriers must offer competitive services while operating profitably.

Public: The ultimate determinant of transportation by desiring goods at reasonable prices. Their concerns are related with the accessibility, expenditure, effectiveness as well as the safety and environmental standards.

Factors affecting carrier decisions:

- **Vehicle related cost**: Cost incurred by the carrier for purchase or lease of the vehicle to transport goods
- **Fixed operating cost**: Costs which can be associated with the airport, terminals and labour which are incurred whether vehicles are in operation or not.
- **Quantity – related costs**: Usually variable in nature except in circumstances where labour for loading and unloading is fixed.

- **Trip – related cost**: Includes the price of labour and fuel incurred for each trip independent of the quantity transported.

- **Overhead cost**: Any cost incurred for planning, scheduling a transportation network as well as the information technology costs incurred.

- **Factors affecting shippers decision**:

- **Transportation Cost**: Total amount paid to various carriers for transporting products to customers.

- **Inventory Cost**: Cost of holding inventory incurred by the shipper's supply chain network.

- **Facility cost**: Cost of various facilities in the shipper's supply chain network.

- **Processing cost**: Cost of loading / unloading orders and the other processing costs associated with transportation.

- **Service level cost**: Cost of not being able to meet delivery commitments. This cost to be considered in strategic, planning and operational decisions.

Modes of transportation

- **Air**

  This is the least hazardous in nature when compared to all other modes of transport. Air transport is expensive, and is very suitable for products having high value or extreme perishability. The prohibitive aspect of this mode is its high cost. From the operator's point of view, though the fixed cost is low compared to other modes like rail, water and pipeline, variable costs are very high as a result of fuel, maintenance, and the labour for crew.

  Though the cargo handled by air is growing at a fast pace, it is still not important when compared to the cargo handled by other modes of transportation. Air, by whatever type of airline, is generally considered a premium means of transportation. The best justification for the high cost can be an emergency situation, which necessitates the service of air transport. Technological developments like new cargo-handling equipment at air terminals and the use of larger containers have been beneficial.

- **Sea / Water**

  The oldest mode of transportation. Water transport, due to its nature, is limited to certain areas. It is the slowest modes of all the modes and a lot of delays also occur at ports and terminals. Water transport is generally suited for carrying very large loads at low cost. Usually the shipping fleet across the globe comprises of tankers, dry bulk carriers, container ships and special vessels. Some of the problems encountered with this mode are rough weather characterized by storms, ice, high waves etc in – transit. Also there is a disadvantage of a limited range of operation and speed.

- **Railways**

  Generally capable of transporting large quantities of freight over long distances very economically. These are the principal carriers of men and material, and play a major role in the country's trade and commerce activities. It is the main source of supply of essential commodities, which are transported across the length and breadth of the country. Road traffic is relieved to a certain extent and also air pollution caused by trucks can be eliminated. The railways also charge competitive freight rates.

- **Roadways**

  Most popular mode of transport. With the manifold growth in industrial and agricultural activities, this mode has achieved a lot of importance. The various advantages of this mode are flexibility, faster turnaround, lesser risk of delays or strikes, door-to-door service, reach to remote places and through movement from consignor to consignee.

- **Pipeline**

  In India, pipelines are used for oil transportation by all public and private sector petroleum refineries. They are also utilized for transporting manufacturing chemicals, dry bulk materials like cement and flour by hydraulic suspension, and also sewage and water within cities and municipalities. This mode is unique in comparison with the other modes in the sense that they operate throughout the day, with limited time for changeover and maintenance. The basic advantage here is that they reduce the operational costs, though the initial investment is high. Also these are eco-friendly. The disadvantage of this being its lack of flexibility where only limited commodities in the form of gas, liquid or slurry can be transported.

Transport Economics: The factors which influence transport economics:

1. **Distance**: This is a major influence on the cost as it is a direct contributor to variable costs like labour, fuel, and maintenance. The tapering principle, where the cost curve increases at a decreasing rate as a result of the distance function is relevant here.

2. **Volume**: It is viable to consolidate smaller loads into larger loads to take advantage of the economies of scale.

3. **Density**: The product density or weight is discussed here, where the product density can be increased within a truckload for better capacity utilization.

4. **Stowability**: This refers to the product dimensions and how they affect the vehicle space utilization. It is easier to stow standard shaped items than odd – shaped items, which occupy more space.

5. **Handling**: While loading or unloading trucks, railcars, or ships, there is a necessity for special handling equipments like trolleys, forklift trucks, conveyors etc to load or unload trucks, railcars or ships.

6. **Liability**: These are product characteristics, which basically affect the risk of damage and the resulting incidence of claims.

7. **Market Factors**: Factors like lane volume and balance. A transportation lane refers to the movements between the points of origin and destination. When a vehicle is sent from the point of origin, it may return empty-handed or may bring back load. Due to the imbalances in demand in both the manufacturing and consumption locations, a balanced (volume is equal in both directions) move is nearly impossible.

It is the responsibility of the logistics managers to understand the influence these factors have on the transportation cost and minimize such expense.

Documents in Transport Decision Making:

- **Bill of Lading**: A computerized, basic document, which is, utilized in purchasing transport services. This serves as a receipt of the commodities and quantities shipped. It also serves as the basis for damage claims in case of loss, damage, delay etc. The terms and conditions of the carrier liability and gives in documentation form the responsibility for all possible causes of loss or damages.

- **Freight Bill**: This is how the carrier charges for the transportation services he performs. The information contained in the bill of lading is utilized for preparation of this.

- **Shipping Manifest**: This document is used when multiple shipments are placed on a single vehicle. The document provides a comprehensive list, which informs the entire load content, making it unnecessary to view individual bills of lading as all details relating to the stops, bills of lading, weight, case count etc for each shipment are listed in this manifest.

Transportation Management

Factors like globalization and technological improvements in the past years have changed the logistician's view of transportation. The logistics manager is expected to be more pro-active in identifying the desirable combination of carrier services and also the suitable pricing structures in order to meet the objectives of the firm. Transportation, when managed independently of other value added logistics operations often represents the weaker elements. Transportation decisions, which are made in co-operation with, related functions remove this weakness.

The two main fundamental principles in transportation management and operations are **economy of scale** and **economy of distance**. Economy of scale means the transportation cost per unit of weight decreases with an increase in the size of shipment. Economy of distance implies that there is a decrease in the transportation cost per unit with an increase in the distance. These principles are essential while evaluating alternative transportation strategies or operating practices.

Thus transportation management is an important activity for the organization which involves the following process:

a) **Analysis and Understanding of environment**: There is a necessity to understand the transport environment, to make sound transport decisions. The environment consists of the five parties – shipper, consignee, carrier, government and public.

b) **Clarity in objectives**: The order of preference in performance of transportation functions has to be decided. The manufacturer must determine his objectives at a level at which service can be performed and the levels at which customers expect, the amount of trade – offs that can be expected. Such setting of objectives can enable the company to choose an efficient mode of transport.

c) **Selecting mode of transportation**: A choice between single mode and intermodal transport has to be made to achieve objectives efficiently.

d) **In source or outsource**: After selecting the mode, the company must decide whether to in source the activity or outsource to third parties. According to the mode selected, the company must perform the functions.

e) **Evaluation and Control**: The efficiency of the transport system can be ascertained by measuring the customer satisfaction.

Conclusion

Modern transportation has undergone a sea – change with a change in the point of view of an operational function to a strategic one. In the new era, transportation requires a constant search for methods to ensure that the customers order will arrive at their doorstep when required, in the right quantities and in undamaged condition. Additionally, transportation has to continually improve its flexibility and ability to respond to the market place, at a short notice, while providing better avenues for communication and also cost reduction. This makes transportation a continuous perennial activity rather than a one – time exercise.

CHAPTER 8: WAREHOUSING / DISTRIBUTION

Warehousing is a support function for logistics and plays an important role in attaining the overall objectives of an organization's supply chain system. Warehouse is a place where inventory is stored. It is basically an area of interface for production, market, customers as well as suppliers. The performance of warehouse is often judged by its productivity and its cost performance.

In today's highly interconnected and interdependent supply chain networks, successful warehouse management involves a thorough understanding of how the basic warehouse management functions impact the supply chain. The warehouse, being a critical link in the supply chain, serves as the source of order status information for the customers, provides inventory visibility for the supply chain partners and for the enterprise as a whole.

While focusing on warehouse objectives of improving profit through reducing cost and enhancing customer service level, the following have to be taken into consideration:

- Utilizing the storage space to the maximum
- Higher productivity of labour
- Reduced material handling
- Reduced order filling time
- Maximum utilization of assets
- Reduced operating cost

Functions within the warehouse:

- **Receiving**: Collection of activities involved in proper receipt of all materials coming into the warehouse, providing the assurance that the quantity as well as quality is as per ordered, and distributing the materials to storage or to the other organizational functions which require them.

- **Pre packing**: This is done in the case when products are received in bulk from a supplier and repacked into single consignments. The entire merchandise, which is received, may be processed at once, or a portion may be held in bulk for processing later.

- **Storage**: Putting away the inventory received to complement order picking. It can be explained as the physical holding of merchandise while it awaits demand. Method of storage depends on the size and the quantity of the items in inventory and the handling characteristics of the product or its container.

- **Order picking**: Physical selection of the products from their locations after receiving the customer orders. In other words, process by which items are removed from storage in order to cater to a specific demand. A document named Pick List containing

details like sales order number, shipment details, item details, quantity etc facilitates order picking.

- **Packaging and / or pricing**: This is basically optional which may be done after the picking process.

- **Sortation and / or accumulation**: When a warehouse stores multiple products, this activity is done.

- **Packing and shipping**: Performance of tasks related to dispatching an order. This includes the following tasks like checking whether order is complete or not, packing material in an appropriate shipping container, preparation of shipping documents, including packing list, address label, and the bill of lading, weighing the shipments to determine shipping charges, accumulate orders by outbound carrier, loading trucks etc.

- **Traffic management**: Choosing the best mode of transportation for inflow and outflow.

Benefits of warehousing:

- **Economic:** Refers to the overall reduction in the logistical costs by utilizing one of more benefits. The major benefits are as follows:

a) Consolidation: Material from a number of manufacturing plants destined to a particular customer on a single shipment are consolidated and received by the consolidating warehouse which results in reduced transportation cost. The advantage is that it combines the flow of logistics from several small shipments to a specific market area. Several firms may also join together and use this consolidation service, which will benefit each shipper individually.

b) Bulk Breaking: Various combined customer orders are received from a manufacturer and shipped to individual customers. A break bulk warehouse sorts or splits individual orders and delivers them locally.

c) Cross Docking: This facility is similar to bulk breaking but involves multiple manufacturers.
Truckloads of products arrive from multiple manufacturers, which are sorted customer wise. Then they are loaded into the truck destined for the appropriate customers. This system is widely used by retailers.

d) Postponement: A warehouse with facilities for light manufacturing activities like packaging and labeling can enable postponement of final production until the exact demand is known. The benefit here is a reduced level of risk and lower inventory as the final labeling and processing activity is done only on knowledge of the actual demand and thus the basic product is used for a variety of labeling and packing configuration.

e) Stock Piling: Stocks piled in the warehouse act as buffer inventory which help to tide over situations of material constraints and customer demands.

- **Service:**

Service benefits may not reduce costs and the justification for a warehouse based on service is an increase in the market share, revenue and thus an increase in margin. The benefits are as follows:

a) Spot Stocking: A selected amount of a firm's product line is placed in a warehouse to fulfill customer orders during a key period of maximum seasonal sales. Features include a narrow product assortment and stocks placed in many small warehouses catering to specific markets over a limited time horizon.

b) Assortment: Various product combinations are stocked in an assortment warehouse in anticipation of customer orders. This is similar to spot stocking except that this has a broader product line, is limited to a few strategic locations and functions throughout the year.

c) Mixing: Similar to the bulk breaking process with an exception that various different manufacturer shipments are involved. Truckloads of products are shipped from manufacturing plants to warehouses and upon arrival at mixing warehouses these are unloaded and the desired combination of specific product for a particular customer or market is selected. Inventory is sorted to suit specific customer requirements.

d) Support in production: Production support warehouses provide a constant supply of components and materials for assembly units. Such a warehouse supports production by supplying components or sub – assemblies in a regular and timely manner.

Warehousing Alternatives:

The various warehouse strategies are as follows

1. **Private warehouse**:

Refers to having the entire facility under the financial and administrative control of the firm, i.e. the firm owns the product and also operates the warehouse. The actual facility can be either owned or can be taken on lease, for a short period. The major benefits of this warehouse are

- **Control**: The enterprise has complete decision-making authority over all activities in the facility thus enabling integration of warehousing operations with other internal processes of the firm.
- **Flexibility**: Operation policies and procedures can be formulated and altered to suit individual needs.
- **Cost**: The basic objective of this warehouse is not profit – making, thus the cost aspects are less compared to public warehouses.

- **Marketing**: An intangible benefit is a marketing advantage over other firms due to the firm's name attached with the warehouse thus enhancing customer perception.

2. Public Warehouse:

These are similar to private carriers in transportation service. Services are provided to others by firms that have warehousing space, storage facility, and material handling equipment for their own use and are used a lot in logistical systems. These are designed to handle the most general packaged products or commodities, which would not require specialized storage or handling arrangement. The products usually stored are food grains, paper rolls, bulk material (cement, fertilizers), furniture, chemicals etc.

A major advantage of a public warehouse is that they provide financial flexibility and economies of scale. More operating and management expertise is provided, as warehousing is the core business for such firms. Variable costs are lower compared to private facilities. With more customers and higher volumes, the fixed costs are spread over resulting in economies of scale. Public warehouses are of great use to firms, which are newly formed, and have the desire of expanding their distribution network and thus needn't invest in developing a private warehouse. They can alternatively hire a space in a public warehouse or channel their funds into other activities, which generate more revenue. This would improve their performance and thus increase the return on investment. Location flexibility is also available through public warehouses. Firms can also close storage facilities in one market and open at other places without any financial losses.

3. Contract Warehouse:

Combine features of both public and private warehouses. The risk is shared and there is a long – term relationship that will result in lower costs. Benefits include economies of scale, flexibility, information, and equipment sharing among clients.

Other types of warehouse

- **General Merchandise warehouses**: Deal in all commodities except specialized or commodity items. These can either be public or private.
- **Refrigerated/Cold Storage warehouses**: Used for storing perishable items, which are kept at low temperatures to preserve quality. These are expensive and a variation of this type of warehouse is known as the controlled temperature warehouse, which is lesser expensive and is used for storing fruits, milk etc.
- **Bonded warehouses**: A special type of warehouse whereby distributors can produce, transfer and store products without paying excise taxes and duties on them. The government licenses these to various parties.
- **In – bond warehouses**: Bring in imported merchandise, store as well as display the merchandise in shops, which sell for export or sell merchandise, which is directly exported.
- **Special commodity warehouses**: These are specialized and handle a specific or a bulk commodity.
- **Combination warehouses**: Warehouses, which combine all the above facilities.

Nature of warehousing costs:

The warehousing costs can be either

a) Fixed costs: Incurred irrespective of how much or how little throughput is experienced.
b) Variable costs: Vary with the throughput.

Warehousing costs are associated with the following:

Association	Costs
Land	Rent
Building	Rent & Rates
Storage and material handling equipment	Maintenance
Labour	Pickers, Packers
Supervision	Warehouse Management
Services	Electricity, Telephone

Decisions in planning the warehouse:

Warehouse Site Selection:

Cost and service are the key considerations here. The other supplementary factors are:

1. **Nature of product**: This influences the number and location of warehouses. For perishable commodities, proximity to the consumption centers is essential. It is preferable to have limited number of warehouses, which have delivery limitation in terms of distances and geographical reach.

2. **Infrastructure**: The efficiency of the warehouse operations improves with the availability of suitable infrastructure like roads, utilities (water, electricity, communication etc) and labour, the unavailability of which will increase the transportation cost. For example, for cold storage, availability of electricity is a major influencing factor.

3. **Access**: Again, when there the warehouse is located at a place where there is little accessibility, the transportation costs will escalate.

4. **Availability**: The availability of warehouse space is an issue, especially in the metros. In the case of non – availability, alternative location at the outskirts will be the alternative, but which will increase the transportation costs.

5. **Market**: To offer better service to customers, warehouses need to locate in proximity to consumption centers so that frequent deliveries by customers in small quantities can be organized at a limited time.

6. **Regulations and local taxes**: Government regulations guide the site selection for certain hazardous chemicals, explosives etc. In such cases, there are limited options

for site selection. Also the regional sales tax and octroi charges influence the site selection. With a lack of uniformity in the sales tax structure across the States, warehouses will be planned to make maximum utilization of this.

7. **Product – Mix Consideration**:
   The product mix is directly related to the design and operation of a warehouse. Considerations such as product sales, demand, weight, bulk, packaging etc needs to be made.

Future Expansion:

Some consideration about the estimated requirements for future operations in case of expansion must be made. A five – to – ten-year expansion plan must be considered while establishing the warehouse facilities so that normal operations are not disturbed during expansion.

Selecting the material handling system:

As movement is the primary function within a warehouse, it is necessary to select the appropriate material handling system.

Warehouse layout:

The warehouse layout needs to fit specific needs. Considerations to be made while planning the layout and operation are:

- Deciding on the receiving and shipping locations
- Identify minimum paths for movement of equipment and people, for speedy storage and retrieval
- Classifying items as slow, medium and fast and then allocating separate area for these
- Placing the material handling systems at their assigned location

Determination of warehouse space and design:

a) A sales forecast or total tonnage expected is used to estimate the final size of the warehouse required. A number of techniques like linear programming, simulation etc are used to determine warehouse size.
b) Warehouse designing is a specialty planning activity usually done by an architect. Specifications like size of warehouse, lay – out, path of material – handling equipment, are required. The warehouse must be designed for maximum utilization of available space and material handling equipments.

Factors to be considered while initiating warehouse operations:

- While stocking the warehouse, a complete list of inventory needs to be obtained. Quantities of individual stock keeping units to be determined while planning the warehouse.
- Hiring and training of personnel is an important issue. There must be clarity about the role played by personnel hired for specific requirements and each group of employees needs to be given special training.
- The management must ensure that work procedures are developed and also understood by personnel.
- Protection against theft of merchandise must be ensured. Adequate security measures to be undertaken by allowing only authorized personnel to enter the premises, where computerized inventory control and processing systems are of use.
- Product deterioration arises from careless storage and non – compatibility among products stored in the same facility. Careless handling by warehouse employees is a mater of concern.
- When firms handle a large number of products it is economical to utilize computers for billing and inventory control. The computer inventory needs to be compared with the physical stock
- Accident prevention is an important consideration.

Warehouse Management Systems

This is a software solution to control movement and storage of materials within a warehouse, transportation management, order management, and a complete accounting system. The following activities are managed through a WMS:

1. **Inbound**: Functions like addition of a new purchase order, palletisation, receipt of goods, putting away received goods etc
2. **Inventory Management**: Transferring inventory, holding and adjusting inventory, awareness of inventory balances etc
3. **Outbound**: Tasks such as creating an order of shipment, shipping multiple orders, allocation of orders, shipping order status etc

Conclusion

Warehouse being the interface area for production, market, customers and suppliers performs a number of functions in the supply chain. In many logistical system designs, the role of warehouse is viewed as a switching facility when contrasted to a storage facility. While the role of a traditional warehouse was to maintain a supply of goods to protect any uncertainty, the contemporary warehousing offers a host of much other value – added services. Effective warehousing has become the order of the day.

CHAPTER 9: PACKAGING AND MATERIALS HANDLING

Packaging is a marketing tool related to the performance of marketing function. The basic objective behind packaging is to prevent damage to the product during storage, transportation and handling, when it is in movement for distribution in the market. It forms an important cost element of goods and represents 5 – 30 per cent of the value of goods, depending on the type of product. It has a significant impact on the cost and productivity of the logistical system. The main cost elements are the purchase of packaging materials, introducing automated or manual packing operations, and further the need for disposal of material. A systems approach is necessary to manage packaging. Any central planning logic, which is designed to control total distribution costs, must keep in mind the costs related to packaging.

There are two main types of packaging: Consumer and logistical/industrial packaging

- **Consumer packaging**

This packaging is done with a marketing emphasis. The packaging design focuses on aspects like customer convenience, market appeal, shelf utilization, product protection etc. The proper package design should have its base on a complete assessment of the logistical packaging requirements, which requires a complete evaluation of how all the components in the logistical system influence packaging.

- **Industrial packaging**

The concept of containerization or unitization where the individual products are grouped into carton, bags, bins, or barrels for handling efficiency. The master cartons are grouped into larger units for handling, the combination that is referred to as containerization or unitization. Logistical packaging is designed to meet the distribution objectives.

Determining the degree of protection required to cope with anticipated physical and element environments is an important issue in package designing.

Functions of packaging:

- **Damage Protection**

  The master carton protects products from damage while movement and storage, in addition to being a restraint to pilferage. The cost of protection increases according to the degree of value and fragility of the product. The vulnerability of damage is related to the environment in which it is stored and transported. The physical environment relates to the logistical system. When the firm has more control over its physical environment, lesser the packing precautions are required. An example can be the utilization of privately owned transportation, which will move the product in a controlled environment. But if common carriers are used for transportations, more precaution needs to be exercised as the product may be transported in a variety of vehicles and there is lesser control. Certain situations in which the product will cause in – transit damage to the product are vibration, compression, puncture and impact. Securing the package with a tight strap or to load the carrier in a right pattern can reduce this.

  The outside elements also influence the packaging. There are certain factors like temperature, humidity etc which are beyond the control of logistical management. It has to be determined in advance how the contents of the packing will react to each of these factors and design the packing accordingly.

- **Utility/Convenience**

  This refers to how packaging can affect the logistical productivity and efficiency. When products are packed in certain configurations and order quantities, it increases the logistical output. Packaging thus provides convenience of handling and storing. Also the concept of unitization is very significant here. Unitization refers to the process of grouping the master cartons physically into one restrained load for easier material handling and transportation.

- **Communication**

  Packaging plays a significant role by assisting all channel members to identify the contents of the package. An attractive surface decoration can serve as a display item. Information such as the manufacturer's name, quantity, code number etc is mentioned on the package. The labels must be visible from reasonable distances. Handling and damage instructions are provided on the package. Especially for hazardous products such as chemicals such instructions can be of great assistance. Tracking is one more feature of logistical packaging. The consignment moves along multiple storage locations, transportation systems at various points with other consignments. For a well – controlled material handling system to track the product as it is received, sorted or shipped, packaging identifiable through a bar code is essential.

Packaging Cost:

The packaging cost depends upon factors like nature of product, physical dimensions, value, regulations etc. Delivery of the product at minimum overall packaging cost is essential. These are the costs included in packaging.

- **Unit Package Cost**: Basic material or container price. This will depend upon factors like volume, freight charges, and methods of over packing and development costs. An increase in the volume attracts lesser price.

- **Operation Cost**: The packaging equipment must have the strength and ability to withstand the stress of high speed filling equipment, in order to make the production process cost effective and efficient.

- **Warehousing**: The packed product is shipped to the user's warehouse for storage before shipment. Shape of the package and strength of the package are the factors of key importance here.

- **Distribution**: Moving the product from the user's warehouse involve several forms of transport. The costs of these are referred to as transport costs, which are governed either by the weight of the finished pack or the volume. They may also depend upon the shipping distance and value of the item being handled.

Types of packaging material

- **Shrink – Wrapping:** Form of packing where a pre - stretched plastic sheet or bag is placed over platform and master cartons. Heating locks the cartons. Advantages of this packaging are adaptability to various shipment sizes, low cost, and the ease of identifying contents and damage. A major disadvantage is disposal of waste material.

- **Stretch – Wrapping:** The unit load is wrapped with a tightly drawn external plastic material. Then it is rotated on a turntable to place the stack under tension. Platform is wrapped directly into the unit load.

- **Aluminium:** The main area of usage is foil. These are used as a replacement for beverage cans, stackability being the main advantage. Metal tubes and moulded trays are the other two forms. While metal tubes are used in pharmaceuticals, crafts, and cosmetics, moulded trays are used in the food industry.

- **High – Density Plastic Boxes:** Containers with lids similar to those purchased for home storage applications. These are rigid and sturdy, thus ensuring high protection.

- **Plastic Strapping:** A load is unitized so that many smaller containers can be handled as a single larger container. The strapping, which is usually about one to one and a half inch wide, is bound tightly around the containers.

- **Plastic Foam Dunnage:** Used to pack irregular shaped products into standard shaped boxes. These are light and do not increase the transportation cost and also provide substantial protection. A major issue here is the environmental problems related to disposal.

- **Film – Based Packaging:** This utilizes flexible materials instead of rigid packaging like corrugated fibreboard boxes. Corrugated fibreboard cases represent an important part of the paper and board industry, in terms of both tonnage and value. Corrugated fibreboards are commonly used for television, washing machines, refrigerators, cigarettes, personal care products, etc among a host of other products. The advantages here include automatic operation, reduced labour costs of manually boxing products.

- **Blanket – Wrapping:** A traditional form of packing, which is generally used in household packing. This packing is most suitable for irregular shaped products like chairs, tables and other furniture. Generally household goods carriers use these services.
- **Returnable Containers:** These are mostly re – usable packages like steel or plastic and sometimes corrugated fibreboard boxes. These are used by automobile manufacturers to pack inter - plant shipment of body parts.

- **Intermediate Bulk Containers:** Used for granular and liquid product shipment quantities smaller than tank cars but larger than bags or drums. Resin pallets, food ingredients, and adhesives are packed in these containers.

- **Plastic Pallets**: The rapid growth in the utilization of plastic in packaging is noticeable. These are lightweight and recyclable.

- **Pallet Pools:** Third – party supplies maintain and lease high – quality pallets all through the country. Palletization has contributed immensely to logistical productivity. Advantages include reduced damage, lesser costs of disposal, and improved use of pallet resources. The disadvantage is the costly investment in pallets.

- **Refrigerated Pallets:** A self – contained refrigerated shipping unit, which can be placed inside a regular dry van as a Less Than Truck Load shipment. This integrates the demands of environment and unitization.

Unitization

Products are grouped together in cartons, bags and barrels for handling efficiency. The containers used to group individual products are called master cartons. When the master cartons are grouped together, it is called unitization. The concept of Unitization has its base upon the theory that all shippers must pack their cargo in such a manner that it is moved and handled entirely by mechanical equipment, like lifts and cranes, all through the distribution network. It enables faster loading and unloading by transportation equipment, results in more efficient distribution center operations and also a reduced level of pilferage.

According to the unit load concept:

- Small, heavy and expensive items are enclosed in containers with double or triple wall to avoid pilferage and damage.
- The boxes or containers are secured to pallets with shrink-wrap or steel strapping.
- Large items can be directly secured to pallets, with assurance that they are completely protected from damage.

Palletisation for Unitization

Pallets enable unifying dry cargo loads. Basically, it is a flat tray upon which a lot of articles can be placed, and can be handled as one article. For securing the articles to the pallets, metal strapping, plastic films or more elaborate forms of devices are used.

Benefits of palletisation include reduction in time required to load or unload the products from the vehicle, and better utilization of warehouse space. Other benefits include assembly of individual packages according to a single customer order, easy handling of pallets for road as well as rail vehicles, and reduction in the rate of damage in transit, and reduced delivery time.

A drawback can be the lack of uniformity in pallets.

Containerization:

Container refers to physical equipment, which is used for unifying a number of shipments, which then move as individual units. These are used to handle bulk commodities as well as merchandise and are especially adaptable for inter-modal transport.

Benefits of containerization

- Reduced door to door shipment
- Reduced freight costs
- Reduced damage and pilferage, thus eliminating intermediate handling of packages
- Higher productivity of labour
- Lesser documentation
- Reduced warehousing and inventory costs
- Better utilization of capital equipment through uniformity of cargo
- Environmental control

Drawbacks of containerization

- All cargo need not necessarily suite containerization
- Heavy capital investment in equipment required
- Difficult to thrust liability as there are several carriers and also no intermediate inspection
- Proper equipment to handle containers may not be available
- System not comfortable with air freight

Movement of containers:

While moving the container, the consignor is faced with several choices such as the follows:

- **By Road**: This is done by using equipments like direct lifting cranes, forklift trucks, portal frames and other self-loading devices.
- **By Rail**: For long distances, road may prove uneconomic and thus the rail transport can be used to transfer containers.
- **By port terminals**: The container finally arrives at the port to be shipped whether road or rail transport is used to transfer containers.
- **By ships**: To secure benefits of rapid loading and unloading and thus to ensure efficient utilization of space, containers are built or customized. Wide hatches give complete access to holds in these ships.

Designing a Package:

Designing the package involves the following steps**:**

- **Briefing the designer**: The person who is designing the package needs to understand what is in the mind of the manufacturer. A complete marketing analysis may be given to the designer or some specific objectives may be given. The designer needs to list his views about the problem.
- **Gathering information about the package**: Meeting the people involved in the production process, various channel members like sales personnel, dealers etc. has to be done. Facts about the packaging materials need to be gathered.
- **Writing the Design Platform**: The designer gives a report giving details of what he has understood and what must be done to achieve the objectives he has laid down. The product and packaging engineers need to work together.
- **Creative Phase**: Here, the creative people are involved. They are given a precise definition of the problem and a set of objectives to work upon. They are required to find visual solutions to the problems stated within the boundaries outlined in the platform of design.
- **Consulting Suppliers**: Then, the appropriate suppliers of materials need to be called in. The ideas are synchronized with reality. The ideas need to be practical and also cost effective.
- **Initial Presentation**: The ideas are presented at a first visual presentation meeting. The client actually sees the work being done. The designs should be judged in relation to the design platform.

- **Modification**: Modifications, if any which need to be done after the first presentation, must be made.

- **Design Testing**: To test package, a number of tests have been developed, a few of which have been listed below:

- **Image tests**: Use the qualitative and quantitative research to assess consumer attitudes, preferences and message communicated.

- **Usage tests**: Examine the functional related attitudes towards packaging and usually involve in - placement tests.

- **Visibility tests**: Are designed to evaluate legibility of pack graphics, relative impact of different pack elements, and the relative impact of different designs they include the use of

- **Brainwave analysis**: Used for both advertising and package designing. Method is based on “Alpha” and “Beta” brainwaves.

- **Final Design Phase**: A final meeting with client is held to finalize the design. In this stage the various aspects of packaging like labels, contents, colour schemes, artwork on label etc need to be finalized.

- **Production Design**: The complete designs are presented to the clients for approval. The design is approved and also set as per the initial discussions concerning the marketing strategy. Any variance needs to be resolved by consulting the experts in the respective fields.

- **Finishing the Job**: The finalized artwork is turned over to the suppliers for producing the packs.

Factors effecting choice of packaging materials

- Characteristics of Materials to be Packaged
- Destination
- Kind of Transportation
- Handling, stowability and storage considerations
- Conditions of usage and distribution
- Cost
- Availability of the type of package and choice of substitutes

Conclusion

Packaging has a key impact on the cost and productivity of the logistical system. A central planning logic designed to control the total distribution costs must incorporate all the relevant costs and trade – offs, also those related to packaging. The cost of every logistical activity is affected by packaging. Inventory control is dependant on the accuracy of the manual or automatic identification systems that are keyed by product packaging. The order selection speed, accuracy, and efficiency are affected by the identification of product, configuration and ease of handling. The capability of unitization and techniques influence the handling cost. Package size and density influences the transportation and storage costs too. From the customer perspective, factors like quality control during distribution, providing consumer education, compliance with environmental regulations explain the importance of packaging. Given the complexity in the global supply chain and the costs of locating new facilities, the concept of packaging postponement to achieve strategic flexibility is gaining importance. With so much influence of packaging in every logistical activity, an integrated logistics approach towards packaging operations can yield substantial savings.

CHAPTER 10: GLOBAL LOGISTICS

Introduction

- What is Global Logistics
- Logistics Intermediaries
- The Global Supply Chain
- Organizing for Global Logistics
- Strategic Issues in Global Logistics
- Forces Driving Globalization
- Strategies to Enter Global Markets
- Barriers to global logistics
- Conclusion

Introduction

Global brands and companies dominate most markets today. The global company seeks growth of its business by extending markets while at the same time seeking cost reduction through scale economies in purchasing and production and also through focused manufacturing or assembly operations. While the logic of globalization is strong, it also presents a few challenges. One challenge is that world markets are not homogenous; there is a requirement for local variation in a lot of product categories. Secondly, unless there is a high level of co-ordination, complex logistics of managing global supply chains may result in higher costs. Both these challenges are related. On one hand, offering local markets the variety which they require while still gaining the advantage of standardized global production and on the other, how to manage the links in the global chain from sources of supply through to end user.

As an effective logistics system is important for domestic operations, it is equally important for global operations too. Global logistics operation must accommodate not only domestic requirements, but should also deal with increased uncertainties associated with distance, demand, diversity and documentation. With this background, there is a necessity for logistics managers operating globally to develop a wide variety of capabilities and expertise.

Globalized economies have created a host of business opportunities beyond the national boundaries of a country. The world has become a global village owing to the rapid advancement in information and communication technologies.

Today, the Internet has made it easier to do business electronically in any part of the globe, from any point to any point. As businesses continue to globalize, their attention has increasingly turned to logistics operations.

Speed and efficiency in the movement of goods across national boundaries depends on the available modes of transportation, their capacity and capability, inter-modal facility for movement, packaging, and handling, and logistical regulations in countries where the buyers, sellers, and carriers are located. The domain knowledge, connectivity with international cargo carriers, and documentation are the three crucial areas that need to be focused in global logistics.

These emphasize the need for defining global logistics as the design and management of a system that directs and controls the flows of materials into, through and out of the firm across national boundaries to achieve its corporate objectives at a minimum total cost.

The various activities involved in global logistics include demand forecasting, packaging, labeling, documentation flow, customer service and parts and service support, which are outbound. Production, scheduling, procurement, and the handling of returned products form a part of inbound movements.

Logistics Intermediaries: These are logistics service providers who have expertise in customs clearance and other formalities of international trade. In import and export business, for the physical movement of cargo, the role of intermediaries is quite indispensable.

Export Management Companies EMCs are intermediaries that market another firm's products overseas.

Export Packers They assist the exporter with special packaging requirements needed to reach some export markets.

Customhouse Brokers These are usually tied to freight forwarders in exporting nations. The customhouse broker meets the importer's shipment, and guides it through customs seeking to use tariff classifications that involve the smallest charges. Then goods are delivered to the importer's place of business.

Publication Distributors Publication distribution firms are specialized intermediaries. For example, an airline company has this service that includes wrapping, destination sorting, addressing, database management, and so on for magazines. Magazines move overseas by air and then are turned to post offices for delivery, saving on international package costs.

Goods Surveyors They are frequently referred to in international trade and are retained by the buyer, seller or both to inspect their quality and retain them.

Parts Banks Several firms, often airlines, offer this service. This helps manufacturers to store important repair parts throughout the world, where they can be quickly flown to customers with equipment "down".

Container Leasing Companies These companies facilitate inter modal movements because they can relieve individual carriers of the financial burdens and control responsibilities they would have if they had to own all of their equipment. Companies lease containers on both a short and long term basis.

Export trading Companies Export trading companies are a distinct intermediary. They actually buy the manufacturer's goods, take title, and then sell these goods in the export market. ETCs are customers of manufacturers in selected markets. By selling to an ETC instead of the importer, the manufacturer removes himself from some of the financial risks associated with exporting. Risks include political instability, importer creditworthiness, and the risk of unavailability of foreign exchange.

The Global Supply Chain

To meet logistical challenges, logistics management must evaluate complexity of global supply chains and must focus on the major differences between domestic as well as international trade. These are as follows:

1. Differences in operations – Major operational differences are as follows:

- Multiple languages are required for both product and documentation for international operations. Complexities increase due to language differences when a product is limited to a specific country once it is been customized with respect to language. Product proliferation due to language requirements has been reduced because of multilingual packaging; this is not an acceptable strategy always. Apart from product language implications, multilingual documentation is required for every country through which the shipment passes. There are many countries where transportation and customs documentation needs to be provided in the local language, although English is the local language. This results in an increase in the time and effort for international operations as complex documents need to be translated before shipment.

- A large amount of documentation is required for international operations. Though domestic operations can be generally completed using only an invoice and bill of lading, international operations require a lot of documentation.

- Global transportation is complex. Certain services which are available and taken for granted in a particular country may not be available in another country, especially the underdeveloped countries.

2. Differences in Systems Integration - Earlier, there was little commonality between the international information systems in multinational enterprises. This was also acceptable as every country's operation was viewed as separate and had an autonomous legal entity. In today's scenario, there is a requirement for increased co-ordination through systems integration. There is a requirement for increased global co-ordination through integration of systems and a few firms have an integrated global logistics information system.

3. Differences in Alliances - The importance of carriers and specialized service suppliers is more in the international operations than domestic operations. In the absence of alliances, enterprises operating internally need to maintain contacts with retailers, manufacturers, suppliers and service providers all through the world. It would be time consuming to maintain these relationships. Market access and expertise is provided by international alliances, which reduces the inherent risk.

Organizing for global logistics

When companies extend their supply chains internationally they have to confront the issue of structuring their global logistics organization. Companies have moved towards the conclusion that global logistics can be achieved only through a greater integration in

different ways. This is in contrary to the conventional idea that a decentralized decision-making responsibility needs to be developed and decentralized at least upto a strategic business unit level. This had led to many companies develop a strong local management, mostly with autonomous decision making at the country level.

A number of general principles that have emerged are as follows:

a) Strategic structuring and an overall control of logistics flows need to be centralized in order to achieve worldwide optimization of costs.
b) Control and management of customer service needs to be localized against the requirements of specific markets for gaining competitive advantage.
c) There is an increased trend towards outsourcing, which increases the need for global co-ordination.
d) A global Logistics Information System (LIS) is absolutely essential for ensuring the achievement of local service needs while seeking global cost optimization.

- **Structure and Control**: A lot of companies, which are active on an international basis, find that there is a constraint on their search for global optimization by strongly infringed local systems and structure. The twin goals of cost minimization and service maximization can be achieved only through centralized planning and co-ordination of logistics. Organizations need to look into locational decisions through total cost analysis as the trend towards global manufacturing continues. There is a necessity for improved access to information for costs related to manufacturing, transportation, handling and inventory holding.

- **Customer Service Management**: Considerable advantage can be achieved by formulating marketing strategies locally, within overall global guidelines. This is true especially in customer service management where opportunities for offering tailor-made services to suit individual customer requirements are huge. Managing customer service involves a lot of monitoring of service as well as performance and also extends to the management of the overall order fulfillment process – from order capture through delivery. With an increasing global and centrally managed order fulfillment system on the rise, there is a need for strong local customer service management.

- **Out-sourcing**: One of the greatest changes in the global business today is the increasing trend towards outsourcing. The trend nowadays is not only outsourcing the procurement of materials, but also outsourcing services, which have been provided in-house traditionally. The main idea behind this trend is that an organization will increase its focus on its core competencies and everything else will be outsourced. Control and management of network of partners and suppliers requires a combination of both central and local involvement**.**

- **Logistics Information**: Managing global logistics involves management of information flows on a real-time basis. The information system acts as a mechanism whereby the complex flows of materials; parts, sub-assemblies and finished goods are co-coordinated for achieving cost-effective service. An organization aspiring to be a global leader depends upon visibility, which can be gained through material, inventories and demand flows throughout the pipeline. Any time lapses in information

flows will be directly translated into inventory. There is a need for information systems, which can estimate demand at every level in the chain and also provide the driving power for a centrally controlled logistics system.

Strategic Issues in Global Logistics

1. Internal Issues

- Logistics Planning: Logistics network planning is crucial for companies with global operations in order to gain competitiveness. Formulating a logistics network strategy also depends on factors such as unit value of the product, markets and competition. For example: A firm's strategy to develop new markets and relocate facilities will trigger the need for sourcing of raw materials with reference to the delivery time frame, logistics cost, and reliability. So the formulation of logistics strategies should consider the location of production facilities, sourcing of materials and components and product-market characteristics.

- Inventory: Make to order or make to stocks: Making to order for delivering products directly to customer can result in a major shift in inventory planning and also reduce inventory levels. Consolidating global production into a single or focused factory for catering to needs of various markets can be an approach. Fulfilling the needs of local individual customers or local markets is done through the strategy of rationalization of product design. A modular approach to product design, where the product can be configured to its final shape at the distribution center catering to local markets can take care of the local markets.

- Product variables: Reach of the logistical system is decided by the unit value of the product. In a globalized marketing environment, firms with low unit value products resort to the local manufacturing system for extending good customer service.

- Flexibility: Global players focus on economies of scale for achieving cost advantage. There is inflexibility in this system as responding to a dynamic market and demanding customers can be difficult. Similarly the logistics system associated with the above strategy also becomes inflexible while responding to changing distribution needs. An example can be the emphasis on freight consolidation

2. External Issues

- Shorter Lead Time: Global markets emphasize on responsiveness with a lean supply chain. Thus, customers bank on the shortest lead-time for inputs going into the product manufacture in order to compress the performance cycle, extend superior customer service, and simultaneously reduce overall levels of inventory. But, in the case of inflexibility in manufacturing system the supplier has to maintain some buffer stock for maintaining the desired level of customer service, thus sacrificing the benefits of lean inventory.

- Trade barriers and facilitation: Though the trade barriers have reduced progressively owing to GATT/WTO, the non-tariff barriers have increased, particularly in the developed countries.

- Cultural Issues: These can be a problem in global sourcing due to a wide variety of approaches to conducting business in different regions of the world.

Forces Driving Globalization

There are many forces, which drive the firms to enter the international arena. These play a combined role of being motivators as well as facilitators. Enterprises are motivated for global expansion of operations for growth and survival. Development of technologies and capabilities are also facilitated through global operations.

Economic Growth

A decline in the economic growth of industrialized economies has occurred simultaneously with an increase in the manufacturing and logistics productivity, which has resulted in excess capacity. With this scenario, a most direct means for an enterprise to increase profit and revenue is through global expansion into other developed and developing nations. This expansion requires an integrated global manufacturing with marketing capacities as well as logistics support for the new business location. A pursuit for growth and profit is a major force, which drives enterprises to serve the global markets.

Supply Chain Perspective

Another force is the total supply chain perspective adopted by manufacturers and distributors. A historical view sought that expenses incurred by other channel members were not important while making logistics related decisions. This trend is slowly changing. Also there was a practice that more control on logistics activities can be achieved by doing as many activities as possible internally. Eventually logistics managers found out that they could reduce capital deployed by outsourcing a host of logistics activities. This has led to development of alliances with global suppliers who could provide expertise and also quality service at affordable prices.

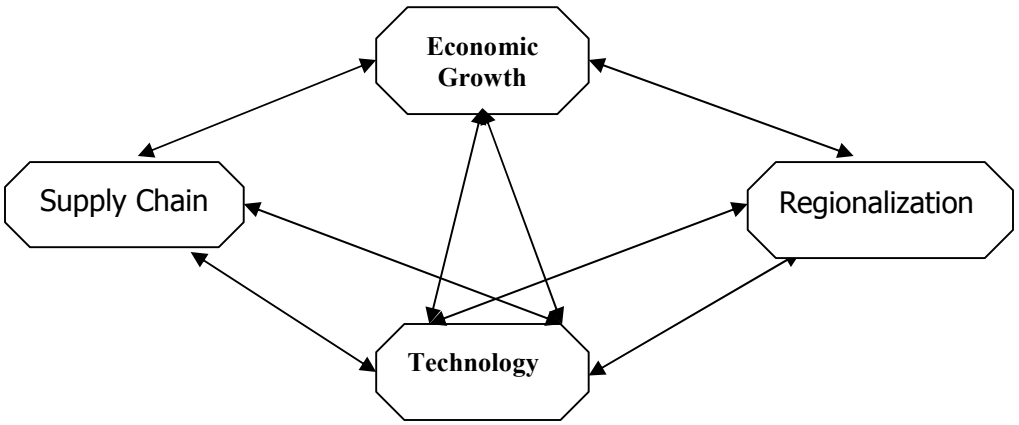
Regionalization

When firms decided to expand, they wanted to do this by spreading their wings to nearby geographic regions. To promote regional trade, countries began to enter into treaties and formalize partnerships. There is always an extra time required to accommodate political requirements, which add to the logistics costs without adding value to the ultimate consumer. Though efforts for regionalization have been designed to facilitate trade, continued government restrictions cause logistical bottlenecks.

Technology

Technological development has resulted in an increased capability for exchanging information facilitated by widespread availability of computer as well as communication networks. For instance, today, the total performance cycle time has been reduced through the use of enhanced information technology. Demand for world-class products and services are on the rise as the world has become more real-time oriented.

Fig 1: Forces driving globalization (Source: Bowersox & Closs, 2004)



Strategies to enter global market

Technique	Modes of Entry
Indirect Exporting	• Export Trading Company • Export Management Corporation • Piggy-Backing
Active Exporting	• Agent • Distributor • Marketing Subsidiary • Co-ordinating Direct Exports • Foreign Sales Corporation
Production Abroad	• Contract Manufacturing, • Licensing • Franchising • Joint Venture • Subsidiary
Parallel Imports	

1. Indirect Exporting: This means firms are not willing to export directly as they prefer to concentrate on their domestic markets. Under this, several alternatives are possible which are as follows:

a) Export Trading Company:

- This is an intermediary, which purchases the goods in the exporting company and resells them to a customer in a foreign country.
- ETCs are very large firms, with local offices in many countries. They take title to the goods in the exporting country, making this transaction a domestic transaction for the exporter, and transfer the title to the importer in the importing country, thus making the transaction a domestic transaction as well. For either parties dealing with the trading company, the product is seemingly handled by a domestic company, its foreign origin is not concerned for the buyer, and its sale abroad is not an issue for the seller.
- These trading companies have acquired a lot of information on potential sellers and buyers and they leverage this knowledge into sales.
- These companies offer a complete package of international logistics services such as shipping, insurance and financing international trade.

b) Export Management Corporation:

- An EMC is located in the exporting country and is operating as an export-oriented manufacturer's representative for the exporter.
- EMCs have the tendency to restrict their sales efforts to potential customers in a single country and often specialize in selling a single line of production in that country. Most of them represent more than a single manufacturer abroad, usually in complementary lines.
- The exporter is involved slightly more in the foreign sale as the EMC acts as an agent.
- Thus, the EMC acts as the export department of the seller, handling every detail of the transaction.

c) Piggy-Backing:

- This choice is for the reluctant exporter.
- A successful exporter involves one of his suppliers or a company making complementary product in the markets that this exporter has developed.
- This strategy gives an opportunity for a firm to gain knowledge about selling abroad.

2. Active Exporting: This option is where the firm desires to exploit the possibilities of sales abroad and decides to become involved in its exporting activities. Various alternatives are as follows:

a) Agent:

- An agent is usually a small firm or an individual located in the importing country, which acts as a manufacturer's representative for the exporter. Thus the agent does not take title to the goods it sells but earns a commission on the sales it makes.
- The exporter is known as the principal due to the relationship with agent.

b) Distributor:

- A distributor is usually a firm located in the importing country – or sometimes in a neighboring country, which buys goods form the exporter. A distributor takes title to the goods it sells and earns a profit on the sales it makes.
- He takes more risk in his relationship with the exporter than an agent and experiences higher costs. He carries the traditional risks associated with inventory and also invests a considerable sum of money in the inventory.

c) Marketing Subsidiary:

- This refers to a foreign office, staffed by employees of the exporting firm that sells goods in the foreign market.
- It is incorporated in the foreign market, and is the importer on record as far as the foreign government is concerned, and the export takes place between two legal entities that are part of the same company, at a transfer price.

d) Foreign Sales Corporation:

Created in the United States for tax break for exporters. In fact more than a method of entry, it is a way for United States based corporations to lower its income tax.

3.Production Abroad:

This is a strategy where a company can start operations abroad. This can be done through the following alternatives.

a) Contract Manufacturing:

- Company enters an agreement with a producer in the foreign market to manufacture its goods.
- Suitable as an entry strategy for markets with significant barriers to entry such as high tariffs and quotas.

b) Licensing:

- Granting of rights to intellectual property owned by a company to another company for a fee.
- Company using the intellectual property has the right only to use the property and for every use has to pay a fee called royalty.
- In the international arena, the licensor is the exporting company and licensee is the foreign company.
- Use of this strategy is when high tariffs or non-tariff barriers, prohibitive shipping costs limit access to market or when licensor is uninterested in actively pursuing the market.

c) Franchising:

- Process by which a firm possessing an array of intellectual property items grants another company the right to use these intellectual property items in exchange for royalties.
- Basically, the franchisee and franchisor are in distinguishable in the eyes of customers.

d) Joint Venture:

- Creation of a new corporation in a foreign country, jointly owned by the joint venture partners in any combination of ownership percentages.
- This strategy minimizes the impact of a possible nationalization.

e) Subsidiary:

- Investment by a firm in a foreign venture.
- Another option is where the firm can relocate an entire plant to a foreign location, for utilizing cheap labor and forgoing the higher costs of a brand new facility.
- Followed by firms who want total control of an investment and are willing to take the risk of such a venture.
- This strategy is more beneficial to the host country as it creates jobs and offers substantial incentives to foreign company that are willing to establish a facility within their borders.

4. Parallel Imports: Goods are sold outside the regular distribution channels of a company, usually because there is a difference between the price charged in one country and the price charged in another.

Modes of Transportation in Global Logistics

Transportation plays a vital role in the movement of cargo within or between countries. Selection of the transportation mode depends upon the following factors

- Location of market
- Cost of transportation
- Speed of cargo transportation
- Reliability of mode

Air: Advantage of this mode is responsiveness as it can quickly respond to urgent and unpredictable demands for parts or components. There is minimum transit damages to the cargo. Also the insurance cost is lesser when compared to other modes. This mode is confined to high value density items – items having high selling prices where the transportation cost is an insignificant percentage of the price of the product. By using air transportation, since the value of cargo is high, the capital tied up in inventory in transit is released fast.

Sea: Used mostly for cross border cargo movement. The types of ships used are as follows:

a) Independent lines: Operate and quote rates individually and independently. They accept cargo from all shippers through freight forwarding agents.

b) Tramp vessels: Do not have any fixed route or schedules and operate on a charter basis. They are mainly involved in bulk cargo transportation.

c) Conference lines: Association of shipping companies across the world. They join hands to have common codes/rules for cargo movement, freight rates, shipping conditions etc.

Road: Preferred when countries are connected by land and other options are either costly or not feasible. In India, roads are an important mode of cargo movement.

Barriers to Global Logistics: A host of barriers hinder global logistics. Three significant barriers are as follows:

Markets and Competition

Restrictions of entry, availability of information, pricing and competition are the market barriers. Poor availability of information is one more barrier.

Tariffs are the other marketing-related barriers. Tariffs are additional cost elements, which need to be considered while evaluating foreign sources of supply. Also tariffs are political, and are subject to change as and when government policies change.
While most international firms experience a highly competitive environment, various rules concerning competitive governance is also proving to be global logistics barrier. A combination of lack of awareness regarding global rules as well as the necessity to conform to norms of particular geographic regions is a competitive barrier.

Financial Barriers

These result from forecasting and institutional infrastructure. Though it is not simple to forecast in any situation, it is very difficult in global environments. The challenge in domestic forecasting is prediction of unit or dollar sales on the basis of customer trends, competitive actions as well as seasonality. In a global environment, the challenges also include exchange rates, customs actions, and government policy complexities. Barriers in institutional infrastructure arise out of the major differences in intermediaries like banks, firms, and legal counselors or transport carriers. A combined financial and institutional uncertainty makes it difficult for planning product and financial requirements.

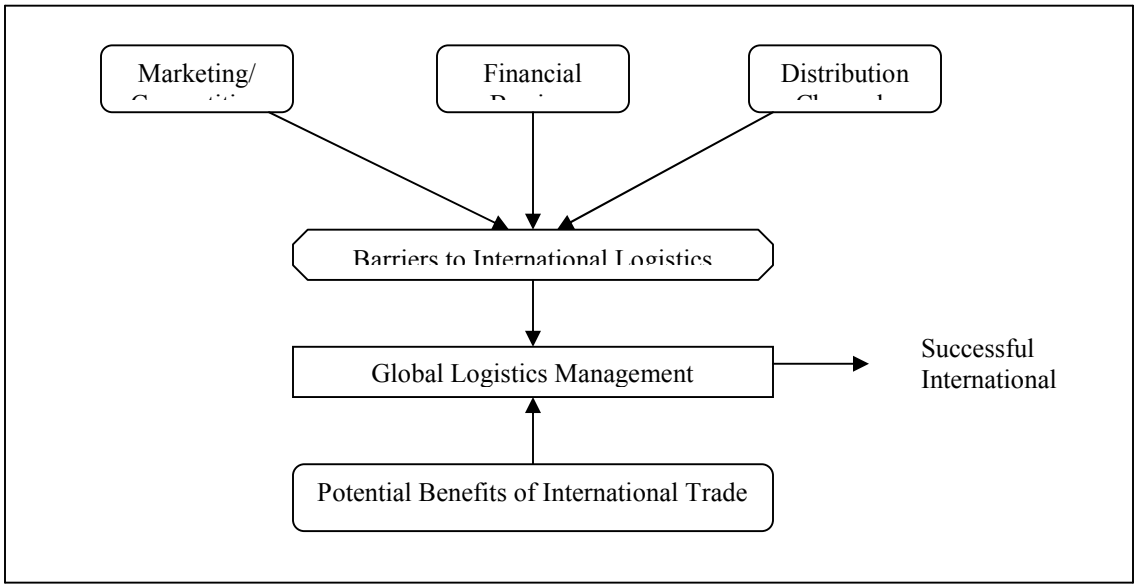
Distribution Channels

Differences in the distribution channels such as standardization of infrastructure as well as trade agreements are a barrier confronting logistics managers. Infrastructure standardization means the differences in transportation and material-handling equipment, warehouse and port facilities and systems of communication. While there are recent efforts for standardization with respect to containerization, there are a lot of major differences in global transportation equipment like vehicle dimensions, capacity, weight and rail gauge.

When there is no standardized infrastructure, products are loaded and reloaded into different vehicles or containers, while crossing national boundaries, which results in higher costs and time.

Trade restriction barriers can also influence channel decisions, such as rules restricting volume of imports or increase duties once a specified volume has been reached.

Fig 2: Barriers to global logistics (Source: Bowersox & Closs, 2004)



Conclusion:

Implementing a global pipeline control is dependant to a large extent upon the organization's ability to find a correct balance between central control and local management. Global organizations are expanding and this suggests that there are certain tasks and functions requiring local management and control. International competition has become more intense, due to a gradual reduction in the national barriers. Sophistication of product technology or marketing communications determines the difference between success and failure in the global marketplace.

CHAPTER 11: LOGISTICS STRATEGY

Chapter Objectives

- Introduction
- Requirements for effective logistics strategy
- Strategic Logistics Planning
- Logistics Strategies
- Implementation of Strategy
- Strategic Issues
- Strategic Fit
- Conclusion

Introduction

In the modern day dynamic business environment, competitive pressures and customer demands force a large number of firms in shifting their priorities towards understanding the logistics supply chain process for delivering superior value to customer. In order to achieve this objective, the historic role of warehousing, transportation, storage, and handling have started with a more comprehensive role, which pervades the entire supply chain.

Logistics strategy facilitates gaining a competitive edge to support emerging technologies. As a service function logistics involves the four basic features:

- **Reliability**: Influences the degree of trust, which a supplier can have, in a company's capability for honoring commitments. The supplier has to be perceived as reliable and for this the supplier needs to exhibit certain service characteristics. A high degree of reliability in terms of inventory and material delivery is expected from the supplier end. Thus a key objective of the logistical system needs to be reliability in meeting the needs of the customer, according to the resource planning.

- **Responsiveness**: The speed with which customer demands are being responded. Responsiveness is expected at all levels of the supply chain. Response to pre-sales enquiry by using latest available information and communication technologies is an important strategy. Supplying material as per customer needs, and frequent deliveries in fewer lot sizes are important. Deliveries can also be made at the various assembly centers, which are in proximity to the markets. A firm will gain a winning edge in competitive markets through a responsive strategy.

- **Relationship**: Firms spend huge amounts in Customer Relationship Management (CRM) related activities for development of long term relationships to retain customers, and also reduce the element of risk in demand management. Partnering with the right supplier and considering the supplier operations, as an extension of its own operations will enhance the efficiency and effectiveness of the supply chain.

- **Rationalization**: This refers to reducing the supplier base and partnering with select suppliers. The supplier's facility is treated as an extension of the buyer's facility and there is sharing of information, experience and resources for mutual advantage.

Requirements for an effective Logistics Strategy

Characteristics of an effective logistics strategic planning and project management are as follows:

Dedicated planning resources and programs: Unless proper resources are set aside for long term planning, it will not be carried out to the level of necessity to assess ways of changing economic, technological, competitive, demographic and regulatory environments affecting long-range requirement of logistics. A dedicated logistics planning team needs to be organized. The logistics planning team should include analytical and operational backgrounds that are required to resolve complex issues.

Formal Logistics Planning Methodology: Logistics is filled with interdependent activities, which impact other areas of the organization. Planning activity goes through three important phases such as investigation, vision and implementation. In the investigation phase, a logistics audit is conducted and the company's current performance and practices are compared with world-class practices. The vision phase involves application of world-class practices to the current environment. In the implementation phase, detailed project plans for completing the recommended initiatives are developed and monitored.

Strategic Logistics Planning

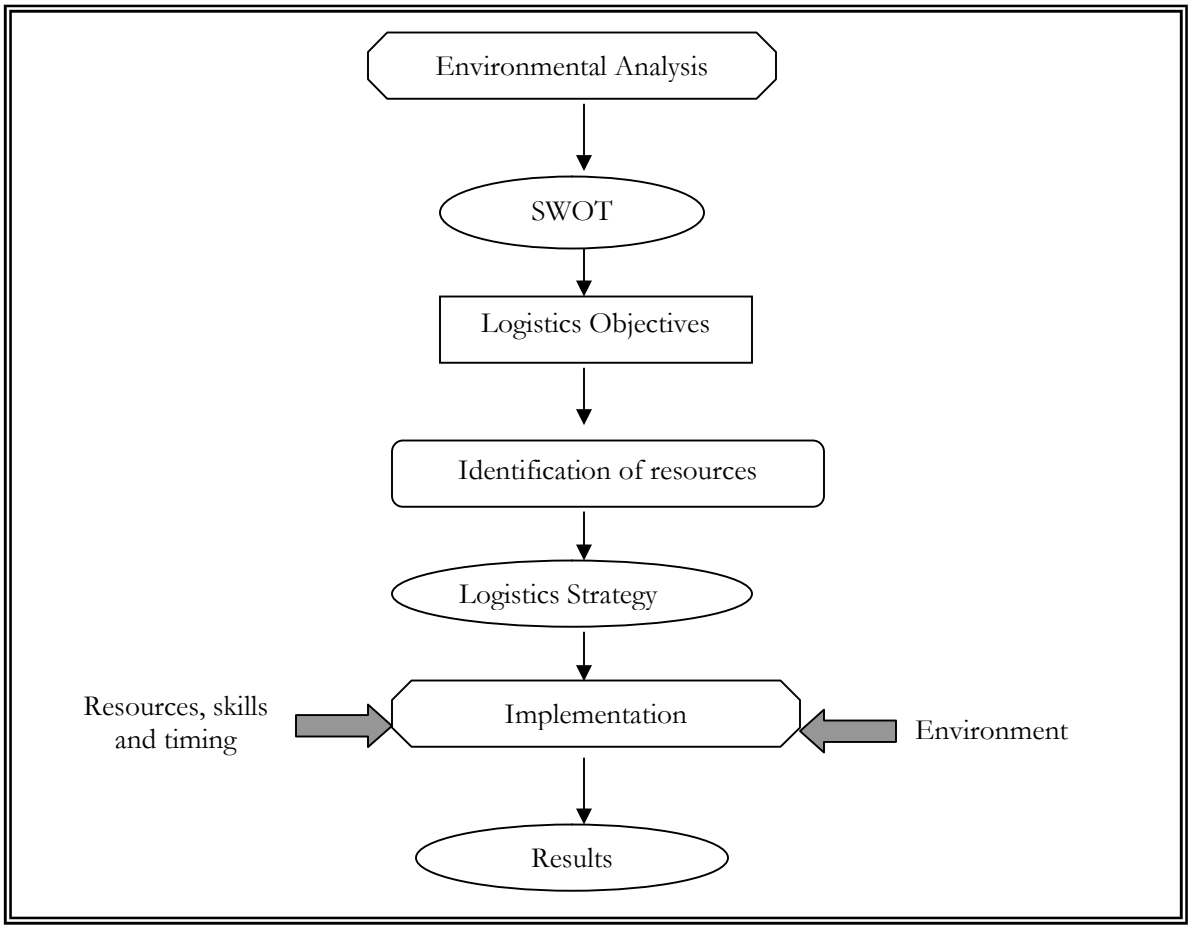
Business firms have been forced to reengineer or redefine their business process so that efficiency and effectiveness can be brought into the operations. The main reason for this has been the increasing globalization of business activities, intense competition, and uncertain markets. Different firms have different process of strategy formulation and implementation. The process of strategic logistics planning has the following steps:

- Analyzing the external and internal environment, which will help to determine the resource requirements, limitations and any other factors.
- The environmental analysis identifies the company's strengths, weaknesses, opportunities and threats in customer service.
- SWOT enables in formulating the appropriate resources and the logistics mix or resources required for achievement of organizational goals.
- A structural design is needed to implement the strategy. The primary concern here is the strategic planning of warehouses; transportation and information flow in the entire supply chain. A proper interface between channel structure of the firm and its logistical network can be done with the help of a structural design. The efficiency of the functional elements in the movement of information and inventory across the supply chain will influence the success of the strategy implementation.
- Selection of transportation route, mode and carrier operator is a key aspect for offering and maintaining a reliable and consistent service level.
- The role of material procurement and management also cannot be ignored.

- Implementing the strategy is absolutely important and its success depends on efficiency of the human resources, equipment and the interfaces involved. A major task at the level of operation are order registration, processing, picking, replenishment and dispatching.

Thus, the process of strategic logistics planning will improve the overall responsiveness of the organization.

Fig 3: Strategic Logistics Planning (Source: Sople, 2004)



Components of Information Decisions in Supply Chain Strategy:

- **Push Versus Pull**: While designing the pieces of supply chain, it is necessary to determine whether these are part of the push or pull phase in the supply chain. Push systems require an elaborate Master Production Schedule (MPS) and Master Requirements Planning (MRP). The Master Production Schedule rolls the Material Requirements Planning (MRP) system. In contrast, for pull systems, information is

required on actual demand for quick transmission throughout the entire chain so that the real demand is reflected.

- **Competitive Strategy**: This defines the customer needs to be satisfied through its products and services. A firm's competitive strategy depends upon the customer requirements. It targets the customer segments with a main objective of providing products and services to cater to the customer needs.
- **Product Development Strategy**: Mentions clearly the portfolio of new products, which needs to be developed by a company giving an indication whether efforts towards these are done internally or externally.
- **Marketing and Sales Strategy**: Specifically mentions about market segmentation and details relating to positioning, pricing and promotion of the product.
- **Supply Chain Strategy**: A wide term, which includes supplier, operations and logistics strategy. Includes decisions relating to inventory, transportation, operating facilities and information flows. The strategy specifies the activities of supply chain such as operations, distribution and service.
- **Other Strategies**: A company also devises additional strategies for finance, accounting information technology and human resources.

Logistics Strategies

Formulating a logistics strategy can be viewed from the following three angles:

- Customer demands satisfied through strategy implementation
- Targeting customers
- Resources required for implementing strategies

Formulating a strategy is not an isolated process. Logistics strategy needs to have congruence with the overall goal and strategy of the business. A synergy with the other domains of the organization is necessary. An example of this can be the Management Information Systems of an organization encompassing all the functional areas of business. The MIS, being an information sharing system across the supply chain has considerable synergy with logistics operation.. Considering the importance of formulating a logistics strategy, the following are the possible approaches:

The following competitive and generic strategies could be pursued for logistics operations:

1. Cost Leadership: Achieving cost leadership is facilitated by logistics cost reduction to a major extent. This can be achieved by many ways. Examples of achieving logistics cost reduction are:

- Reducing transaction costs through IT support
- Warehouse operations based on scale economics
- JIT, cross docking and postponement, which results in reduction of inventory and related costs.
- Reduced vendor base and co-partnerships with suppliers.

2. Differentiation: This strategy focuses on offering superior service. Examples of offering logistics services for differentiation:

- On time and consistent delivery
- Logistics solutions to suit individual requirements
- Tracking consignments

3. Collaboration: A strategy where the customer works in collaboration with the suppliers. An example here is Vendor Managed Inventory (VMI). In VMI, customer places no orders but instead shares information with the vendor. This information relates to actual usage or sales of their product, their current on hand inventory and details of additional marketing activity. On the basis of this information, the supplier takes responsibility for replenishment of the customer inventory.

4. Diversification: Firms having a lot of operations adopt this strategy. The basic objective here is the lower cost and better control over operations thus providing superior customer service.

5. Outsourcing: Outsourcing services to logistics service providers having expertise in this area in order to bring efficiency and effectiveness into the logistics operations. An example in outsourcing is Customs Clearance service providers. As a majority of exporters and importers do not have a proper expertise in this area of logistics operations, many logistics service providers offer customs clearance services to their clients. This can reduce the overall transaction cost.

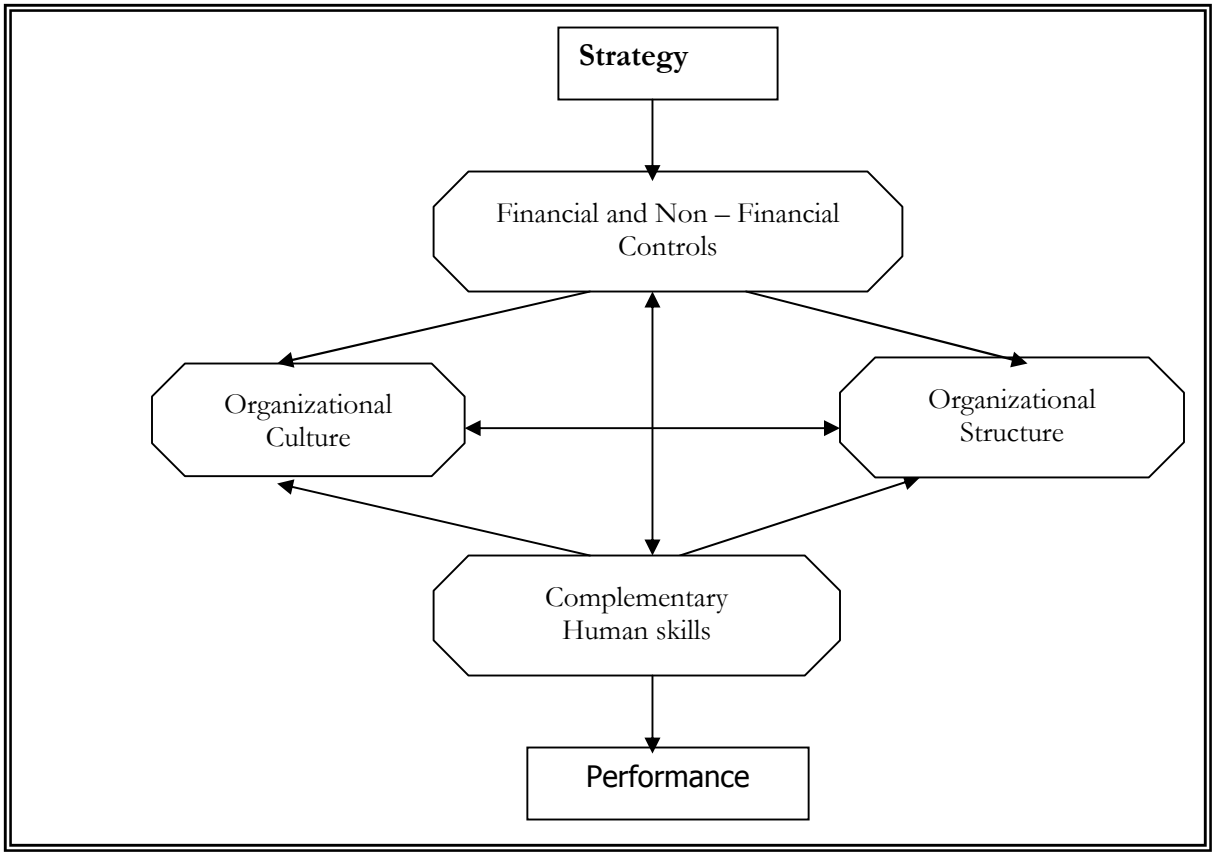
Implementation of Strategy

Implementation of the strategy is an important activity after the formulation. The firm needs to evolve a proper framework to successfully implement its logistics strategy. Important aspects for implementation of strategy are:

- Financial dimensions of control such as net income return on equity, net profits etc
- Non-financial parameters of control such as quality of service, customer satisfaction, delivery time etc
- The organizational culture and employee motivational programmes initiated by the company facilitate behavioral controls for employees.
- The structure of the organization is of importance. Organizational structure with a wide span of control give higher motivation to employees to perform well and strategy implementation can be done successfully in such organizations.
- Skills of the implementers of the strategy are also an important consideration.

The successful implementation of logistics strategy depends to a great extent on the information shared with internal and external customers and also logistics partners. Transparency at both the buyer and seller's end helps to build an element of trust, thus adding value to the customer delivery chain, which makes the task of implementation simpler.

Fig 4: Framework for strategy implementation (Source: Sople, 2004)



Strategic Issues that confront today's business organization

With today's business scenario becoming more complex these have an impact on logistics. The following strategic issues confront the area of logistics today:

- **Expansion of customer service**: Today's customers are more demanding, not only in terms of quality but also from service point of view. There is a need for differentiation with more and more markets becoming 'commodity' markets. The creation of differential advantage is through adding value, especially through customer service. Achieving competitive advantage through customer service is from a carefully planned strategy for service, and developing appropriate delivery systems and commitment from people throughout the organization. Achieving service excellence can be only through a closely integrated logistics strategy.
- **Time Compression**: Time is a critical issue in management. Shorter product life cycles enable customers to accept substitute products, which are available just in time. In the case of introducing new products, management implications result from the reduction in the time 'windows' for making profits. Amidst all the concern for creating and managing

innovation, there is an issue, which is perhaps given the necessary attention only now. This issue is the problem of extended logistics lead times. Lead-time is the time taken to convert order into cash. An important function of logistics is the provision of availability. The integration of marketing and manufacturing planning is necessary to achieve the availability requirement. More problems are created by limited co-ordination of supply decisions with the dynamic requirements of the market and the limited visibility in purchasing and manufacturing related to final demand. A radically different approach to manage lead-time is required to overcome these problems and establish long-term competitive advantage by ensuring timely response to changing demand.

- **Globalization of the industry**: The increasing trend towards globalization is proving a challenge for logistics management. Global companies seek to achieve competitive advantage by identifying world markets for its products and then developing manufacturing and logistics strategy to support its marketing strategy.
- **Organizational integration**: The classical business organization is based upon strict functional divisions and hierarchies. Achieving a closely integrated, customer-focused materials flow while encroached management with its priorities guards traditional territorial boundaries. Today's organizations follow a systems approach where functions are components of the system, which requires an overall guidance to fit together.

Strategic Fit

This means that there is a common goal between the competitive as well as supply chain strategies. Aims at achieving a consistency between the customer priorities satisfied by the competitive strategy and the supply chain capabilities satisfied by the supply chain strategy. Three basic steps in achieving the strategic fit:

1. **Identifying the uncertainties of the customer and supply chain**: To have an understanding about the customer, the company must first understand the needs of the customer segment. For example a customer who visits a store nearby may be doing so for convenience and not for the low cost. Similarly, a customer may visit another store irrespective of its location for its low cost.

Various attributes on the basis of which customer demand varies across segments are as follows:

- Product quantity required in each lot
- Tolerable limit of response time
- Price of the product
- Required service level
- Desired level of innovation

Demand and Implied Uncertainty: Demand uncertainty reflects the uncertain customer demand for a product Implied demand uncertainty is related to the portion of demand, which the supply chain is required to handle. This is in contrast to the demand uncertainty, which reflects uncertain demand for a product.

2. **Understanding the Supply Chain**: After understanding the company uncertainty, the firm needs to meet the demand in the uncertain environment in the best possible way. A trade off between responsiveness and efficiency is of significance here. A responsive supply chain has an ability to provide the following such as responding to a voluminous demand; meeting high service levels, handling variety and innovative products. But responsiveness can be achieved only with a cost. An efficient supply chain operates by making and delivering a product to the customer at a lower cost.

3. **Achieving Strategic Fit**: The performance of the supply chain needs to be consistent with the targeted needs of the customer and uncertainty in the supply chain. A firm needs to consider all the functional strategies within the supply chain to achieve a complete strategic fit. A supply chain, which is highly responsive, needs to devote all its functional strategies towards service levels while an efficient supply chain needs to focus its functional strategies towards cost.

Other Issues Affecting Strategic Fit:

Multiple products and customer segments: A majority of the companies manufacture and sell multiple products to multiple customer segments, each one of these with different characteristics. Each of these products and segments has an implied demand uncertainty of their own. While creating a supply chain strategy for each of these, the company needs to balance efficiency and responsiveness provided the portfolio of products, customer segments and sources of supply are known.

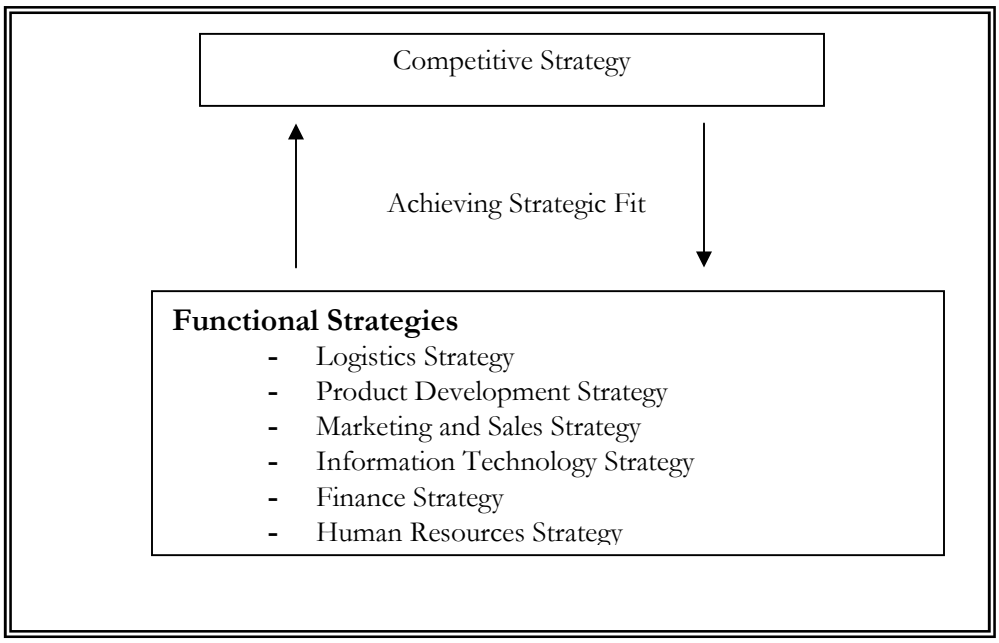
Product Life Cycle: When products pass through the product life cycle, there is a change in the characteristics of demand and the needs of the customer segments being catered to. Towards the beginning of the cycle, demand of the product is absolutely uncertain and there is unpredictable supply. Availability of product is a crucial factor in capturing the market, cost being a secondary factor. High implied uncertainty makes responsiveness a key feature of the supply chain.

At the later stage of the life cycle, demand becomes more certain and supply is predictable to a certain extent. Increase in competition lowers the margin. The supply chain becomes efficient from responsiveness. Thus the supply chain strategy must keep changing over the product life cycle as demand and supply characteristics change.

Competitive Changes over Time

Finally, changes in competitor behavior are a point of consideration. Competitors can influence the competitive strategy. With more product variety, supply chain have been forced to develop an ability to supply high variety. With a change in the competitive landscape, firms are forced to alter the competitive strategy. A strategic fit needs to be maintained with a change in the supply chain strategy.

Fig 5: Achieving Fit Between Competitive and Functional Strategies



Conclusion

Organizations formulate strategies responding to environmental pressure. Logistics is an important element in these strategies. The apparent trends today are from a logistics strategy approach to a strategic logistics approach. Logistics is being used as a tool to again sustainable strategic advantage more than a tool for developing competitiveness. The success of the strategy depends to a great extent on the framework, where key variables are control tools like organizational culture and structure, and human skills involved in the process.

Today, managers are encouraged to look beyond the traditional view and seek out to develop logistics strategies for exploiting a lot of potential to improve productivity and efficiency to deliver advances in customer service. A large amount of capacity utilization, reduction of inventory and improvements of service through tighter co-operation with suppliers is required.

CHPATER 12: LOGISTICS INFORMATION SYSTEMS

Chapter Objectives:

- Introduction
- Functions of LIS
- Building Blocks of LIS
- Data Warehousing, Mining and DSS
- Information Architecture
- LIS flows
- Applications of LIS
- Principles of LIS
- Conclusion

Introduction

Logistics information systems are the means of capturing, analyzing, and communicating information related to logistics and supply chain management. Information was largely paper-based during the past and thus resulted in slow, unreliable, error-prone transfer of information. Now, with technology becoming user friendly and also less expensive, logistics managers can effectively and efficiently manage information electronically.

Earlier, logistics focused on efficient flow of goods through the distribution channel. Information flow was not given that much of importance. Now, timely and accurate information is critical owing to the following reasons:

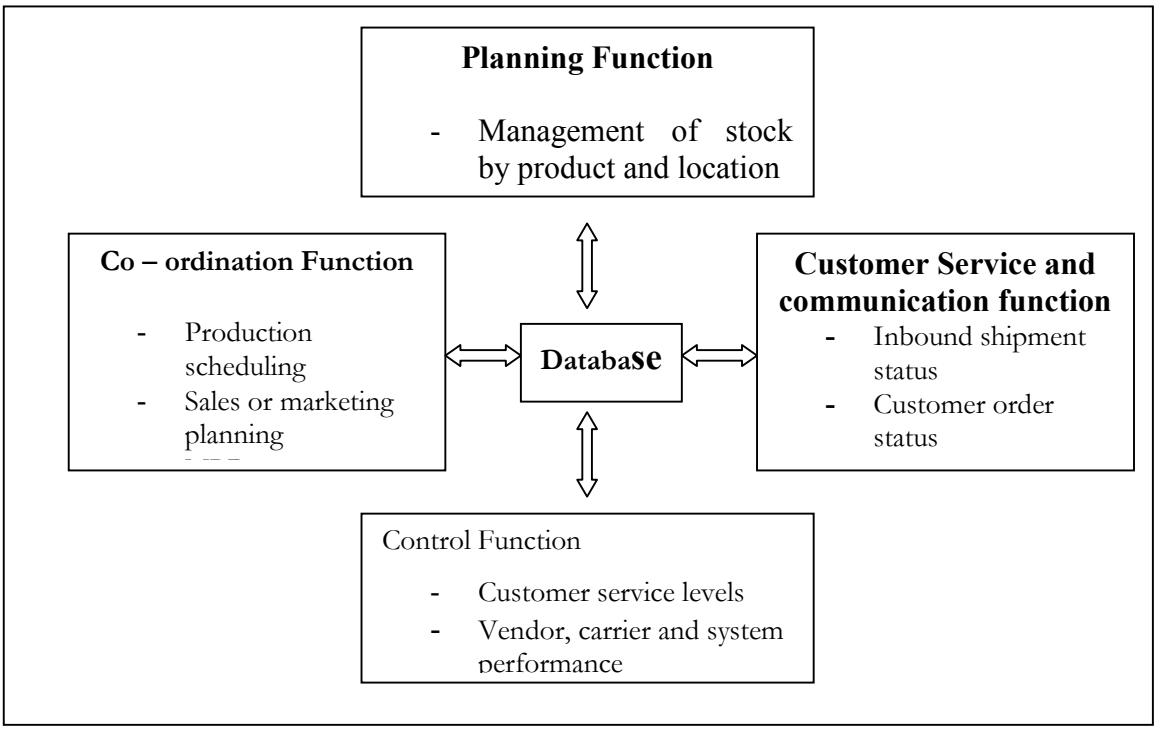
- Total customer service includes information related to order status, product availability, delivery etc.
- To reduce supply chain inventory, information is very essential as this can minimize demand uncertainty
- There is more flexibility with information as there is clarity as to how, when and where resources may be utilized to gain strategic advantage

This has triggered the need for an effective Logistics Information System.

Functions of a Logistics Information System are as follows:

- Planning
- Co-ordination
- Customer Service and communication
- Control

Fig 6: Functions of a Logistics Information System **(Source: Martin Christopher)**



Logistics information systems are the threads, which link the various logistics activities into an integrated process. The system builds on four levels of functionality:

Building Blocks of LIS are as follows

a) **Transaction System -** Initiates and records individual logistics activities. Activities include order entry, selection, inventory assignment, shipping, pricing, invoicing and customer enquiry. In this system, the customer order performance cycle is completed though a series of information system transactions.

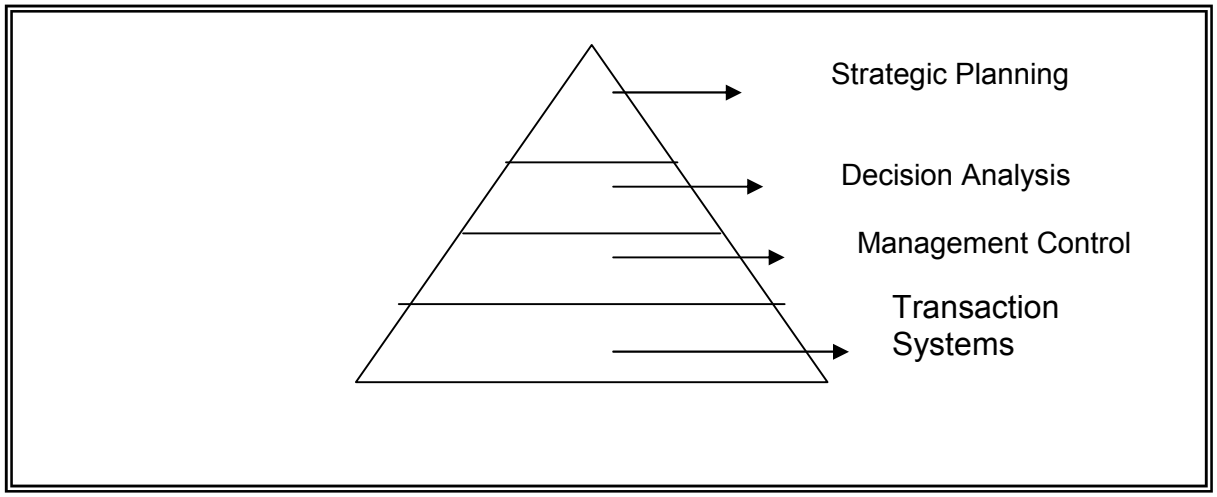
b) **Management Control Systems -** Focus is on performance measurement and reporting. Performance measurement provides management feedback regarding the service level and resource utilization. Customer service, productivity, financial and quality indicators are the commonly used performance measures. While, the Logistics Information System (LIS) reports past performance, it is also essential that exceptions are identified as and when they are processed.

c) **Decision analysis –** Focuses on decision applications to assist managers to identify, evaluate and compare logistics strategic and tactical alternatives, vehicle routing and scheduling, facility location cost – benefit analysis etc. Evaluates future tactical

alternatives and thus need to be unstructured and flexible to consider a wide range of options. To benefit from its capability, user requires a lot of expertise and training.

d) **Strategic Planning** - Focus is on information support to develop and refine the logistics strategy. Decisions are typically more abstract in nature, are lesser structured and have a long-term focus. This level requires incorporating lower-level data collection into a range of business planning as well as decision-making models, which help in evaluating the probabilities and payoffs of strategies.

Fig 7: Building blocks of LIS (Source: Bowersox & Closs, 2004)



Logistics Data Warehousing, Data Mining, and Decision Support Systems

Logistics Data Warehousing serves as the foundation for the entire Information System. The data warehouse contains data structures, which are anticipated and developed ahead of the requirements for the other execution as well as planning systems, which makes the design, selection and implementations of those systems easier, and less time consuming. It contains information, which describe past activity levels as well as the current status, which serves as the basis for planning future requirements. This enables access of data. Data access usually becomes a bottleneck as it causes a lot of system failures, delays and response time problems. Also, profiling the logistics activity and data mining is not possible until the logistics data warehouse is designed and developed.

Logistics Data Mining is key to any logistics improvement initiative and is a methodical and systematic analysis of supply and demand activities. The process is designed to identify the root cause of materials and information flow problems, to identify major opportunities for improving processes, and also enables objective decision-making.

Logistics Decision Support Systems are computer based decision support tools, which provide solutions to logistics problems. Examples include QAD, SAP and JD Edwards.

Information Architecture

Logistics system architecture includes both the information - that which maintains the data warehouse as well as the execution components. Data warehouse contains past as well as current information. Execution components include activities such as initiation, monitoring, and measurement of activities required fulfilling customer as well as replenishment orders. These activities are as follows:

- **Planning and Co-ordination**: These form the information system backbone for manufactures as well as merchandisers. Activities include material planning within the organization as well as between channel members. Components of planning and co-ordination include:

  - Strategic Objectives – These are the primary information drivers in many organizations, which basically define the financial as well as marketing goals. These objectives are developed for a time period ranging for many years and usually include quarterly updates. A combined marketing and financial objective define markets, products as well as the services and indicate the activity levels for logistics managers during the planned time frame. A combined marketing and financial plan also serves as a direction for other enterprise plans.

  - Capacity Constraints – These evolve from the strategic objectives. Capacity constraints identify the material bottlenecks using the defined activity levels and thus effectively manage resources to satisfy market demands. The place, time and quantity for production, storage and movement are determined by capacity constraints. Aggregate production and throughput limitations like annual or monthly capacity are considered. Time dimension is introduced into an organization's strategic objectives by considering factors such as facility, financial and human resource limitations. These constraints have a great influence on logistics schedules. The enterprise's aggregate plan is linked by capacity constraints, which have a great influence on the production for every location. A high level of integration across all planning and co – ordination components is highly essential for a good organization.

  - Logistics Requirements: These co-ordinate the facility, equipment, labor, as well as inventory resources, which are necessary for accomplishment of logistics objectives. Distribution requirement planning (DRP) is used for implementation of logistics requirements. Future requirements and forecasts are based on customer orders, sales and marketing conjunction with historical activity levels. Logistics requirements need to be integrated with capacity constraints as well as manufacturing requirements in order to obtain optimal system performance.

  - Manufacturing Requirements: Production resources are scheduled by manufacturing requirements and attempt to resolve day – to - day capacity bottlenecks within the material management systems. The Master Production Schedule (MPS) and Materials Requirements Plan (MRP) are determined by manufacturing requirements. Weekly or daily production schedules are defined by the MPS. Once the MPS is given, MRP enables co-ordination of purchase and arrival of materials to provide support to the desired manufacturing plan.

- Procurement Requirements: These facilitate the material releases, shipments and the receipts. Long – term material requirements and release schedules are demonstrated by procurement requirements, which build on the capacity constraints, logistics and manufacturing requirements.

➢ **Operations:** Include information activities, which are required for receipt, processing and shipment of customer orders and also to ensure co – ordination of receipt of purchase orders. Components are as follows:

- Order Management: Serves as the point of entry for customer orders and inquiries. Enables entry as well as maintenance of customer orders using various technologies of communication such as mail, phone, fax, EDI etc. Functions include retrieval of requisite information, editing appropriate values, and retention of acceptable orders for processing done. Information relating to inventory availability as well as delivery dates to confirm customer expectations can be obtained. Order management creates and maintains customer as well as replenishment orders base that affect the remaining operations components.

- Order Processing: Available inventory is assigned to open customer and replenishment orders. Orders may be allocated on receipt basis or in batch mode. Real – time allocation is more responsive, and batch allocation provides more control over situations of low inventory. Generating an order solution satisfying both customer requirements as well as enterprise resource constraints is a suitable order processing application.

- Distribution Operations: Direct all activities within the distribution centers using a combination of batch as well as real – time assignments. In the case of batch environment, LIS develops list of instructions or tasks for guiding each material handler (a person who handles material handling equipment such as fork trucks or pallet jacks) in the warehouse. In a real – time situation, information – directed technologies operate in interaction with LIS to prevent time elapse between decision and action. There is more operational flexibility and reduction in internal performance – cycle time requirements in case of real – time distribution.

- Transportation and Shipping: Include LIS functions of planning, execution and management of transport and movement activities. Activities include scheduling and planning shipment, consolidation, notification, transport generation and carrier management There are three parties involved in transportation and shipping LIS – shipper, carrier and consignee. A basic level of information integration needs to exist for information to be shared. Increased planning as well as performance measurement capability can be incorporated with the help of state of the art transportation and shipping LIS.

- Procurement: Procurement systems have not been considered a part of LIS. But the importance of integrating procurement is inevitable while managing the entire supply chain. Procurement manages preparation of purchase orders, modification, as well as their release. A desired procurement LIS needs to provide planning, direction of

activities and measurement of performance and also co – ordinate inbound and outbound activity movement.

- **Inventory deployment and Management**: Serves as the primary interface between planning, co – ordination and operations. It plans requirements and manages finished inventory from the production till customer shipment. The primary component here is the forecast module, which predicts product requirements of customers for every distribution centre and thus supports enterprise planning. Other components include simple reactive models to complex planning tools. Customer service objectives established by management are of significance in inventory deployment and management. With effective inventory deployment and management, level of inventory assets required can be significantly reduced. An important function of this is measurement of inventory performance by continuous monitoring. An integrated forecast information facilitates inventory deployment and management and this results in low inventory requirement.

- **Logistics Information System Flow**

The LIS flow consists of the following elements:

- Modules: Actual routines that process data or information. Examples include entering orders or assignment of inventory.
- Data Files: Information structures that store task specific data like orders or inventory records.
- Management and data entry activities: Represent the interface where LIS need to obtain input from externals environment like decision-maker or from another firm.
- Reports: Provide information related to logistics activity as well as performance links.
- Communication links: External and internal interfaces between LIS components and the external environment.

Modern Technology Applications:

Information technology is a major source of improved productivity as well as competitiveness. Specific technologies with widespread logistics applications are as follows:

Electronic Data Interchange: Intercompany computer-to-computer exchange of business documents in standard formats. It describes both capacity as well as the practice of communicating information between organizations electronically instead of using traditional methods like mail, courier or fax. Benefits of EDI are as follows:

- Improved internal productivity
- Improved external productivity
- Improved channel relationships
- Reduced operating cost
- Ability to compete internationally

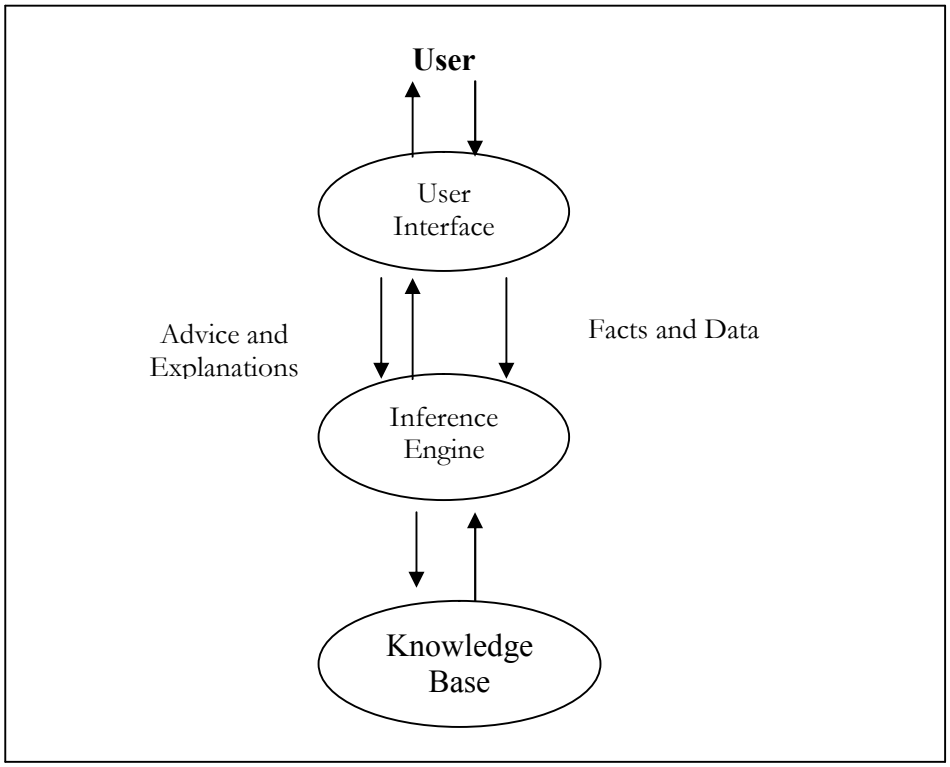
With regard to logistics cost, EDI impacts the same by reducing labor and material cost associated with papers, reduces communication and also clerical cost.

Electronic Data Interchange Standards**:** Essential elements in Electronic Data Interchange (EDI) which include communication and information standards. Communication standards influence the character sets, priority in transmission and speed. Information standards prescribe types of documents and sequence in which a document is transmitted

Artificial Intelligence or Expert Systems: This refers to a term, which describes a group of technologies, which are aimed at enabling computers to imitate human reasoning. Technologies include expert systems, natural language translators, neural networks, recognition of speech, 3D-vision etc.

Logistics expert systems increase a firm's return on assets. They primarily include three components: knowledge base, inference engine and user interface. The process of developing the knowledge base is by interviewing a series of "experts" regarding the data as well the logic used to make decisions. The knowledge base regarding the best technique to use is available with an experienced forecaster. The inference engine to identify rules relevant for a specific decision searches the knowledge base. It determines the relevant rules and their sequence of evaluation. Interaction between the decision maker and the expert system is facilitated by the user interface, which formats the key questions to user in the natural language and also interprets the responses. As additional information or expertise is obtained, a good interface enables user to refine his knowledge base as additional expertise or information is obtained.

Fig 8: Basic Structure of an expert system



Communication: Logistics performance through faster and widespread communication is enhanced by information technology. Earlier, logistics activities had a glaring communications disadvantage as they involved the movement in either a transport or a material handling vehicle or were decentralized. Thus, information and directions were removed in terms of time as well as location from the actual activity. Radio frequency, satellite communications and image processing technologies have overcome this problem to a great extent.

Radio frequency technology is within smaller geographical areas, like distribution centers, which facilitates two-way communication. These applications related to logistics include two-way communication between warehouse count verification, selection instructions and printing of labels.

Satellite technology enables communication across a wide geographic spread. It also provides faster and a high-volume channel for movement of information across the globe.

Image processing application depend heavily upon fax as well optical scanning technology for transmission as well as storage of freight bill information, as well as other documents of support such as proof of delivery receipts or bill of lading.

Substantial capital investment before obtaining returns is required for RF technology, satellite communication capability, as well as image processing. The major benefit for these communication technologies is an improved customer service.

Bar Coding and Scanning: Collection and exchange of information is very critical for logistical management as well as control. Earlier, manual collection and exchange were done which resulted in error and time consumption. Bar coding involves placing computer readable codes on items, cartons, containers, as well as railcars. A bar code system includes a bar code symbol, which represents a series of alphanumeric characters. Universal Product Code (UPC) is present on almost all consumer products. A standardized bar code reduces errors in receipt, handling or shipping a product. Two most significant developments in logistics are multidimensional as well as container codes. Multi – dimensional codes increase transfer of information as their design enables them to “stack” one bar codes on top of one another. Container codes enable manufacturers and distributors to provide container identification from point of production to point of sale.

Radio Frequency Identification Device (RFID): Radio frequency identification, or RFID refers to the technology that uses radio waves to automatically identify people or objects. An RFID system consists of a tag, which is made up of a microchip with an antenna, and an interrogator or reader with an antenna. The reader sends out electromagnetic waves. The tag antenna is tuned to receive these waves. A passive RFID tag draws power from field created by the reader and uses it to power the microchip’s circuits. The chip then modulates the waves that the tag sends back to the reader and the reader converts the new waves into digital data.
RFID is an evolutionary step in global supply chain integration. It makes it possible to synchronize the physical flow of goods and the related information flow without the need for human intervention from the point of origin to consumption.

Principles of Logistics Information

Six principles to be incorporated to ensure that management information needs are adequately met:

- **Accuracy** - The degree to which the Logistics Information System reports should match with the actual physical counts. The logistics information must accurately reflect both the current status as well as the periodic activity for measures such as customer orders as well as levels of inventory.

- **Availability** - Logistics information must be readily available when required. Enterprises usually have substantial data relating to logistics activities, but these are often paper-based or very difficult for retrieval from computer systems. It is necessary that these are available speedily to improve customer response and decision - making. The decentralization of logistics operations makes in necessary to access information from anywhere and update them, which the information system must enable to do.

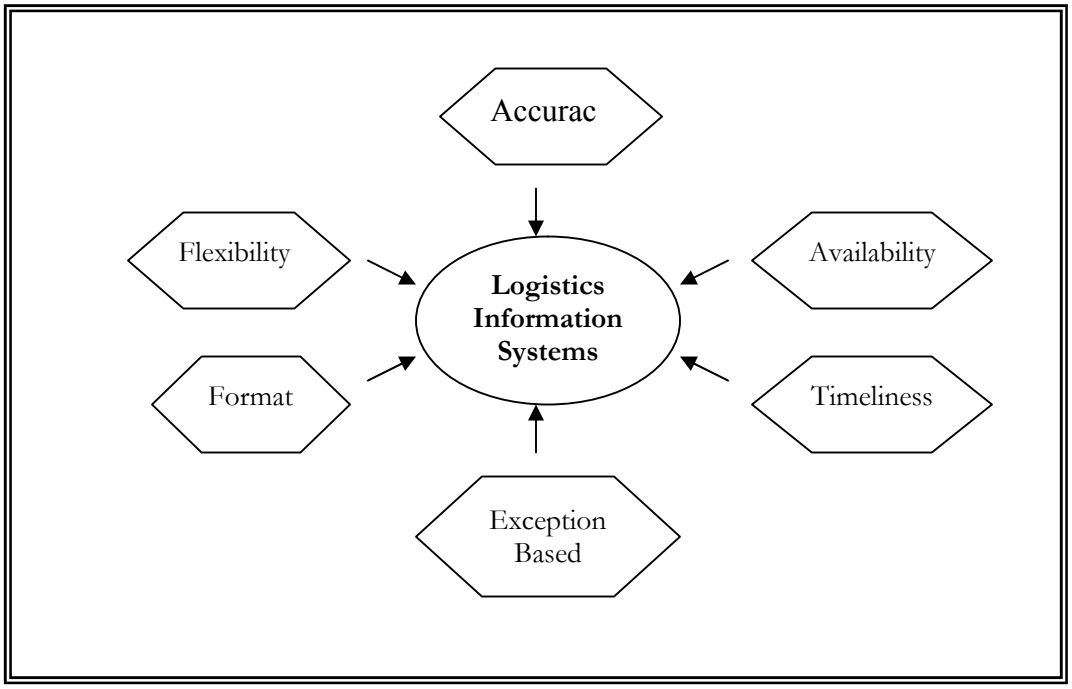
- **Timeliness** – Refers to the time lapse between when an activity occurs and when the activity becomes visible in the information system. It is essential that timely information be provided for quicker management feedback. Corrective action can be taken and loss can be minimized with timely management controls. Thus, timely information reduces uncertainty and identifies problems, reduces inventory requirements and increases decision accuracy.

- **Exception-based Logistics Information System** – LIS needs to be exception-based in order to highlight problems and opportunities. The information system must identify exception situations, which require attention of management and decision-making. Managers can then focus on situations, which require maximum attention and offer opportunity to improve service or reduce cost. LIS need to be state of the art, highly exception-oriented and must utilize the system for identifying decisions requiring management attention.

- **Appropriate Format** – Logistics reports and screens need to contain the right information in the proper structure and must follow a logical sequence.

- **Flexibility** – LIS must be flexible to meet the requirements of both system users and customers. Tailored data to meet specific customer requirements must be made available by information systems. Within the organization, information systems must be capable of upgrading to meet future requirements of the enterprise without incurring huge costs or time.

Fig 9: Principles of LIS (Source: Sople, 2004)



Conclusion

A major factor for enhancement of logistics competitiveness is information. In fact, information is one of the few resources whose cost is declining and capabilities are on the rise. Improved information technology results in lower processing cost for orders, reduces the planning and operating uncertainty and also provides assistance to an enterprise in meeting strategic objectives. Logistics firms, which follow best practice, find that it is cheaper to manipulate information rather than moving inventory. Thus, competitive advantage can be achieved by information only when it provides support in transaction, helps in management control, decision analysis and also strategic planning capabilities.

CHAPTER 13: ORGANIZATION FOR EFFECTIVE LOGISTICS PERFORMANCE

Chapter Objectives

- Introduction
- Significance of logistics in the organization
- Organizational System or Positioning
- Stages of Functional Aggregation in the Organization
- Conclusion

Introduction

Organization structure helps in creating, implementing and evaluating plans. The organization structure gives concrete shape to the organization. Basically it is a pattern in which various parts or components are interrelated or interconnected. It prescribes the relationship among various positions and activities.

Logistics is generally viewed as a facilitating or support function prior to the 1950s. The organizational logistics responsibility is dispersed all through the firm. This resulted in duplication and waste, with fragmentation and aspects of logistics related activities were performed without any cross-functional co-ordination. The primary idea behind functional aggregation was done with a belief that grouping all functions of logistics into a single organization would increase the integration.

Basically, the organizational chart for a company represents a pyramid, which gives a clear view of how and where everyone fits and also the reporting relationships.

Logistics significance is highlighted by the following concepts:

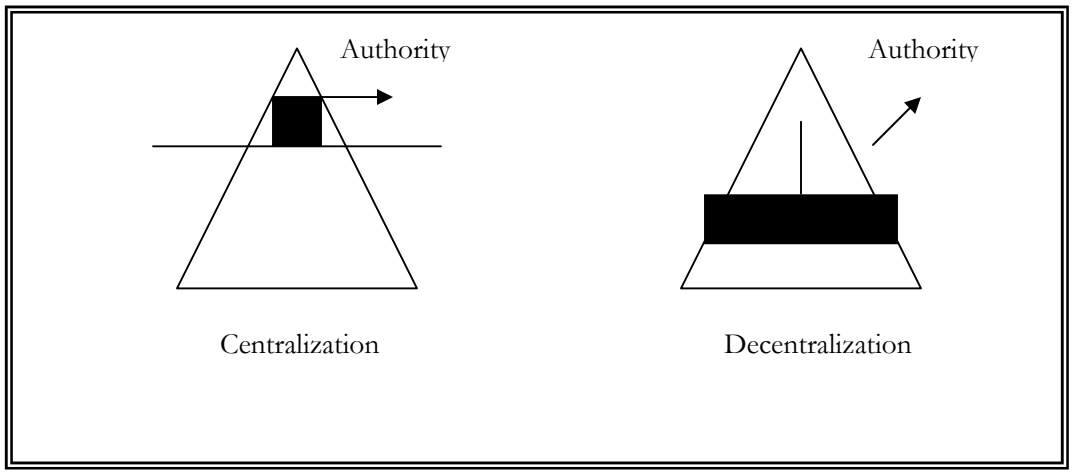
Structural Compression: The role of the chief logistics executive is changing and this ignites the motivation for logistical structural compression. An environment with restricted head count as well as intensive control of assets has enabled the senior logistics manager to emerge as an important part of the firm's continuous move towards gaining and maintaining customer loyalty.

Centralization/Decentralization: An enterprise is considered decentralized if their basis of function is autonomous. Every unit would be responsible for their own logistical planning as well as its execution. A centralized organization has the opposite policy. A central headquarters group directs logistical planning and execution. In today's organization, which is information-intense, the distinction between centralization and decentralization is becoming hazy. Recent trends have seen a shift towards centralized organizations. But with the recent developments in distributed information processing, a centralized logistics organization is no longer required for efficient data processing. Logistical responsibility gets pushed down the organization, as a result. Basically, there is a direct relationship between the desired degree of centralization and the complete nature of business operations. Customers who desire a host of products sold by different business units of a conglomerate

have encouraged many cross-divisional or various business units. The availability of information technology is considered a major benefit of decentralization.

To conclude, today's organizations, which are agile simultaneously, enjoy both centralization and decentralization.

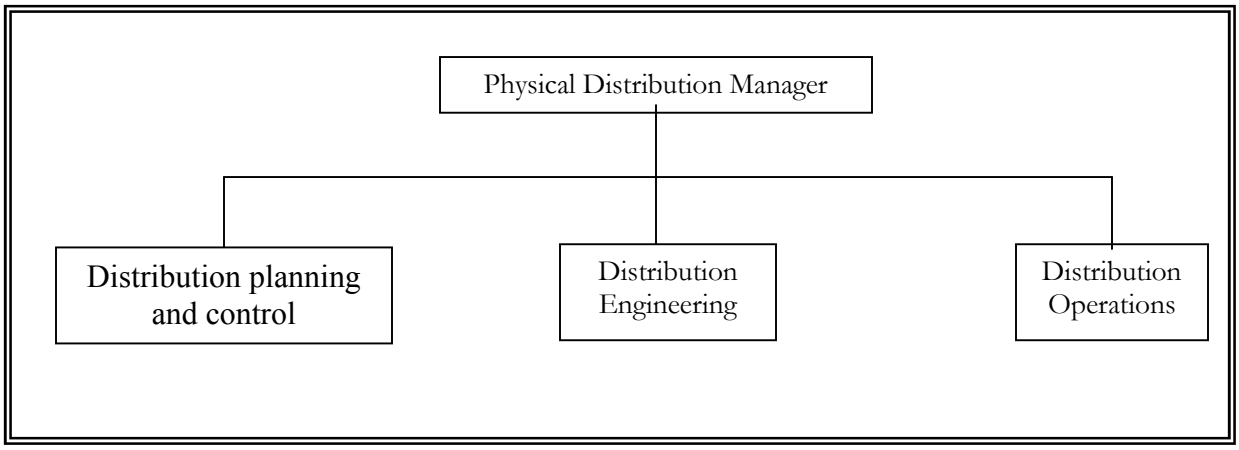
Fig 10: Centralized and Decentralized Structures (Source: Satish Kapoor, Purva Kansal, 2003)



Line and Staff Distinction: Traditionally, line performed or executed day-to-day operations, while the staff was engaged in planning. Today this distinction is no longer relevant. Logistics managers in all levels are involving themselves in both planning and operations. Direct involvement and assumption of responsibility with regard to the reason and methodology of performing work is the key to a leading edge practice in logistics. One of the major reasons for the elimination of line/staff distinction is the impact of logistics information systems. A desired balance of the nature of work for line and staff needs to be communicated which results in an organization which reflects the total employee resources dedicated to serve customers through maximum integration.

In line organizations, logistics activities are centralized into departments and placed under the responsibility of a single manager. Activities are divided on the basis of importance to the achievement of the overall organization objectives. The manager is in the operational role. In a staff organization, functions are more of planning and measuring nature. There is not much requirement of reassignment of people. This type of structure can be implemented in a very short time. A drawback is the resistance from line personnel who refuse to follow the logistics manager and opts to follow their own views. An organization to have the best of both the structures needs to opt for staff and line function organizations. Providing a structure for logistics reduces the conflict among various activities of physical distribution. But this leads to an additional functional area within an organization and thus interfunctional conflict increases.

Fig 11: Combination of Line and Staff Organizational Structure (Source: Satish Kapoor, Purva Kansal, 2003)



Matrix to Horizontal Structure: Under a functional structure, logistical activities like transportation and warehousing are grouped into clusters and authority and responsibility create a direct relationship. The matrix model of authority and responsibility has been gaining a lot of popularity in service organizations like consulting and public accounting. The matrix organization's potential has gained a lot of interest as mangers are struggling with the challenges of process management. A technical resource group, which can be deployed geographically in order to satisfy line-unit requirements, is required by a matrix approach. This approach helps in sharing scarce assets and technical resources on a flexible basis. It also reduces the duplication of skilled personnel among business units. A horizontal organization is a modern extension of a matrix approach. While an organization is restructured, the key issue for the logistics managers is concerned as to how innovative he can make the new structure.

Empowerment: The main concept in empowerment is the availability as well as willingness of senior management to freely share the relevant information. Empowerment ranges from accommodating all requirements of an order on a single call basis to an on the spot resolution of discrepancies of delivery. An organization that is empowered allows middle-level management to resolve problems as well as utilization of pro-active judgement. The response speed shows the extent to which an organization is empowered. From logistics point of view, empowerment makes it necessary for frontline managers to be positioned in order to complete all the aspects of their respective work. Empowerment, to be effective in an organization, requires fully established ways as well as means of gaining differential advantage.

Teaming: A self directed work team (SDWT) has originated from the idea that multiple viewpoints are better than the one which have a long standing in administrative practice. The SDWT is not structured typically for any specific assignment or problem solving. From logistics point of view, a special purpose work group can be formulated in order to facilitate the development of a new software application or for handling a unique requirement, like selecting a new location for distribution warehouse. A self-directed team is unique in the way

its performance is planned and executed. The team members are empowered to perform whatever it takes so effectively as well as efficiently perform the designated work.

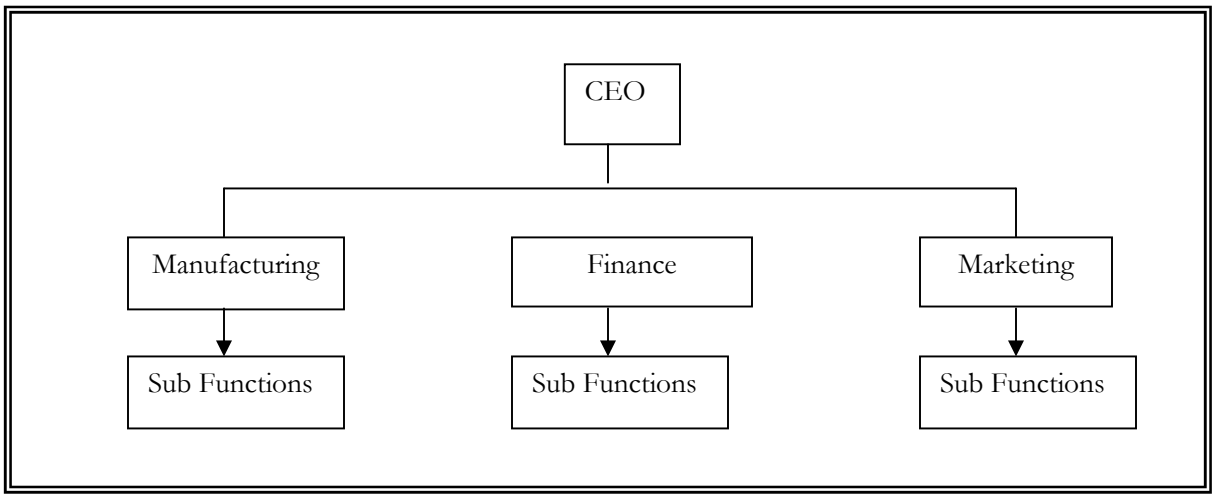
Strategic and Operational structure: Position of logistics in light of other enterprise functions. Logistics is considered as a strategic element of the overall organizational structure or an operational element. By this, its activities are spread under various other functions i.e., marketing, finance and production. If it is treated as a strategic element then various activities of logistics need to be grouped together. In the recent times, logistics has become a strategic department equivalent to marketing, production and finance as it helps in achieving interdepartmental objectives and also helps increase customer satisfaction.

Stages of Functional Aggregation in an Organization

Stage I Organization

During the late 1950s and 1960s an initial attempt at grouping logistical activities had emerged. Organizations with even minimal degree of formal unification have emerged only after the senior management has become committed to the belief that improved logistics is the result. Two or more logistics functions have emerged, which can be operationally grouped without changing the overall organizational hierarchy to a great extent. Such an aggregation initially has occurred both at the staff as well as line levels of the organization. During this initial development stage, organization units were rarely engaged in the purchasing and physical distribution integration.

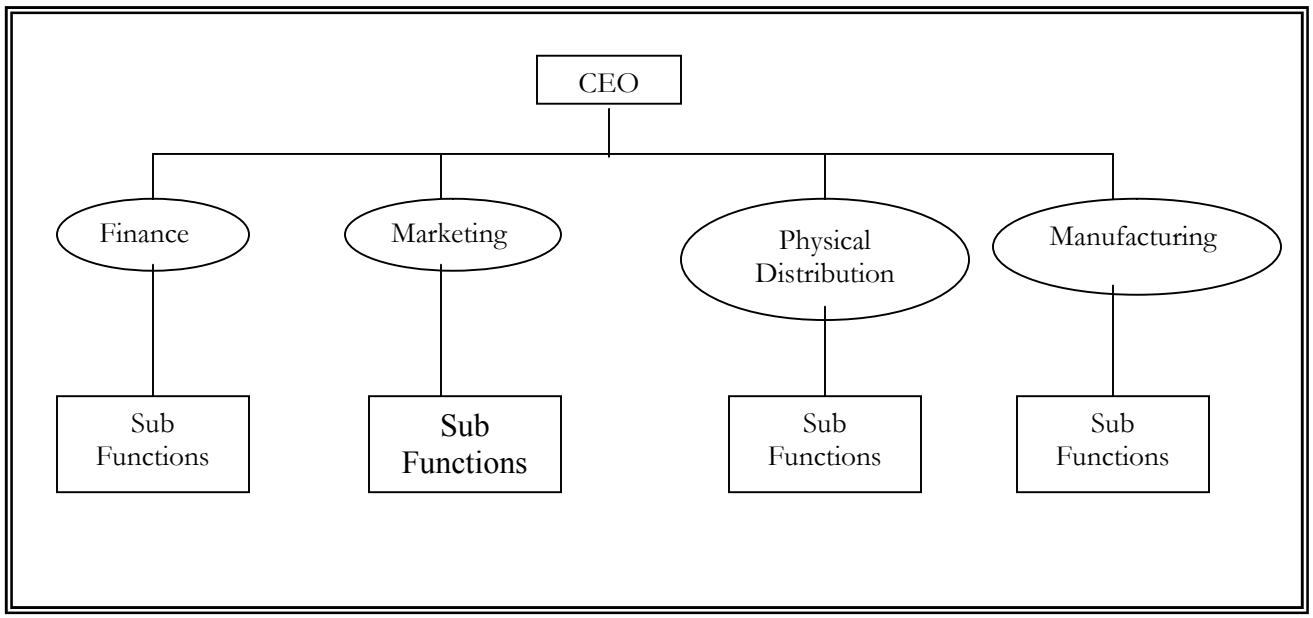
Fig 12: Stage 1 Organization (Source: Bowersox & Closs, 2004)



Stage 2 Organization

This stage of organization has begun to evolve with the overall enterprise gaining operational experience with logistics and cost benefits. The position of logistics has been elevated to that of a higher organization authority and responsibility. Positioning logistics at a higher organizational level has increased the likelihood of strategic impact. Logistics has been managed as a core competency due to the independent status given to logistics. The stage 2 organizations have been established as it was necessary to reassign functions and position newly created organization at a higher level within the overall enterprise structure. Though logistics has been given a lot of importance, the concept of a fully integrated system has not yet been achieved. An important factor for this is the lack of cross-functional logistics information systems. Another feature here is that the integrated physical and material management has begun to be accepted among the financial, manufacturing, and marketing counterparts.

Fig 13: Stage 2 Organization (Source: Bowersox & Closs, 2004)



Stage 3 Organization

Emerged in the 1980s with the beginning of logistical renaissance. Grouping many logistical planning and operational functions under a single authority and responsibility is the feature of this organization.

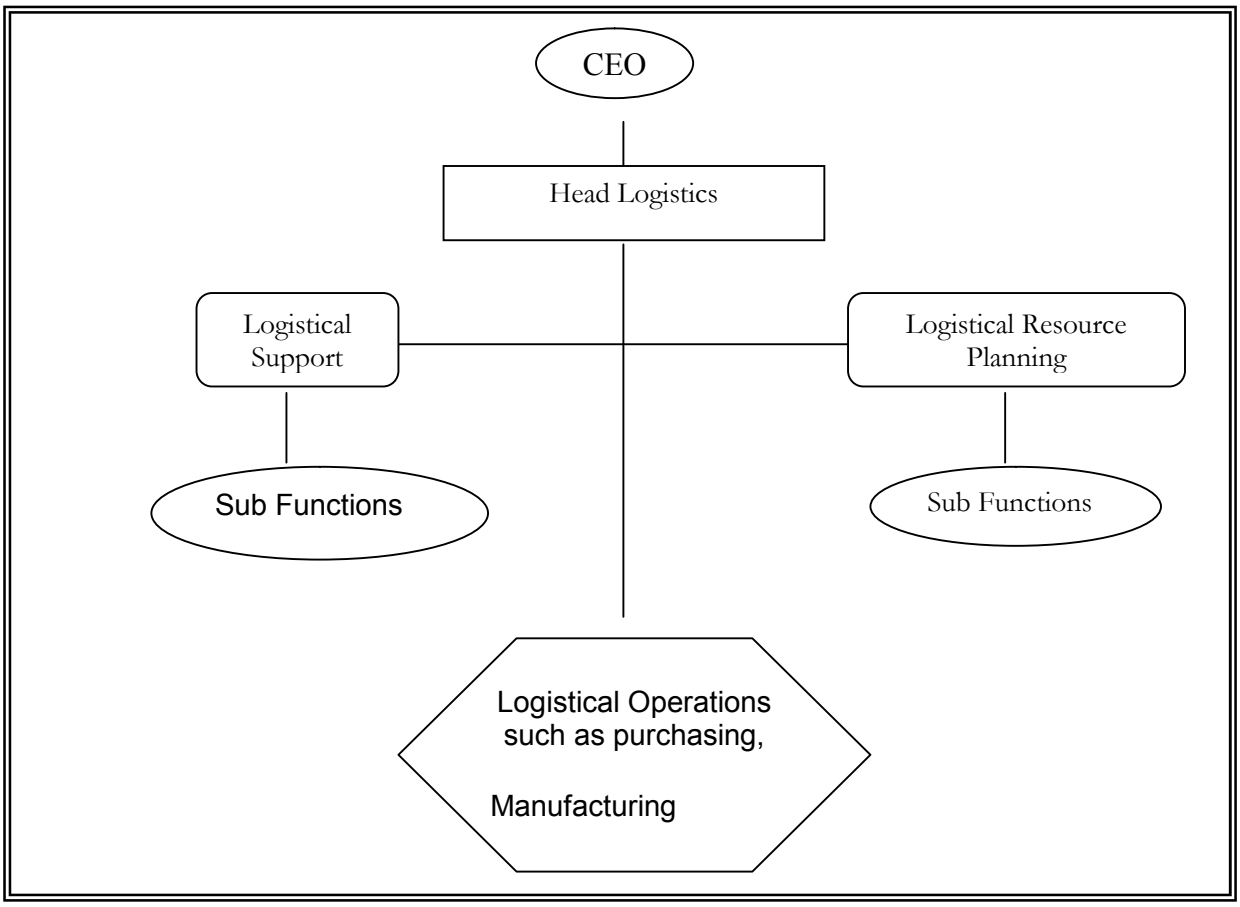
Every area of logistics – purchasing, manufacture and physical distribution is given the structure of a separate line operation. Operational responsibilities are well defined and thus

it is possible to establish manufacturing support as a unit of operation similar to the purchasing and physical distribution.

Logistical resource planning covers the full potential of management information to plan and co-ordinate operations. Logistical resource planning facilitates integration.

Overall planning and controllership exist at the highest level of the organization. This organization serves as a single source for guiding the efficient application of financial and human resources right from sourcing of materials to customer delivery.

Fig 14: Stage 3 Organization (Source: Bowersox & Closs, 2004)



Stage 4 Organization: A shift in the focus from function to process

A conventional organization had a vertical design. There were functions with clearly identified tasks and within these functions there is a formal hierarchy that employees need to progress. This approach had a shortcoming in the sense that it is inwardly focused and the primary concentration is on the utilization of resources more than creating the outputs.

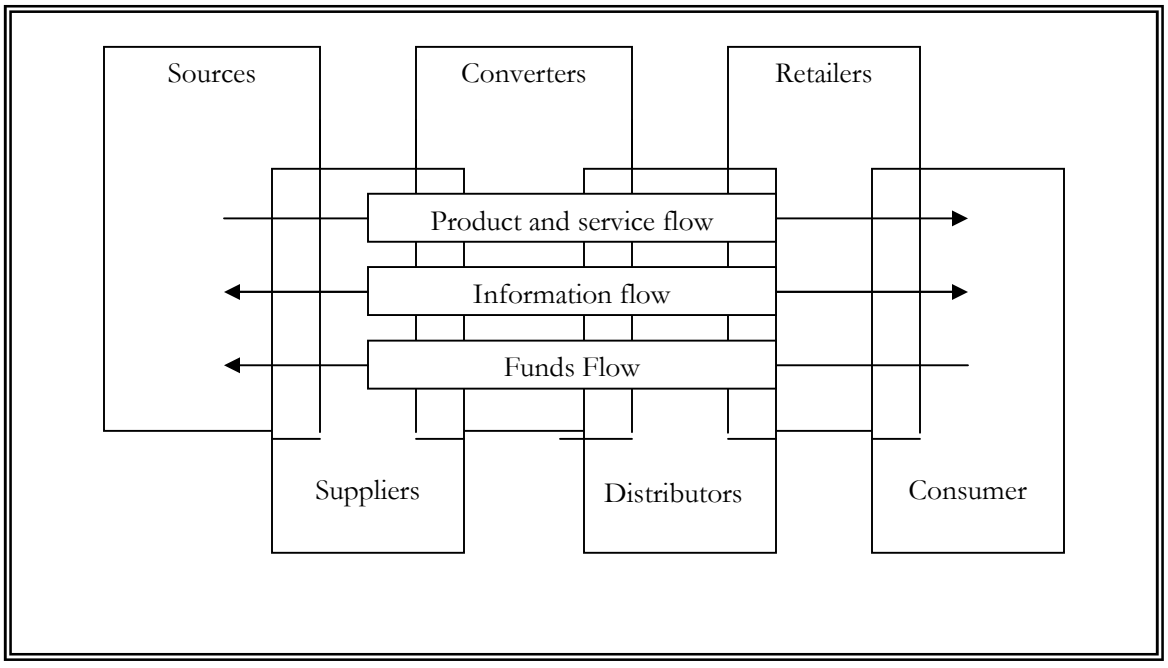
Measuring the outputs of any business can be done only if these can be in terms of customer satisfaction achieved at a profit. These outputs can be realized only when there is co-ordination and co-operation horizontally across the organization. The materials and information flows, which connect the customers with business and suppliers, have horizontal linkages, which mirror these. These are basically the core processes of the business.

There are many challenges in managing logistics as a process. Efforts need to be focused only on those activities, which contribute to customer value. Systems integration is required to stimulate synergism. A shift from functional to process orientation, has both positive and negative aspects. Positive aspects include general adoption of a process orientation builds on the basic principles of integration. Shifting the emphasis from function to process means it will be positioned as a chief contributor to all initiatives, which will focus on development of new products, customer order generation, fulfillment and delivery. The negative aspect is a lesser understanding of how the process will be performed and managed.

Stage 5 Organization Beyond Structure: Virutality and organizational transparency – Extended enterprise.

An extended enterprise is a boundaryless organization where the internal functional barriers are eroded favoring a horizontal process management. There is very little separation between vendors, distributors, customers and the firm. A virtual organization exists without a formal recognition. Basically it consists of an informal electronic network replacing the formal hierarchical command and control in the structure. Key work teams may be linked electronically for performing critical activities in an integrated fashion. Formal organizational charts may not relate to the actual workflow.

Fig 15: Extended enterprise and virtual supply chain (Source: A.T.Kearney as quoted by Martin Christopher, 2004)



It is essential for the structure and strategy to be aligned for achieving the business objective of superior customer service at lowest cost. A three-level framework can be adopted for achieving this integration for a enabling a transition to a customer-oriented organization:

Conclusion

The revolution in information is making logistics managers reconsider the traditional organizational logic. The idea of middle managers serving as guardians of information has been replaced with a frontline workforce having access to the entire information. A continuous redesign and re-engineering of the basic nature of work has made hierarchical organizations modified to accommodate networking of information and self-directed work teams.

CHAPTER 14: FINANCIAL ISSUES IN LOGISTICS PERFORMANCE

Chapter Objectives:

- Introduction
- Key Financial Metrics
- Supply Chain Performance Measures
- The Balanced Scorecard Approach
- Financial Gap Analysis
- Conclusion

The need for supply chain performance measures is to align activities and share joint performance measurement information and to explain 'line of sight' within the chain. It is required to allocate benefits and burdens resulting from financial shifts within the supply chain.

Financial performance has been the primary measure of success in most supply chains. Financial issues also encourage cooperative behavior across corporate functions and chain.

It is required to establish dynamic supply chain performance measurements and measurement-enabling systems to effectively manage supply chain operations and meet financial and non-financial business objectives.
The link between efficient supply chain operations and financial performance can be deduced by linking elements of balance sheets as well as income and cash flows to various supply chain activities.

The criticality of feedback and reorientation makes measurement important. Setting objectives, tolerance limits, developing action plans, allocating resources, assigning responsibilities, implementing plans, and measuring performance for feedback and corrective action are all part of a close looped supply chain management process

Factors, which contribute to a management's need for new types of measures to manage, supply chain:

- Lesser number of measures capturing the entire supply chain
- Going beyond internal metrics and taking a supply chain perspective
- Determining an interrelationship between corporate and supply chain performance
- The increasing complexity of supply chain management
- Requirement to align activities and share joint performance measurement information for implementing strategy which helps in achieving supply chain objectives
- Encouraging co-operative behavior across corporate functions and across firms in the chain

The following are the steps to develop good financial measures:

- Point-of-origin to point-of-consumption mapping of the supply chain
- Utilizing the customer-relationship management and supplier relationship management processes to analyze links
- Develop customer and supplier P&L statements
- Re – align supply chain processes and activities to achieve performance objectives
- Compare shareholder value and market capitalization across firms with supply chain objectives
- Replicate above steps at each link in the chain

Key Financial Metrics are as follows

Overall financial performance:

- Return on capital (investments and assets).
- Cash flow.
- Economic profit

These are further broken down into the following:

- Revenue growth
- Operating income margin (profitability)
- Capital utilization

1. **Revenue growth**: Revenue is the value of products and services sold. Revenue growth measures the year-over-year percentage change in revenue. Important activities which affect revenue are forecasting, supply chain responsiveness lead-time and availability of new products.

2. **Operating income margin (profitability)**: Measures the percentage of operating income generated per unit of revenue. It is the revenue less total operating expenses, which is the sum of the following three components.

   • Cost of goods sold (COGS)

   • Selling, General and Administrative Expenses

   • Depreciation and Amortization

   Calculated by taking the difference between percentage of cost of goods (services) sold and percentage of selling, general and administrative expense.

3. **Capital Utilization**: Capital utilization can be broken down into the following: -

   a) Cash operating cycle
   b) Fixed asset utilization

   a) **Cash Operating Cycle**: This is a key component of capital utilization, which measures the number of days from the time a rupee is invested in inventory and the time it is

converted back into cash with a profit. Cash operating cycle = Days in Inventory + Days Sales Outstanding – Days Purchase Outstanding.

The three components are as follows:

- **Days in inventory (DII**): Inventory includes raw materials, work in progress and finished goods. This measures the number of days of operations held in inventory.

  - Activities in SCM that affect Days in inventory (DII) are as follows:
    - Procurement: - Procurement practices like order frequency, special buys, supplier discounts etc, have major impact on DII.
    - Transportation management: - The mode of transportation affects inventory through lead tomes, which impacts safety stocks, and inventory in transit.
    - Warehouse management: Warehouse efficiency impacts Days in Inventory through visibility and design. Poor visibility and design lead to higher inventory.
    - Forecasting: A higher inventory is attributed to lower forecasting accuracy.
    - Demand planning: **-** Better demand planning leads to lower inventory and less capital blockage.
    - Network design: More consolidated networks require less investment in inventory.

- **Days sales outstanding (DSO)**: Accounts receivable money owed to a company by its customers. This measures the number of days on an average, which a company takes to collect credit sales from its customers.

  - Activities in SCM that affect DSO: -
    - Fill rates: - Low fill rates always lead to higher account receivables and days sales outstanding.
    - Shipment integrity: - Poor shipment integrity leads to higher DSO.
    - Invoicing accuracy: - Discrepancies and incomprehensible invoices lead to higher DSO.
    - Poor communication: - Poor communication between shipping and invoice leads to higher DSO.

- **Days purchase outstanding (DPO)**: Accounts payable money, which a company owes to suppliers and vendors. This measures the number of days on an average a company takes to pay its debts.

  - Activities which affect Days Purchase Outstanding:
    - Procurement terms: Procurement managers generally trade-off purchase price for credit terms to purchase goods and services at the lowest total cost.

- ❖ Payment practices: - Paying on the exact date of an invoice compared to fixed date (paying quickly) impacts DPO. Paying on fixed days reduces DPO and cash flow.

b) **Fixed Asset Utilization**: - Measures the amount of revenue generated per unit of currency invested in net property, plant and equipment. It is computed by dividing Revenue by Net property, plant and equipment. Net property, plant and equipment include assets like manufacturing facilities, warehouses and corporate offices.

- o Activities in SCM that affect fixed asset utilization: -

  - ❖ Transportation management: - For a company managing its own fleet activities such as load management, routing and scheduling impact the size of the fleet required which is relative to shipments and in turn fixed asset utilization.
  - ❖ Warehouse management: - Impacts fixed asset utilization through automation, physical layout, and other activities.
  - ❖ Network design: - Lesser investment in distribution assets is required by more consolidated networks.
  - ❖ Selective outsourcing: - Outsourcing of manufacturing, warehousing and distribution facilities increases fixed asset utilization.

Supply Chain Performance Measures are as follows

1. The Supply Chain Council's SCOR Model

The Supply-Chain Operations Reference-Model (SCOR) has been developed and endorsed by the Supply Chain Council. This is a process reference model that is used as cross-industry standard diagnostic tool in supply chain management. This enables users to address, improve and communicate supply chain management parties within all parties in the chain.

The SCOR model describes the business activities that are associated with all the phases in satisfying the customer demand. This model has been very successful in providing a basis for supply chain improvement for global projects.

This model also provides guidance about the types of metrics which might be used for obtaining a balanced approach in measuring one's overall supply chain. The model advocates a set of supply chain performance measures that are a combination of cycle time, cost, quality and asset metrics.

At the core level of the SCOR model is a four-level pyramid that guides supply chain members on the road to integrative process improvement.

Level One defines the scope and content for the SCOR model. This level broadly defines four key supply chain process types (i.e., plan, source, make, deliver and return). This is the point at which supply chain competitive objectives are established.

Plan
Processes that balance aggregate demand and supply to develop a course of action which best meets sourcing, production and delivery requirements. Under this process the company should assess supply resources, aggregate and prioritize demand requirements, plan inventory, distribution requirements, production, material and rough-cut capacity of all products and all channels. Long-term capacity and resource planning, product phase decisions are taken in this phase.

Source
Processes that procure goods and services to meet planned or actual demand. Under this process-sourcing infrastructure is managed. Various activities like vendor certification and feedback, sourcing quality monitoring, vendor contracts are conducted. Also activities involved with receiving of material such as receive, inspect, hold and issue material are under taken here.

Make
Processes that transform products to a finished state to meet planned or actual demand. This process is concerned with production, execution and managing “make” infrastructure. Specifically under production execution activities like manufacturing, testing, packaging, holding and releasing of product are undertaken here.

Deliver
Processes that provide finished goods and services for meeting planned or actual demand, typically including order management, transportation management, and distribution management.

Return
This consists of processes associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support.

Level Two defines the 26 core supply chain process categories which have been established by the Supply Chain Council with supply chain partners can jointly present their ideal or actual operational structure. At this stage, each SCOR process can be further described by process type:

Planning: This process aligns expected resources to meet expected demand requirements. The planning process involves balancing aggregated demand and supply, considering consistent planning horizon, and contributing to the supply-chain response time.

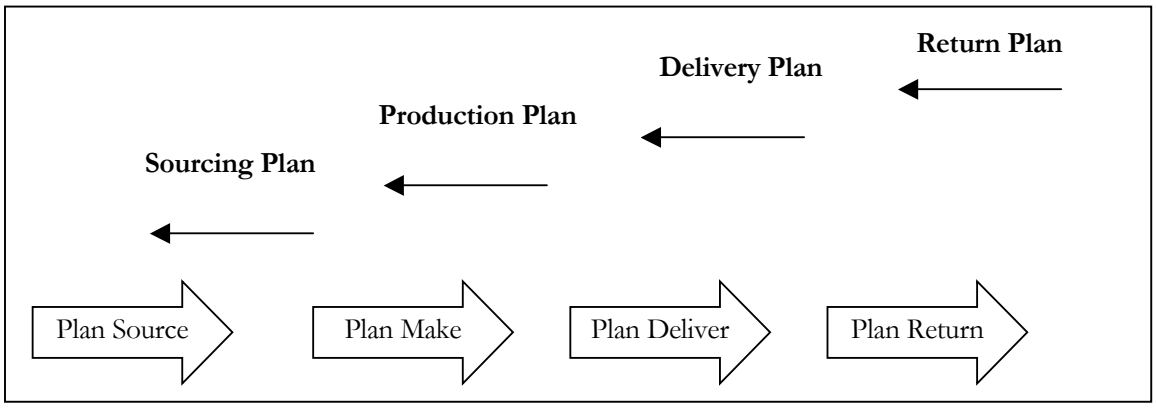
Execution: This process is triggered by planned or actual demand that changes the state of material goods. The process involves scheduling or sequencing, transforming the product and moving product to the next process.

Enable: This process prepares, maintains, or manages information or relationships on which planning and execution processes rely.

Level Three provides partners with information useful in planning and setting goals for supply chain process improvement.

Level Four focuses on implementation of supply chain process improvement efforts.

Fig 1: SCOR Model supporting Horizontal Process Integration (Source: www.supply-chain.org)



2. The Logistics Scoreboard

This approach to measuring supply chain performance was developed by Logistics Resources International, a consulting firm specializing in supply chain. The company recommends the use of an integrated set of performance measures falling into the following general categories:

- Logistics financial performance measures (e.g., expenses and return on assets)
- Logistics productivity measures (e.g., orders shipped per hour and transport container utilization)
- Logistics quality measures (e.g., inventory accuracy and shipment damage)
- Logistics cycle time measures (e.g., in-transit time and order entry time)

3. Activity Based Costing Technique

The Activity-Based Costing (ABC) approach was developed to overcome some of the shortcomings of traditional accounting methods in linking financial measures to operational performance.

The method involves breaking down activities into individual tasks or cost drivers, while estimating the resources (i.e., time and costs) needed for each one. Costs are then allocated based on these cost drivers rather than on traditional cost-accounting methods, such as allocating overhead either equally or based on less-relevant cost drivers. This

approach allows one to better assess the true productivity and costs of a supply chain process.

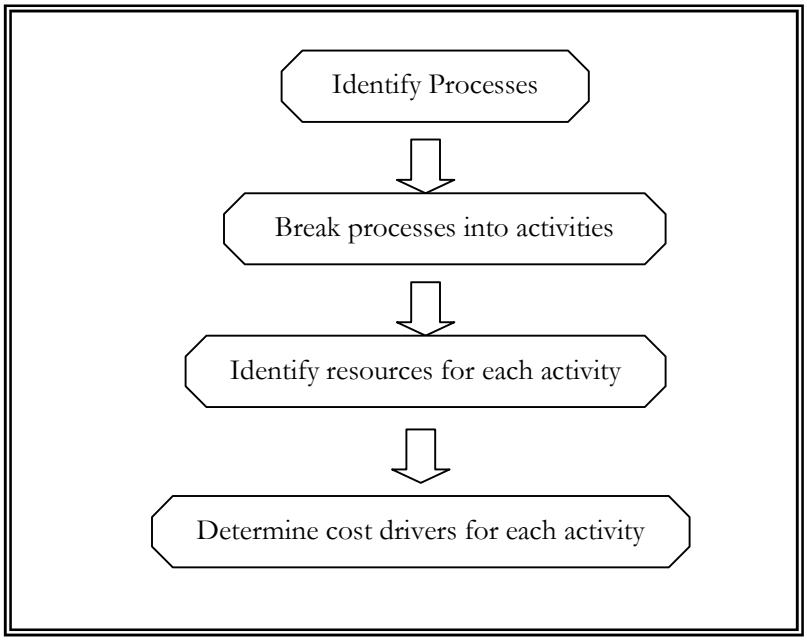
Activity – based costing techniques tend to fall into one of three major categories:

Diagnostic: - Provides snapshot cost information at widely spaced intervals of typically three to six months apart. Critically needed information such as activity costs, output costs, resource consumption, activity consumption etc.

Reengineering: - The activity analysis attempts to identify the performance of any non-value added activities.

Integrated cost management system: Most mature forms of activity based costing. They differ from the above because they are updated frequently, fully relational, flexible to changes, have automated feeds from other systems, and have on-line reporting and query capabilities.

Fig 2: Steps in ABC Costing



4. Economic value-added Analysis (EVA)

This measure has been developed by Stern, Stewart & Co. It attempts to quantify value created by an enterprise on the basis of operating profits in excess of capital employed (through debt and equity financing).

Some companies are starting to use measures like EVA within their executive evaluations. Similarly, these types of metrics can be used to measure an enterprise's value-added

contributions within a supply chain. Economic-value added metrics are less useful for measuring detailed supply chain performance and more useful while assessing higher-level executive contributions. They can be used, however, as the supply chain metrics within an executive-level performance scorecard, and can be included in the measures recommended as part of The Logistics Scoreboard approach.

The Balanced Scorecard Approach

Developed at the Harvard Business School, the balanced scorecard is a comprehensive, top-down view of organizational performance with a strong focus on vision and strategy. It is founded upon the idea that financial measurements being important for corporate performance tend to be retrospective in nature.

Financial metrics typically tell how an enterprise has performed, but give little indication as to how it will perform. A true balanced scorecard must include metrics that provide both historical and future insights. Thus, a scorecard must be comprised of both leading and lagging indicators. Leading indicators drive performance, whereas lagging indicators are actually results of past performance. For example, in a logistics analysis system, 'customer complaints' is a lagging indicator, while 'on-time delivery' is a leading indicator.

More than just a measurement system, the Balanced Scorecard is a management system that channels core competencies and emerging technologies toward strategic goals and business objectives. Four categories or "perspectives" to align individual, organizational and cross-departmental initiatives for meeting objectives are utilized.

To achieve 'balance' the methodology prescribes the strategic assessment of four perspectives: financial, customer, internal, and innovation and learning.

- Financial perspective
- Customer perspective
- Internal business perspective
- Innovative and learning perspective

The balanced scorecard approach compels supply chain managers to abandon the belief that traditional financial and operational measures are sufficient for strategic supply chain analysis. To develop an effective scorecard, management defines the organization's vision and goals. Next, while keeping organizational structure in mind, they must decide which supply chain strategies will lead to successful goal attainment. These strategies are then translated into specific tactical performance driving activities. Finally, metrics are established for each activity. Once a vision, and subsequent strategy have been developed, the individual metrics – or vital signs –are integrated at relevant places.

The four main key elements in SCM are Supply Chain Operational Efficiency, Optimization of Supply Chain Cost, Customer Satisfaction and Continuous Improvement of Supply Chains. On the other hand the four key perspectives in Balanced Scorecard are Internal

Business Perspective, Financial Perspective, Customer Perspective and Learning and Growth perspective. Henceforth there is an opportunity to integrate and measure the four key elements of Supply Chain through the four perspectives of Balanced Scorecard.

1. Supply Chain efficiencies of waste reduction, time compression, flexible response and unit cost reduction directly correspond to the Internal Business perspective of Supply Chain cost of ownership, Supply Chain cycle efficiency, Number of choices/Average response time, Percentage of Supply Chain target costs achieved respectively.
2. The Customer benefit goals of improved product/service quality, improved timeliness, improved flexibility and improved value translate into customer benefit measure of number of customer contact points, relative customer order response time, customer perception of response flexibility and customer perception of derived value of the Balanced Scorecard.
3. The third dimension of financial goals of higher profit margins, improved cash flow, revenue growth and high return on assets translate into the metrics of profit margin by supply chain partner, cash to cash cycle, customer growth and profitability and return on supply chain assets respectively which is the Financial Perspective of the Balanced Scorecard.
4. Finally the supply chain improvement efficiencies of product/process innovation, partnership management, information flow and threats and substitutes is represented by the metrics of product finalization points, product category commitment ratio, number of shared data area and local data set and performance trajectories of competing technologies.

The above approach illustrates how measures and metrics in the areas of planning, sourcing, make/assembly decisions, delivery, and customer service level, have been integrated successfully in the balanced scorecard framework.

The approach has many advantages, in terms of emphasizing the inter-functional and inter-firm nature of supply chains and recognizing the need to ascertain the extent to which firms effectively work together and the extent to which functions must be coordinated and integrated. Also, the framework increases the chance that a “balanced” management approach is indeed practiced within firms and among the supply chain partners.

Fig 3: Balanced Scorecard

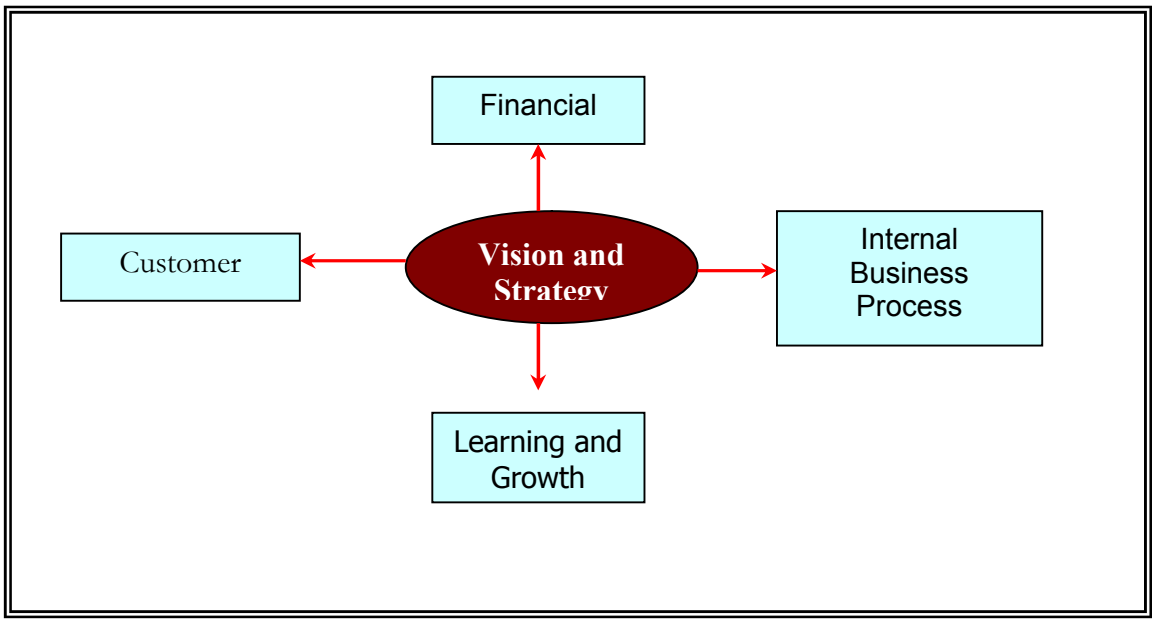
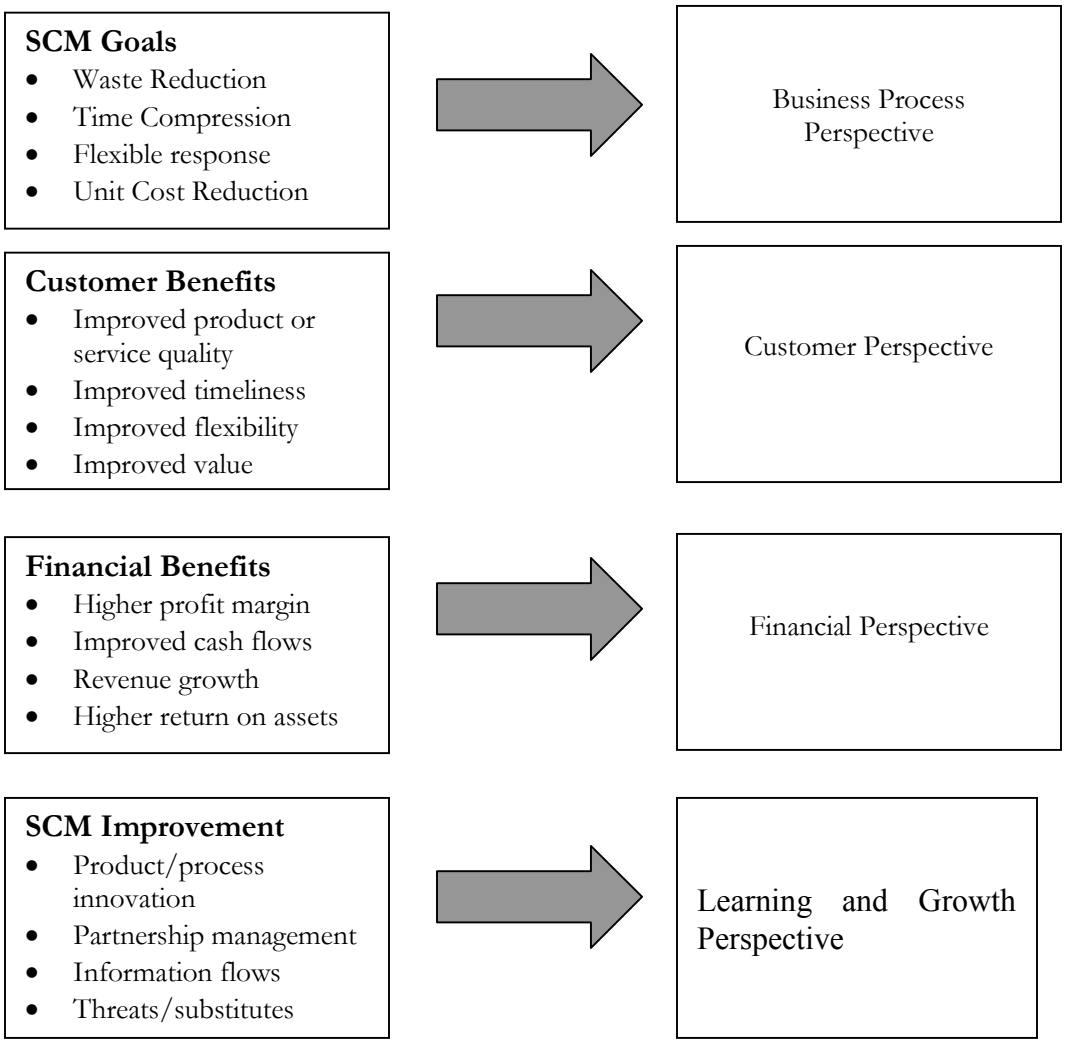


Fig 4: Linking Supply Chain Management Framework to the Balanced Scorecard (Source: Publication on Balanced Score Card tool as Supply Chain Measure, Dr N. Chandrasekaran & Varun Kumar Jha)



Financial Gap Analysis:

Though supply chain management has the potential to improve the three drivers of financial performance namely growth, profitability and capital utilization, financial gaps still arise.

A number of reasons for financial gaps exist a few of which are as follows:

- Many senior level executives continue to view SCM as a tactical back-room cost-center activity. Thus it is not being given so much of importance.

- SCM drives performance throughout the enterprise. Thus, SCM strategic and tactical decisions cannot be made in a vacuum.
- Lack of appropriate performance measurement
- Proper Information Systems not in place
- Lack of collaboration with supply chain partners.

Process of calculating gaps:

Step 1: - Calculate value of gaps in key financial metrics
SCM drives key financial metrics like revenue growth, percentage cost of goods sold, and days in inventory (DII). The values of the gaps may be based on benchmarks from competitors, industry aggregates, historical performance, and aspirations derived from business intelligence tools. They can be measured using a variety of value-based financial measures such as free cash flow, economic profit and stock price.

The values of the gaps are an effective means of communicating to the organization the need or change and the potential value of improved SCM. Like all financial analysis, great caution should be used when interpreting the results of the gap analysis.

Techniques for analyzing gaps:

The following are the techniques for analyzing gaps:

Benchmarks
Target Company's measures are compared to other companies, which may be from inside or outside the Target Company's industry. Additional benchmarks could be from industry or other aggregates.

Percentage Gap Analysis

Target Company's performance is measured in percentage terms.

Valuing the gap
Each gap is converted into an annual cash flow measure. This measure by how much annual cash flow would increase if the gap were completely closed.

The gaps are also converted into a stock price benefit if Target Company is publicly traded.

The size of the gaps provides a guide to which ones to be attended to first. The largest gaps and the ones to examine first are revenue growth, operating income margin and days in inventory

Step 2. Link gaps in financial metrics to SCM business processes and strategies
The next step in this approach is to link gaps in financial metrics to SCM-related business processes and strategies such as sales mix, pricing strategies and outsourcing trends.

For example, a gap in profitability related to percentage cost of goods sold can be mapped to an SCM-related process such as distribution and logistics, which, in turn, is linked to a key activity such as warehouse management. Warehouse management is related to tasks such

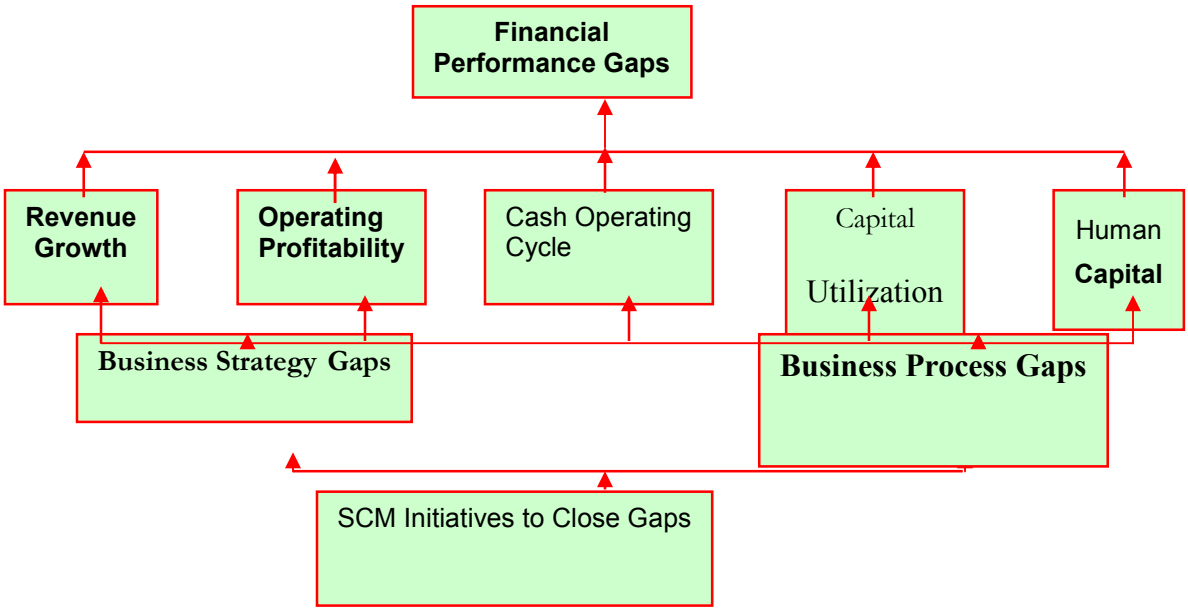
as receiving, put-away, pick, pack, and ship, and to key performance indicators (KPIs) such as labor costs, average time per pick, and pick accuracy. This mapping provides a better understanding of the cause-and-effect relationships between SCM business activities and financial performance.

Step 3.: Map SCM Initiatives to Financial Performance Gaps

Linking gaps in financial metrics to SCM business processes and strategies are used as the foundation for exploring SCM solutions that improve the SCM – related business processes and strategies underlying the gaps in the key financial metrics. This provides a logical methodology for identifying specific areas of opportunity. It also provides a disciplined approach for estimating the monetary benefits and understanding of the critical success factors and risks of SCM solutions.

Improvements in SCM business processes and strategies typically cannot completely close financial performance gap. But this can make a significant contribution for many companies.

Fig 5: Financial gap analysis



Conclusion

Organizations need to maximize profitability at each link in order to increase the overall profitability. It is not enough for management to just identify metrics, but they have to be developed for their situation. In fact standard metrics can be developed in spite of different supply chain settings. Most of the performance measures called supply chain metrics are nothing more than logistics measures that have an internal focus and do not capture how the firm drives value or profitability in the supply chain. The goal should not be to identify specific metrics, but to provide the framework that allows management to develop the best

metrics for their situation. By maximizing profitability in each link, supply chain performance migrates towards management's objectives and maximizes performance for the whole.

It may be possible to conclude that standard metrics can be developed irrespective of the different supply chain settings.

CHAPTER 15: INTEGRATED LOGISTICS

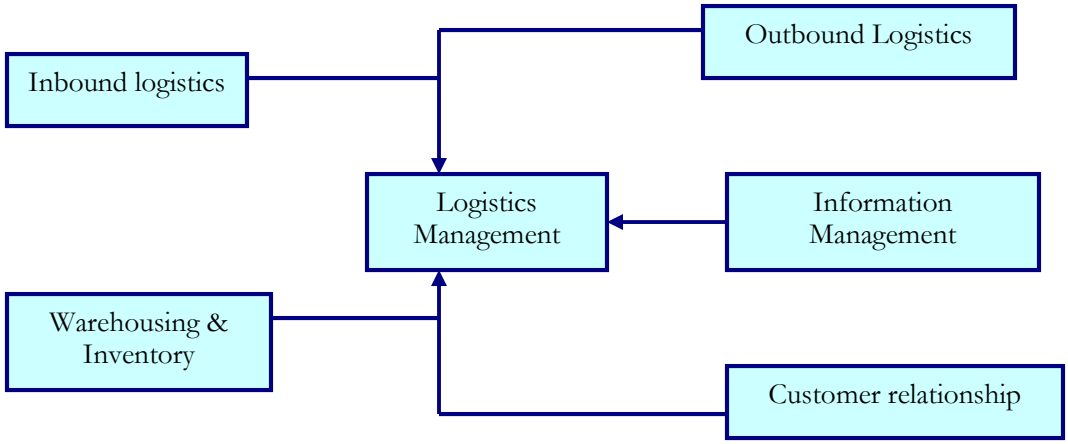
Chapter Objectives:

- Introduction
- Imperatives for successful integrated logistics
- Need for Integration
- Activity Centers
- Barriers to Internal Integration
- Hierarchy of Logistics Integration
- Complete Systems Perspective
- Conclusion

Logistics links an enterprise with its customers and suppliers. Information flows through the enterprise from and to customers in the form of sales activity, forecasts and orders. Such information is refined into specific manufacturing and purchasing plans. A value-added flow of inventory is initiated as products and materials are procured. This ultimately results in transfer of ownership of finished products to customers.

Supply chain integration focuses on defining key linkages across functional areas both within and among companies partnering along a supply chain. Integrated logistics is a process-oriented integrated approach to procure, produce, and deliver products and services to customers.

Fig 6: Logistics Management



The following are the imperatives for successful integrated logistics:

- New Culture: Enabling employees to adapt to the new operating realities in cross-supply chain collaboration are a key component of integrated logistics. Core capability teams, which consist of professionals, must be focused on key integrated logistics activities, which synchronize activities across the entire supply chain. Senior executives entrusted with the task of integration and synchronization has to articulate the strategy for a new cross supply chain culture, which will be shared by all partners.

- Agreements on cost-sharing and revenue-sharing: Building a benefit structure balancing rewards with each partner's understanding of their contribution is important for maintaining close partnering relationships. A generally agreed upon framework for equitable revenue and cost sharing amongst all participants is necessary. Analyzing the supply chain economics examines the role and costs of each of the different participants of the supply chain. Detailed practices and performance metrics will help in understanding the participant's competitive advantage.

- Establish Transparency: Establishing of an integrated logistics system is challenged by participants' unwillingness to forgo any degree of control, which is a symptom of lack of trust. This lack of trust will hinder acceptance of integrated logistics while lack of standard communication and business processes will hinder implementation.

Need for Integration

A significant feature of a responsive organization is the priority the organization attaches for integration. Not only integration within the organization but also integration upstream with suppliers and downstream with distributors and customers is important. There is also a lot of emphasis on linking organizations through information. Information systems nowadays drive companies to reconsider their relationships with customers and suppliers. Process integration is achieved through logistics integration, which means both upstream and downstream integration. The objective in an extended enterprise is creation of an 'end-to-end' process so that innovative products are created and delivered at higher levels of quality and in lesser time frame to markets. This is achieved through the following means:

Rationalization of supply base: Companies try to rationalize their supply base by reducing the number of suppliers. In fact, companies are looking at these suppliers to provide systems rather than components. Companies are basically trying to rationalize their supply base. For example: the automotive sector is trying to integrate tier 1, tier 2 and tier 3 suppliers.

Centralized inventory: The extended enterprise not only includes upstream suppliers but also the downstream flow of finished products through dealer networks. Traditionally, when dealers did not have the product demanded by customers, they used to swap this with another dealer who had that product variety in stock. Today, enterprises have centralized inventory and also take responsibility for its management. The dealers have only demonstration models; they have on-line access of the enterprise supply system and can give the customer an immediate confirmation about the availability of the product of their

choice and when it can be delivered. For those products not available from stock, dealers enter order directly into the production schedule and the product required is made to order.

Integrated Information Systems: The benefits of a fully transparent information system are being considered with the use of Electronic Data Interchange (EDI) together with the growing acceptance of 'just-in-time' philosophy. Suppliers can now manage the flow of materials into the plant on the basis of advance notification of a company's production schedule. With integrated information systems, there are no manual orders, invoices or delivery notes. A single source of information provides the basis for a timely physical response, which automatically triggers payment to the supplier.

Supplier Development Programmes: Supplier development has replaced the traditional purchasing function. A cross functional team of specialists work closely with suppliers and seek improvements in supplier processes as well as in the interfaces with the enterprise's processes.

Supplier involvement: Innovations in industries are supplier originated. By bringing suppliers closer to the process of new development, it has been found that innovation can be embodied in new products continually and simpler cost effective designs can be created.

Activity Centers in integrated logistics

Refers to the activities that make up business logistics. These are studied in the following two categories:

Key Activity centers: These are the activities forming the core of logistics function and also take place in every logistics channel. These are as follows:

Customer Service Standards: The customer has become more and more demanding in overall performance terms. The manufacturer needs to create a competitive advantage on the basis of customer-service. Co-operating with marketing to determine customer needs and wants determine the customer response to service and set customer levels.

Transportation: This is one of the most expensive activity centers in logistics. It is concerned with movement of raw materials to the plant and semi-finished goods or finished goods to the market. Any problems in the transportation service can result in the company holding inventory for more days than planned for. An efficient transportation planning and management is a pre-requisite function of logistics.

Inventory Management: The operational aspects of logistical management are concerned with movement and storage of materials and finished goods. Logistics operations start with the initial shipment of material from a supplier and finalized when a manufactured or processed product is delivered to a final customer. As material gains value at every step of its conversion into finished inventory, work-in-progress inventory needs to be moved to support final assembly for supporting manufacturing. A meaningful value-addition is done only when the final ownership is transferred to customers wherever specified. For better understanding of the inventory it is divided into the following three areas:

- Physical Distribution: Concerns with movement of a finished product to customers. Here, customer is the final destination of a marketing channel. Availability of a product is a key part in the marketing efforts of every participant. A major part of the overall marketing effort will be lost unless a proper assortment of products is delivered efficiently wherever needed. Time and space of the customer service becomes an integral part of marketing through the process of physical distribution. The common feature of all physical distribution systems is that they link manufacturers, wholesalers, and retailers into marketing channels that provide product availability as a key aspect of the overall marketing process.

- Manufacturing Support: This area focuses on managing work-in-progress inventory as it flows between various stages of manufacturing. The overall concern of manufacturing support is the method by which production occurs. Manufacturing support is different when compared to physical distribution. Physical distribution attempts servicing the desires of customers and thus needs to accommodate uncertainty of consumer and industrial demand. Manufacturing support involves movement requirements under the control of the manufacturing organization.

- Procurement: This area focuses on with purchasing and arranging the inbound movement of materials, parts or finished goods from suppliers to assembly plants or retail stores. It involves availability of the desired material wherever needed.

  All the above three areas of inventory flow in logistics overlap in a typical enterprise. Looking at each as an integral part of the overall value-adding process gives an opportunity for capitalizing on the unique attributes of everything while facilitating the overall process. A major concern area for integrated logistics is co-ordination of overall value added movement. All these three areas combine to provide an integrated management of materials, work-in-progress and finished products moving between various locations.

Information Flow and Order Processing: Completing activities of the order cycle are very important in customer service. A lot of management attention is being given to activities involved in processing orders. An effective order processing system should have an effective order status reporting system also.

Support Activity Centers: These are the activity centers necessary for achieving synergy in key activity centers. This category includes:

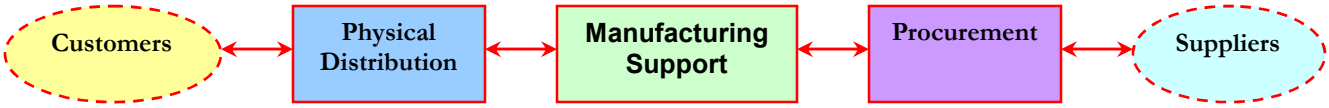
Warehousing: Storing goods that are waiting for sale. This function is necessary as there is rarely a match between production and consumption. Organizations choose between warehouses and distribution centers. Distribution centers are larger, automated warehouses designed to receive goods from various plants and suppliers.

Material Handling: Efficient material handling methods in warehouses can improve customer satisfaction by decreasing the damage in handling, maintaining the quality of storage, facilitating order processing and moving the right goods at the right time to make them available to the right customers. Costs are also reduced through proper material handling techniques.

Information: Information collection, storage and handling are necessary for achieving higher customer service. Information enables reducing the gap between actual and benchmark and also assists in strategy formulation – a key activity in logistics.

Packaging: Packaging protects the goods and acts as a source of information for customers. It is also used as a marketing tool to attract customers. The concept of packaging has paved way to 'Unitization', where various package are handled together as one unit. Example: Palletization.

Fig 7: Logistics Integration (Source: Bowersox & Closs, 2004)



Barriers to Internal Integration

Implementing internal logistics integration is not possible in a vacuum. There are certain barriers to integration, which are as follows:

Organization Structure: The traditional organization structure prevents implementation of any cross-functional process being implemented. Traditional structure is to divide authority and responsibility according to functional work. Organizations are generally concerned with achievement of functional excellence and this structure can hinder success of the goal of integration – which is co-operation among functional areas. Also, managers are usually rewarded for achieving functional excellence. Successful integration of logistics process requires managers to look beyond their organizational structure and facilitate cross-functional co-ordination. This may not be possible by creating a new organization structure. Thus, regardless of whether organizational structure is realigned or not, organizations dealing with cross-functional matters are required for successful integration of processes.

Ownership of Inventory: Inventory can facilitate a specific function to achieve its mission. A traditional approach to ownership of inventory is to maintain adequate supply for gaining ease against demand and operational uncertainty. Availability of inventory also results in economy of scale. While such practices create benefits, they also have a related cost. The critical issue is cost-benefit relationship.

Measurement systems: Traditional measurement systems make cross-functional co-ordination difficult. A new scorecard needs to be developed for facilitating integration of logistics functions. The measurement system must facilitate logistics managers to view their specific functions as part of a process and not just stand-alone activities.

Transfer of knowledge: Ability to share experience is an additional barrier. Failure to transfer information or knowledge tends to nurture functional orientation by development of specialized employees. Many firms also fail to develop procedures and systems to transfer cross-functional knowledge. When work is done in a series of processes and involves many employees, transfer of this type of knowledge and experience is difficult.

Information Technology: IT acts as a key resource to achieve integration. IT applications need to be designed along organizational lines. Databases are mostly limited to specific functions are not easily accessed on a cross-functional basis. Data warehouses have emerged due to the need to share information. Schemes to transfer information are required to be developed as existing applications can serve as a barrier to process integration as critical data cannot be shared readily.

Hierarchy of logistics integration:

- Competencies: For long-term survival, a wide variety of competencies are required. A firm will excel in a few of these, which are referred to as core competencies.
- Performance Cycle: A structure integrating all aspects of logistical operations linking procurement, manufacturing, support and physical distribution.
- Function: These are traditional areas of logistics specialization, which are essential for operational excellence. They need to be viewed as integral parts of the overall logistical competency and not as unique areas of performance.
- Sub functions: Specific jobs within functions, which need to be performed within functions for satisfying logistical requirements.

Complete Systems Perspective for Logistics

This concept is a cost-service integration, backed by an integrated logistics network, which is aimed at minimizing the total cost of distribution at a given level of customer service. The main components are as follows:

Perspective of total cost: The cost of logistics includes various logistics activities such as cost of planning and managing range of logistics activities such as transportation, finished goods distribution, receipt, inspection and storage of goods etc. All functions necessary for converting inventories and satisfying customers have a cost. An individual cost control perspective should be avoided and the overall cost of all logistics elements need to be considered simultaneously. This is referred to as tackling the cost of logistics as a whole, while trying to tackle the primary function of logistics system i.e. to perform the function assigned to the system in a most cost effective manner. In fact, the total cost perspective is an important component of logistics.

System Perspective: This concept is an extension of the logistics concept and is a key for managing logistics function. This total system perspective of logistics is time consuming but results in reduction of inefficient logistics systems as a whole. The total system of logistics also has a number of sub-systems such as transportation, warehousing, inventory

management etc. A number of techniques and objectives that are stated beforehand have been designed so that each of these activities is conducted in an optimal manner. A proper balance between these activity centers is necessary to reduce the total cost of logistics.

Trade-offs: This refers to the evaluation of the cost of each system component with the objective of determining a combination of components providing a minimum total cost for a specified level of customer service. Trade-off takes place when management incurs cost in a particular activity center as part of the strategy to achieve benefits from another activity center.

Intra – activity trade-off occurs when trade-offs occur within an individual activity of the logistics system. An example can be a decision to use one's own transportation instead of a public transportation.

Inter-activity trade-off occurs between various activities of logistics system. Management prepares itself to bear the increased cost of one activity center so as to get the profits from another. For example, using airfreight can increase transportation cost but would result in a reduced inventory and warehousing cost.

Inter-functional trade-off occurs between the logistics system and other functional areas of the firm. A trade-off is made between various functions. For example, the packaging structure for a company was changed from conventional vacuum packs to a different shape to suit the structure of the product.

Inter-organizational trade-off is a category between manufacturer and other organizations involved in creating utilities for the manufacturer. The manufacturer has to be concerned with the members of the distribution channel and should try maintaining relations with these members.

Managing the supply chain as a network

The firm is at the center of an inter-dependant network that competes as an integrated supply chain against the other supply chains. Managing such a competitive structure requires various skills and priorities. A focus on the network management as well as upon internal processes is necessary to achieve market leadership. The following are the most significant issues in such an environment:

- Collective development of strategy: In the traditional view, members of a supply chain never considered themselves as part of a marketing network and so never shared their strategic thinking with each other. A higher level of joint strategy development is required for network competition to be truly effective. Network members must collectively agree to strategic goals for the network and the means of attaining them.

- Open communication: The advent of information technology is making the exchange of information between supply chain partners very easy and this has been one of the most powerful drivers of change in the marketing networks.

- Benefits for partners: There is a growing realization between network partners for co-operation that usually leads to improved performance. Another issue is how the results of that improved performance can be shared amongst the various players. All partners must benefit and be better off due to co-operation.

Conclusion

A key to logistics integration is the transparent flow of information from one end of the chain to the other. Supply chain partners are able to respond more rapidly to known demand with lesser inventory and hence lower cost by sharing information. A responsive supply chain is highly integrated. They integrate internally across functions and externally integrate with suppliers and downstream customers. A lot of companies are attempting to become more agile and responsive due to an encroached functional structure. They have a fragmented approach to the marketplace and thus manage functions rather than processes. It is also difficult for firms like these to reflect external integration when they lack internal integration. Companies that have got over this are now looking to design close linkages with their supply chain partners.

CHAPTER 16: ROLE OF 3PL & 4PL

Chapter Objectives:

- Introduction
- First Party Logistics
- Second Party Logistics
- Third Party Logistics: Functions, Advantages, Essential characteristics
- Fourth Party Logistics: Features, Advantages
- Selection of a Service Provider
- Key Trends in Logistics Outsourcing

Logistics involves getting the right goods to right place at the right time at the right cost in the right condition. To survive in today's highly competitive markets, companies are focusing on their core competencies to adopt outsourcing as a strategic solution to improve quality of service and also reduce cost of key and non-core activities. An accepted trend today is to form a collaborative relationship with logistics service providers on the basis of the backbone of information technology, for integrating knowledge based supply chain.

Business organizations across the world are struggling for competitiveness for both growth and survival. Customers are demanding more and more value-added services from prospective suppliers for the amount spent. Business organizations have started reviewing business processes and realized that cost cutting and differentiating in value delivery systems is essential. Focusing on core business areas can be done through outsourcing non-core operations to experts in the field.

Logistics operations are an area of specialized function and a majority of marketing and manufacturing organizations do not have the requisite expertise in housed. Thus, there is a requirement for outsourcing operations to experts in the field. It has become an accepted practice to use strategic partnerships that are known as 'third party service providers' in integrated logistics.

Most companies consider using the services of a 3PL in their supply chain operations when they realize that it is essential in providing efficient and effective competitive customer service which requires huge investment and is difficult to develop on their own.

Outsourcing has the following advantages:

1. Focus on core competencies
   - Management is freed from repetitive/mundane tasks, reduces investment and generates cash.
   - Organization can concentrate on core competencies.

2.Organizations can adopt "best-in –class" practices.

- Vendors have considerable strength and focus on outsourced processes. To remain competitive, they are continuously looking to improvise their services and adopt best practices to make them more efficient.
- This helps organizations achieve faster, efficient, effective and more economical business process.

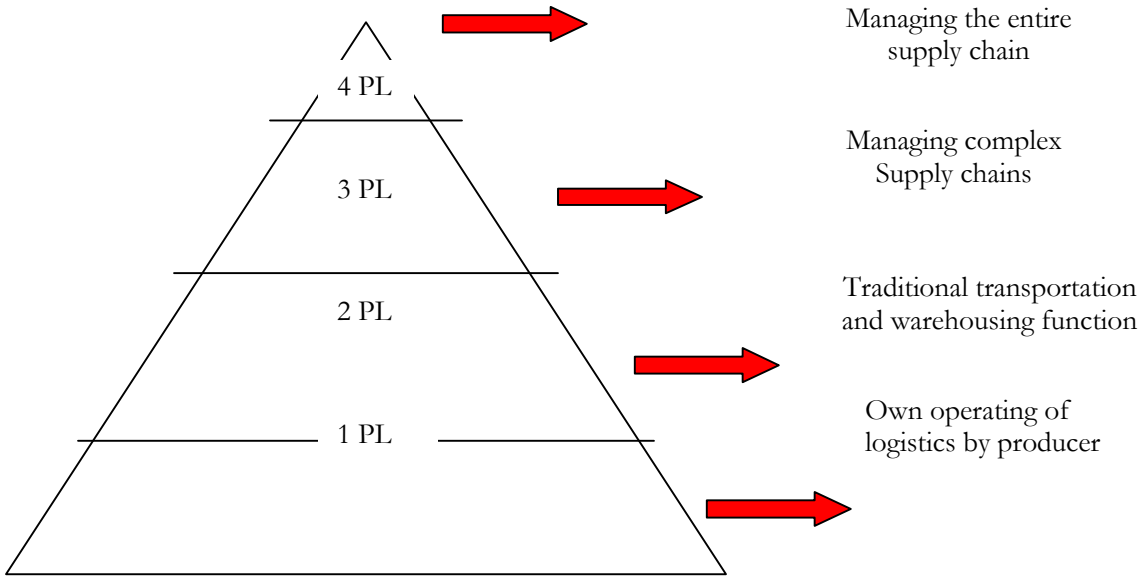
3.Organizations become more competitive

- Can respond more effectively to changing demands.
- Allows companies to gain more scalability.
- Outsourced activities allow companies to have greater leverage in responding to changes and to gain market access, expand.

4.Reduced cost and advanced technologies

- Vendors often implement latest technologies to make their processes and services. Companies can take advantage of these technologies, which they might not be always able to do if they were conducting activity in-house.
- Vendor's economies of scale helps drive down overall cost in the system, thus enabling companies to realize more productivity and efficiency.

Fig 8:Difference between various logistics service providers



First Party Logistics

First Party Logistics are companies, which do their own logistics activities.

Second Party Logistics

Second party logistics people provide their own assets such as truck owners, warehouse operators etc.

Third Party Logistics

Third party Logistics Provider (3PL) performs logistics services on behalf of another company. 3PLs provide the management skills along with the physical assets, labor, and systems technology to provide professional logistics services, relieving companies of the responsibility of performing these services themselves. 3PL's typically can provide transportation, warehousing, pool distribution, management consulting, logistics optimization, freight forwarding, transportation management, rate negotiations, cost evaluations, and contract management services.

3PL is the function by which the owner of goods outsource various elements of the supply chain to one 3PL company that can perform the management function of the clients inbound freight, customs, warehousing, order fulfillment, distribution, and outbound freight to the clients customers. 3PL is a service provider who gives service for one or more portfolios of services in stand alone or integrated manner with own or leased or contracted assets or services.

A 3PL can also be described as a contract logistics service provider who manage inventory/material flow between companies and encompasses all processes and activities such as transportation, warehousing, documentation.

Common 3 PL functions are as follows:

1. Transportation Management
   - 3PLs fleet (or alliance partners) offer optimized network to serve their customers.
   - 3PLs plan load management, routing, equipment and driver management by Shipment Management System (SMS).
   - SMS can be effectively integrated with Warehouse Management Software (WMS), to provide integrated logistics solutions concepts such as multi-stop workload or less than truckload which are often used to serve customers better.
   - Multi-vendor consolidation reduces overall costs. Full truckload economies can be used to combine freight from different vendor to common destinations.

2. Warehouse management

- 3PLs run and manage warehouses using Warehouse Management Systems, radio frequency scanning, and bar code labeling
- 3PLs manage and track the movement of goods from initial receipt to outbound shipment. Real time, periodic and accurate information can be provided to manage inventory and demand better.
- Additional services such as advanced shipment notifications can be generated to inform the retail partners in the supply chain.

3. Packaging

- 3PLs often have ability to do final product packaging in their warehouse, thus eliminating the need to ship product to off site packaging companies. This in turn means reduced product handling, reduced cycle time and reduced costs.
- 3PLs can offer variety of packaging services like custom pallets, display shippers, inserts and coupons, labeling and printing, repackaging / conversion and also wrapping and bundling.

Advantages to companies by using 3PL services: -

- Focus on core competencies: Outsourcing enables companies to focus on the core businesses and strengths. The companies limited resources can be saved and the company can remain focused on what it can do best.
- Lower Investment: Organizations can outsource and save a large amount required for building logistics assets, networks and facilities such as warehouses. As an alternative for these investments, the companies can outsource these requirements by outsourcing and investing in their core processes.
- Enhanced technological capabilities and flexibility: Utilization of technological capabilities has enhanced the efficiency of logistics operations. But, it may not be feasible always for companies to invest in newer systems or upgrade their existing systems. However, deploying third party logistics providers can insure against such technological changes. 3 PL often invest in such technologies for providing competitive services.
- Best practices: Outsourcing logistics to third party logistics enables companies to implement best practices and also allows organizations to achieve best performance.

Essential characteristics of a 3 PL

- Solutions Orientation
- Logistics Know-how
- IT Capability
- Management and organizational Skill
- Innovativeness
- Independent and best of breed approach

Fourth Party Logistics

Information technology plays a key role in logistics and supply chain management. In fact logistics integration, which is a complex exercise, is completely dependent on IT support. Third party logistic suppliers provide logistics solutions to clients on the basis of their domain knowledge they have acquired over the years. 4 PL companies provide logistics solutions built around the domain knowledge provided by third party logistics companies. Thus 4 PLs have emerged out of the vacuum created by 3PLs.

Fourth Party Logistics (4PL) is the integration of all companies involved along the supply chain. 4PL is the planning, steering and controlling of all logistic procedures (for example flow of information, material and capital) by one service provider with long-term strategic objectives. Fourth-party logistics (4PL) has evolved as a breakthrough supply chain solution comprehensively integrating the competencies of third party logistics (3PL) providers, leading edge consulting firms and technology providers.

4 PLs see the process and what is required for the process to succeed. A 4PL is a supply chain manager & enabler who assemblies and manages resources, build capabilities and technology with those of complimentary service providers. They act as the first point for delivering unique and comprehensive supply chain solutions. 4PL leverages combined capabilities of management consulting and 3PLs. They act as an integrator assembling the resources, capabilities, and technology of their own organization and other organizations to design, build and run comprehensive supply chain solutions. 4 PL is an emerging trend and it is a complex model and offers greater benefits in terms of economies of scale.

Features of a 4 PL:

- Covers the customer's entire supply chain
- Collaboration between two or more logistics service providers on a resource-sharing basis for extending logistics solutions to a common customer.
- Flexible arrangements

The following are the requirements of a 4 PL:

- 3PL cost advantage are one time achieved through the contract process
- Performance and competency across the logistics network
- Logistics planning and consulting
- IT support
- Operative and administrative logistics functions
- Customer Relationship Management
- Linking analytical capabilities with strong implementation and operational capabilities
- Building a high level of customer confidence in outsourcing and its solutions
- Offering transparent and flexible win-win contracts

Advantages to companies using 4PL services: -

- Reduced inventory and cycle time.
- Improved delivery performance.
- Lower supply chain cost.
- Improved order fulfillment, capacity utilization.
- Overall productivity.

4 PL attempts to do the following to create value by:

- Reduction of complexity/eliminate redundancy.
- Economics of scale
- Tailor made solutions
- Improved customer service at reduced cost.
- Access to new technology.

Selection of a Service Provider

Selection of a service provider is a strategic one and has long-term effects upon the customer service capabilities of an organization.

Major issues to be considered before deciding on a 3PL or 4PL partner:

- **Switching cost**: Outsourcing logistics services results in reorganizing the existing assets of a company in tuning with the working methodology of the service provider. It includes activities such as management of existing assets, fully or partly to the service provider, deploying existing assets on lease to service provider and divesting existing assets and completely switching over to the usage of a logistics infrastructure by the service provider. A high degree of risk is involved in each of the activities. Though outsourcing reduces cost substantially, switching over to other service providers in terms of poor customer service during the period of transition and stabilizing new system will cause more loss.

- **Degree of control**: The firm, which is outsourcing needs to be particular about the degree of control over activities of the service provider, for getting the desired service by the end user. It is not possible to have direct control over the activities of the service provider but the service provider should ensure timely availability of information to monitor activities.

- **Degree of outsourcing**: The following factors influence an organization's logistics outsourcing in part or in total:
  - Existing logistics infrastructure of the company
  - Policy of management for third party involvement
  - Anticipated benefits
  - Product portfolio of the company

  The areas of responsibility and authority both at the outsourcer's and service provider's end must be clearly differentiated.

- **Channelizing logistics services to suit the needs of channel partners:** Logistics service standards are to be quantified as per requirements of channel members who service the end users or consumers in turn. Logistics acts as a key enabler for efficient channel management. Channel and logistics management must go together for effective and efficient physical distribution system.

- **Interface:** Suitable co-ordination through an intelligent interface is necessary for proper working of two organizations together in partnership. A match of cultures is essential. Proper interface between employees of both organizations is very important for formulating policies and guidelines for smooth operations of the outsourcing firm and service provider. Mismatch in technologies used at the two ends may result in problems too. Differences in technologies used in communication, material handling, storage, inventory management may cause delays and errors resulting in performance below the expected level.

Key Trends in Logistics Outsourcing

The following are some of the important observations from logistics outsourcing

1. Adoption of Internet, ERP, SCP and SCE technologies continues to accelerate

- Many ERP systems are used for financials, payroll and HR, but not for core operations.
- Most ERP systems lack logistics service provider-specific functionality forcing the use of customised solutions.
- Need to increase intelligence and productivity of ERP by adding Internet communication technology, Supply Chain Planning and Supply Chain Execution components
- ROI from these technologies is often unclear.

2. Global visibility has now become a basic requirement

- Customers desiring to decrease transport costs, increase delivery reliability and cross-docking activity, and shorten cycle times are demanding end-to-end visibility of goods. For example: Shippers not only want to be able to track their goods via the Internet but also to receive automatic notification when a shipment is deviating from its schedule.
- Logistics service providers need to build or buy Inventory Visibility in the Supply Chain to meet this requirement.

3. Most carriers and 3PLs in India are unprepared to move from a transaction-based customer relationship to strategic supply chain partnerships with customers.

- Shippers expect their logistics providers to help them improve supply chain processes and increase revenues.

- Customers will succeed via mass customisation and Web commerce initiatives. Logistics suppliers need to respond to such initiatives.
- SCM IT tools will help in facilitating of cross-docking, delayed allocation, in-transit merge, postponed assembly and other value-added services, increasing their customers' supply chain agility and velocity.
- Innovators will use IT to move beyond tactical logistics to influence product and procurement strategies.

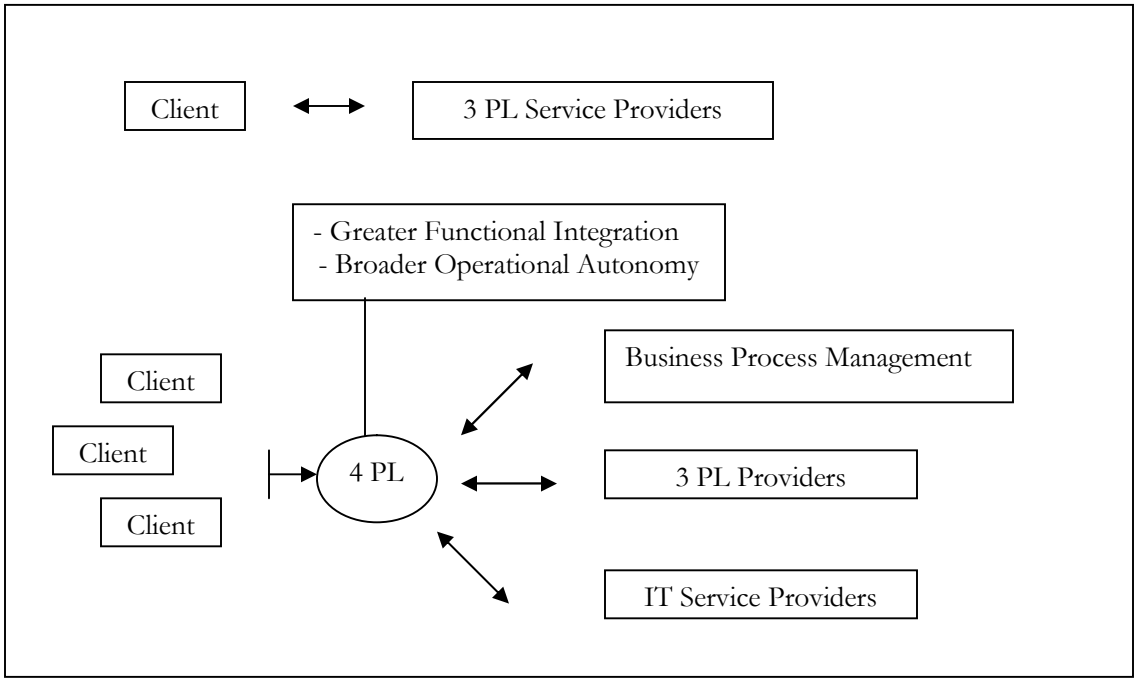
4. Ability of matching market Demand with available Supply

- Leveraging suppliers' distribution systems and collaborating closely with them to ensure seamless information flow across the supply chain.
- Using tactical initiatives such as sales promotions and pricing changes to shift demand towards in-stock products and accessories.
- Usage of scientific tools for better demand forecasting.

5. Outsourcing of non-core activities

- Increasing number of organisations are now outsourcing their non-core activities to specialist logistics service providers for whom it's their core business.
- Past cost centres have now become present profit centres and the focus has turned to innovation and continuous improvement.

Fig 9: A holistic view of 3 PL and 4 PL



Conclusion

Third party logistics service providers have the core competency in a particular area of logistics such as warehousing, transportation, inventory management etc who provide comprehensive logistics service solutions for the entire supply chain. A new and emerging trend in outsourcing is the Fourth Party Logistics who assembles and manages the resources, capabilities and technology of its own organization with those of complimentary service providers to deliver a comprehensive supply chain solution. A management's decision to outsource can be justified by its value proposition or the benefits. By outsourcing, the company gains on many fronts such as cost reduction, higher return on investments, utilization of manpower for more productive work and a clearer focus on core competency area.

Bibliography

a) Bowersox and Closs, Logistical Management, the Integrated Supply Chain Process, Tata McGraw Hill, New York, 2000.

b) Burt, Dobler, Starling, "World Class Supply Management, the key to supply chain management", Tata McGraw Hill, New York, 2003.

c) Martin Christopher, "Logistics and Supply Chain Management, Strategies for Reducing Cost and Improving Service", Pearson, New Delhi, 2004.

d) Edward Frazelle, "Supply Chain Strategy, The Logistics of Supply Chain Management", Tata McGraw-Hill, 2004.

e) Robert B. Handfield, Ernest L. Nichols, Jr., "Supply Chain Redesign, Transforming Supply Chains into Integrated Value Systems", Pearson, New Delhi, 2003.

f) Mohanty and Deshmukh, Supply Chain Management, Theories & Practices, Biztantra, New Delhi, 2005.

g) Satish Kapoor and Purva Kansal, "Marketing Logistics, a supply-chain approach", Pearson, New Delhi, 2003.

PRACTICE AREA

Objective Type Questions

1. The supplier takes charge of the inventory management of the product and also manages the replenishment process based on the customer's consumption pattern. This is known as:

a. Just in time system
b. Vendor Managed Inventory
c. Materials Requirement Planning
d. Distribution Requirement Planning

2. There are three phases in Customer Service.

True / False

3. Determining how frequently to order and in what quantity is called Production scheduling.

True / False

4. _____ refers to having the entire facility under the financial and administrative control of the firm.

a. Public Warehouse
b. Private Warehouse
c. Contract Warehouse
d. Combination Warehouse

5. _____ is a methodical or systematic analysis of supply and demand activities.

a. Logistics data mining
b. Logistics data warehousing
c. Logistics Decision Support System
d. None of the above

6. _____ integrates all companies involved along the supply chain.

a. 1PL
b. 2PL
c. 3PL
d. 4PL

7. ABC costing method involves breaking down activities into individual tasks or cost drivers, while estimating the resources (i.e., time and costs) needed for each one.

True / False

8. "B" category items as per ABC analysis refers to those items that cost approximately 60-70 per cent of the total inventory cost while they are less in number.

True / False

9. Grouping together products in cartons, bags and barrels for handling efficiency is called unitization.

True / False

10. The logistics technique used in the retail and trucking industries to rapidly consolidate shipments from disparate sources and realize economies of scale in outbound transportation is known as:

a. Lot-sizing
b. Break-bulking
c. Cross-docking
d. Assorting

11. Which one of the following is not the primary responsibility of the logistics manager?

a. Ware house management
b. Transportation
c. Managing working capital interest rate
d. All of the above
e. None of the above

12. Logistics service providers help the business in achieving any of the following goals:

a. Reducing the operating cost
b. Increasing the revenue
c. Both
d. None of the above

13. If the supply chain strategy for a product is focused on efficiency, then the primary goal of the inventory manager is to stock more to increase customer service level.

True / False

14. "A" category items as per ABC analysis refers to those items that costs approximately 60 -70 per cent of the total inventory cost while they are less in number.

True / False

15. Random location of storage means that goods of a particular group are stored together in a given area.

True / False

16. At Wal-Mart distribution centers, products are exchanged between trucks such that each truck going to retail store has products from different vendors and such a practice is called cross-docking.

True / False

17. Export Management Companies (EMCs) are intermediaries that market another firm's products overseas by actually buying the manufactured goods, taking title and then sell these goods in export market.

True / False

18. Which one of the following is not part of the cost leadership / reduction strategy in logistics management:

a. Extensive IT support mechanism
b. Scale economics based warehouse operations
c. JIT, Cross-docking and Production Postponement
d. Increasing vendor base for increasing supply source
e. None of the above.

19. Logistics system architecture include:

a. Data warehouse management
b. Execution components
c. Both
d. Neither

20. A conventional organization has a vertical design where functions are identified and within these functions, tasks are identified and there is a formal hierarchy that employees need to progress.

True / False

21. Materials handling adds both to cost and value.

True / False

22. A Forklift truck is a semi-variable path equipment.

True / False

23. 'A' class items are those with high unit cost.

True / False

24. Transportation cost is only directly related to distance.

True / False

25. Cradle-to-cradle logistical support is the same as life-cycle support.

True / False

26. The primary repeat primary unit of analysis for integrated logistics in the performance cycle.

True / False

27. Only form and possession utilities add value to the customers. The form utility is generated during the manufacturing process and marketing creates possession. Logistics is, therefore, a redundant function created by elite academics.

True / False

28. Logistical costs are always high at the introductory phase of product life cycle.

True / False

29. Scrambled merchandising will arise at the growth stage of PLC.

True / False

30. Logistics quality is all about reliability.

True / False

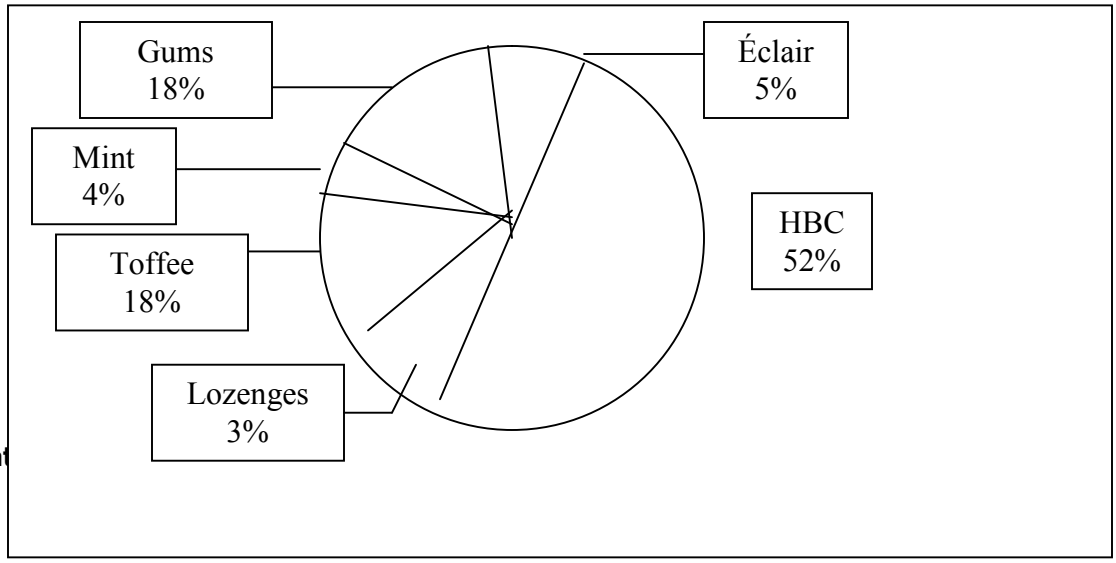
Paragraph Type Question

1. What is the 'key' difference between Logistics and Supply Chain Management
2. Explain the various modes of transportation and compare each mode's merits and demerits
3. Briefly define Integrated Logistics
4. What are the major Logistics functions
5. Explain the various warehousing alternatives.
6. What is the basic objective in logistics design and analysis study? Is it normally a one-time activity?
7. Why is a cost benefit evaluation important to logistical systems design efforts?
8. What managers in a logistical organization are most apt to be concerned with direction focused information? How does direction information relate to variation and decision information?
9. What is the purpose of a trend report? How does it utilize status report information?
10. What environmental factors enable time-based competition in today's business arena? Discuss time-based competition on logistics operation.
11. Provide a definition and an example of strategic storage from a logistical system you are familiar with.
12. Under what conditions could it make sense to combine private and public warehouses in a logistical system?
13. Explain the three phases of customer service with a suitable illustration
14. Discuss any three of the following:
    a) Economic Order Quantity
    b) Just-in-time
    c) Vendor Managed Inventory
    d) Distribution Requirements Planning
15. Elaborate the functions of warehousing, its benefits and type.
16. Explain the need to have proper measurements in monitoring and control of logistics activities
17. Analyze set of metrics for quality, customer responsiveness and financial performance.

Model Case Study

1) Lean Supply Chain Through Demand Management

Traditionally, confectionery has been seen a transformation with the conventional chocolate éclair complemented by a host of fruit filled, soft centred, coffee cream and caramelized candies. Broadly, the entire confectionery market can be divided into 7 major categories namely, hard-boiled confectionery (HBC), toffees, éclairs, chewing gum, bubble gum, mint and lozenges. The entire confectionery market in India is estimated to be 80,000 tonnes in volume and Rs. 7 billion in value.



Major cat

The Indian Chocolate market grew at the rate of 10 per cent per annum in the 1970s and 1980s, mainly due to the children segment. However, in the 1990s the industry witnessed a growth of 12 per cent. ORG-MARG estimates that chocolate penetrated just 5 per cent of Indian households in the year 2000, as against sugar boiled confectionery, which reached 15 per cent households. Even considering the urban market alone, this category reached just 22 percent urban consumers. Of the total market, the chocolate segment makes 22,500 tonnes, which is valued at Rs. 400 crore, and is dominated mainly by Cadbury's and Nestle.

In the late 80s when the market started stagnating, Cadbury's repositioned its Dairy Milk as an anytime product rather than an occasional luxury. Its advertisement focused on adults rather than children. Cadbury's Five Star, the country's first chocolate, was launched in 1968. Due to its resistance to temperature, Five Star has become one of the most widely distributed chocolates in the country. Other

competing brands, such as GCMMF's Badam Bar and Nestlé's Bar, have minor shares. In the early 90s, high cocoa prices compelled manufacturers to raise product prices and reduce their advertisement budget, affecting volumes significantly. The launch of wafer chocolate Kit Kat and Perk spurred volume growth in the 1990s. These chocolates were positioned as snack food rather than as an occasional indulgence.

Chocolate consumption in India is extremely low as compared to foreign countries. In India the consumption is around 160 gm in urban areas as compared to 8 to 10 kgs in developed countries. In rural areas, consumption is even less.

Cadbury's a subsidiary of Cadbury's Schweppes, is a dominant player in the Indian chocolate market, with brands like Dairy Milk, Five Star, and Perk. Dairy Milk is in fact the largest selling chocolate brand in India. Chocolates contribute to 64 per cent of Cadbury's sales turnover. Confectionery sales account for 12 per cent of their turnover. Cadbury's attempting to expand its confectionery product portfolio with the launch of sugar based confectionery but it is not a success story. In malted health drinks Cadbury's has a strong presence in Bournvita, which accounts for 43 per cent of its sales turnover.

Cadbury's continues to dominate the chocolate market with about 70 per cent market share. Nestle has emerged as a significant competitor with about 20 per cent share. Key competition in chocolate is from Amul and Campco besides a host of players from the unorganized sector. In confectionery products Cadbury's enjoys a 4 per cent market share, wherein leading national players are Nutrine, Ravalgon, Cadinco, Parle's, Joyco India, and Perfetti. MNCs like Joyco and Perfetti have aggressively expanded their presence in the country in the last few years.

The malted drink category covers white and brown drinks. White drinks account for two third of the 80,000 tonne market. The South and East are the largest markets in India for food drinks. Cadbury Bournvita is the leader in the brown drink (cocoa based) segment. In the white drink segment SmithKline's Horlicks is the leader. The other significant players are Heinz(Complan), Nestle(Milo), GCMMF(Nutramul), and other Smithkline brands(Boost, Maltova, Viva). Cadburys holds 14 per cent of the share in the health drinks market.

Despite tough market conditions and increased competition, Cadbury's managed to record a double digit (11 per cent) top line growth in the year 2000. The company achieved volume growth of 5.2 per cent. This was achieved through innovative marketing strategies and focused advertising campaign for its flagship brand Dairy Milk. The net profit of the company rose by 41.8 per cent to Rs. 520 million in 2000.

Reduced material cost, effective and efficient logistics operations, and tight controls on working capital enabled the company to grow. The company added 6 million consumers and saw the growth of its outlets to 4.5 lakh and consumers to 60 million.

Cadbury's management has cut down on its growth target by setting a target of 10 per cent average volume growth for the next three years (as against 12 per cent growth in volume and 20 per cent in value, as targeted earlier). Coupled with inflationary price increases, this could translate into top line growth of 14 to 15 per cent. This target is also difficult to achieve due to consumer slowdown and the fact that the company is dependent on a single category – chocolate – to drive growth. In the malted food drinks category the company faces stiff competition from Smithkline Beecham and market share is stagnant at 14 per cent, despite the company's efforts and investments in repositioning the brand. Efforts at the expanding confectionery portfolio have also not yielded the desired results. The management has declared its intension to focus on Eclairs for the time being in this category. In chocolates, the onus is on two to three brands that have supported the company's growth in the past. Cadbury's dominates the Indian chocolate market with 70 per cent market share.

Product Categorywise Contribution to Cadbury's Sales

Product Category	Contribution in sales turnover (%) 1994	Contribution in sales turnover (%) 2000
Chocolate	59	64
Sugar confectionery	9	12
Food Drink	32	24

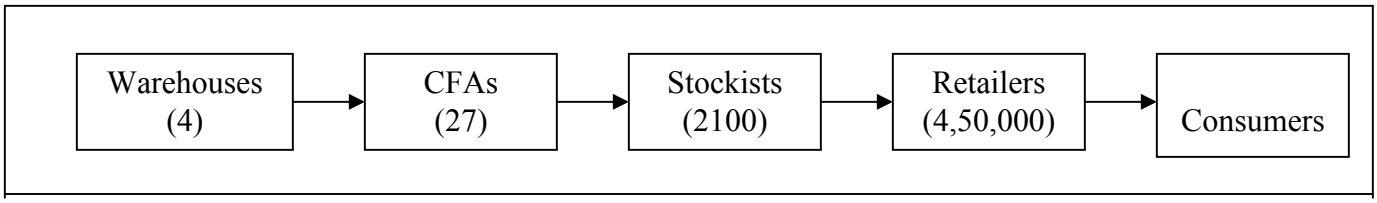
Cadbury's main manufacturing facilities are at Thane (Maharashtra), Gwalior(Madhya Pradesh), Hyderabad(Andhra Pradesh), and Pune(Maharashtra), Cadbury's also outsources manufacturing to third parties, who are located at Phalton, Warna, and Nasik in Maharashtra. The raw material is procured from Uttar Pradesh, Gujarat, and Maharashtra.

Cadbury: Income and Profit Growth

Year	Income (Rs. Million)	PAT (Rs. Million)
2001	6263.2	597.2
2000	5711.4	523.1
1999	5110.8	412.3
1998	4283.3	264.2
1997	3541.4	185.7
1996	3118.0	203.2

Source: Annual Reports

The company controls its marketing operations through four regional offices located at Mumbai, Delhi, Kolkata, and Chennai. Each branch has 4 to 6 depots managed by carrying and forwarding agents (CFAs). There are 27 CFAs located across the country. Material is supplied to the CFAs from 4 warehouse hubs located at Thane, Gwalior, Hyderabad and Pune. These CFAs supply material to 2,100 stockists, who in turn serve 4,50,000 retailers. The company has a total consumer base of 60 million.



Marketing supply chain at Cadbury's

As the product melts above 35 C, all the Cadbury warehouses are installed with temperature controlled facilities. CFAs store the products in cold storage with storage areas varying from 2,000 to 5,000 sq ft. The hub warehouses are bigger, with areas varying from 20,000 to 45,000 sq. ft, depending on the demand in the region. The product is transported through refrigerated vehicles. The average pack size is 2 feet x 2 feet x 2 feet with a maximum weight of 20 kilograms. Cadbury's has excellent connectivity with its braches, CFAs and stockists. They have developed and extended IT support throughout the distribution network. Cadbury's is attempting to improve distribution quality. To address the issue of product stability they have installed Visi coolers at several retail outlets.

For product transportation Cadbury's uses two types of vehicles, insulated (for chocolates) and non-insulated (for chocolates) and non-insulated (for products that are not temperature sensitive). In 85 per cent cases they go in for containerized vehicles, while in 15 per cent cases they use open trucks. All consignments are full load trucks.

Currently Cadbury's outsource transportation to various parties. The insulated vehicle category includes National Freight Transport (NFT), Fresh Express, Assam Transport, Haryana Freight Carriers (HFC), Interstate etc. while dry type vehicles includes Best, Delhi Road Services (DRS), Shivalaya, East India Transports, and Transport Corporation of India (TCI). The logistics cost incurred in distribution is around 10.5 per cent of the sales value. The contribution of transportation cost and warehousing cost to the logistics cost is to the extent of 45 and 55 per cent respectively.

Cadbury's presently maintains 15 days finished goods inventories at its various warehouses and 18 to 20 days at the CFA locations. For cost reduction the management is planning to reduce the inventory level further to 8 to 10 days at warehouse hubs and 15 to 16 days at each CFA, without losing out on the market front. The major deciding factor is demand accuracy. Even though the firm has excellent connectivity with its warehouses and CFAs, it has no direct interaction with the retailers and customers.

Discussion Questions

1. For reduction of inventory level, what measures should the company adopt, without sacrificing customer service and market share?
2. Does Cadbury's need to undertake any major changes in its distribution network?
3. Discuss the nature of logistics programmes the firm needs to evolve for different channel members.

2) The Case of Alpha Machinery

It's monsoon time and Mr.Ranjit, C.E.O of Alpha Machinery Manufacturers located out of Pune was struck at Bangalore after he missed out a evening flight to Pune, thanks to the traffic jam. He went back to his guest house and gathers his thoughts for the next day Board meeting wherein he needs to address some serious concerns the Board has on the performance of the company. Mr.Ranjit was made the C.E.O four years back when this engineering machinery company was growing because of a buoyant economy. Alpha manufactures specialty equipment in this industry and its fortune hinges on the engineering industry performance.

Alpha's current sales are about Rs.288 crores. But there is tremendous pressure on sales. Mr.Ranjit had projected growth in sales for his Board but the last quarter results (which is to be shared with the Board on the next day) shows declining trend in sales. However, the pressure on costs is going up compounding the problem of "squeezing margins". Mr.Ranjit is worried from many angles including his prospects as C.E.O., his moral responsibility to stakeholders and future of employees. He decides to take on the issue and picks a discussion with his finance controller Mr.Jose. Mr.Ranjit knows that Mr.Jose is a seasoned professional of high calibre. In fact, he is the man waiting for the C.E.O slot if a change were to happen!

Mr.Ranjit tells Mr.Jose that the losses currently happening need to be plugged. Can any one disagree! But the time frame fixed was next quarter. He advises to revise the estimated numbers for the next year at 5 per cent profits, a 20 per cent increase in sales and he is not contended. He defined that the profit contribution should happen by controlling costs especially through reduction in labor, material and overheads. He suggests to Mr.Jose every rupee saved is every rupee earned as profit.

Mr.Ranjit suggests that inventories are high and recommends at least 10 per cent reduction in inventory by improving the manufacturing process and discipline. Mr.Jose responds stating that one cannot be ad hoc in determining the percentage of reduction. Mr.Ranjit responds harshly that ad hoc or scientific, the target must be achieved. Rather he states that he would be happy if scientifically proven that more of inventory could be reduced.

The company has inventory worth Rs.48 crores and 10 per cent reduction in inventory means release of Rs.4.8 cores. A better management practices could reduce carrying cost of Rs.1.2 crores a year. Apart from this, Mr.Ranjit also recommends reducing the size of purchase department. He tells Mr.Jose that there is a trend to outsource a number of activities and also to deploy right kind of technology and people with supply chain perspective and current level of staffing could be reduced. Mr.Jose is shocked

but refused to react immediately. Sensing his discomfort, Mr.Ranjit comforts him stating that we may lose some good people for the overall interest of the organization.

Mr.Ranjit ends the telephone conversation stating that some of the issues may crop up at the next day's Board meeting and Mr.Jose must meet him at Pune office by 9 a.m with details and a plan to manage the future of the company.

Mr.Jose digs at his desk and laptop at office immediately after the conversation. He also catches up a conversation with his colleagues informally on the pretext of the next day's Board meeting on operations review. He finds that the purchases aggregate to Rs. 172.80 crores for the above project turnover. The company buys a wide variety of materials from few kilograms of rare material to tons of specialty steels. A big part of the purchase budget goes on foundry castings, forgings stamping, fasteners and sub-assemblies. Many of these are currently supplied by vendors who have been nurtured over years. Some of them are exclusive suppliers and their fortunes are tied with the company.

The purchase department is responsible for buying, vendor coordination, in-bound material movement and so on. The department has a general manager and a team of vendor coordinators, engineers and support staff. The current cost of the department covering their salaries and benefits is about Rs. 1.48 crores.

Mr.Jose calls his new management trainee from a premier school to help him to resolve some of the issues and support his boss, Mr.Ranjit.

Questions:

1. Discuss the actions that Mr.Jose may take on reducing inventories by 10 per cent and is it good to reduce inventories and does Mr.Ranjit sound ad hoc?
2. How would you manage the cost of goods purchased?
3. What are the steps to be taken for reducing the payroll cost? Develop options for the same.

3) Dilkhush Products Ltd.

Dilkhush Products Ltd is a typical FMCG company with an annual turnover of nearly 700 crores. It has six factories, 30 depots and 3500 distributors spread over the entire country. It product profile comprise of ten categories such as branded coconut oil, jam, cooking oil and special flavors. At one time, Dilkush was faced with considerable difficulties in terms of forecasting. At the depot or the godown level, variations on some SKUs were in
the range of as much as 100%. There were also complexities in distribution on account of the large number (3,500) of distributors across the country. This would invariably lead to a pile up of inventories at certain places and stock-outs in others. Visibility of stocks at the distributor level was low, because after invoicing, it was impossible to determine the level of stock that distributors were holding.

The only source for this was the secondary sales figure. These figures were collated manually once a month, and their accuracy was always questionable (in the FMCG industry, secondary sales calculation is the bigger challenge; primary sales are always easier to collate). Because planning cycles were fixed, decisions could not be taken online. Processes were highly individual or employee-dependent, and in the absence of an integrated approach, there was little or no communication.

The planning cycle was only 15-20 days - hardly enough to allow corrective action. Apart from the annual budget, the firm operated on a fixed 3-month cycle. Thus, once the output at the end of these 3 months was decided, nothing could be done in the interim. The result was that if the output for the first month were in excess, the next 2 months' stock would simply pile up. Invisibly therefore, there were skews towards the ends of quarters. The firm had fixed dispatch plans for the quarter – these were followed even if sales were low. There were coordination difficulties between the sales and manufacturing department, as managers were not using the same data.

Typically, sales staff would complain they lost sales because of stock-outs, while the back room would say that there were excess supply lines somewhere in the system, about which they were unaware. The planning cycles for sales and manufacturing did not match. There was no system for distribution planning – one would wait for the sales person or distributor to call up and place the order. Some means of replenishment order generation was tried – however, they were on stand-alone systems and did not succeed. There were several 'islands' of information, inconsistencies in the MIS and no data visibility across the system. The firm had to do a lot of cleaning up before new technology could be brought in.

Mr. Kelkar, the Sales and Distribution manager recently attended a seminar on 'Supply Chain Management' organized by an Institute of Management. He realized them that Integrated SCM approach is the only way to get out of all the present ills of the company. He also saw a huge opportunity for cost savings with such an approach. However he was confused as to how to proced since any wrong move or faulty implementation will have serious consequences to the company.

Questions: (Answer any three)

Summarize Dilkhush's present problems in Sales and Distribution.
Identify the potential areas for cost savings with an integrated SCM.
Identify specific action plans for implementing integrated SCM including the role of IT.
Indicate appropriate performance metrics to measure the various aspects of Supply Chain performance in FMCG business such as DILKHUSH Products Ltd.

4) Audio Duplication Service, Inc. (ADS)

Audio Duplication service is a compact disk and cassette duplication and distribution company. Its major customer, the big record companies, uses ADS to duplicate and distribute CDs and cassettes. ADS stores the master tapes and, when a customer requests it, makes a certain number of copies and delivers them to its customers' customers, music stores and others point of sale such as department stores Wal Mart and Kmart and electronic stores such as Circute City and Best Buy. ADS has about 20 percent of the $5 billion market, while its two biggest competitors share another 40 percent.

Manager at ADS are currently trying to understand and react to some difficult supply Chain- related issues.

Some of the big national retailers are putting pressure on ADS's customers, the record companies, to manage inventory in the following way, know as a vendor –managed inventory, or VMI, agreement. The record companies will be put in charge of deciding how much of each album, CD, and cassette title is delivered to each store and when each delivery is made. To help with these decisions, the record companies will be provided with continuously update point- of –sale (POS) data from each of the stores. Also, the record companies will own the inventory until it is sold, at which point payment will be transferred from the retailers to the record companies. Since ADS provides the record companies with duplication and distribution services, the record companies have asked ADS to help with the logistics of the VMI agreement.

In the past, ADS has shipped to the distribution centers of large national retailers, and the retailers have arranged for distribution to the individual stores. Now, the retailers are providing strong incentives to ship directly to individual stores. Of course, this means higher expenses for ADS.

In general, ADS's shipping costs are increasing . Currently, ADS has a shipping manager who arranges with different shippers to make deliveries on a shipment-by-shipment basis. Perhaps there is a better way to manage these deliveries, either by purchasing a fleet of trucks and doing the shipping in house or by outsourcing the entire shipping function to a third party. May be something between these two extremes will be best.

Of course, ADS is facing even bigger issues, such as the future of the audio duplication industry as on-line audio distribution technology become more prevalent. In any event, each record company periodically reviews its contract with its audio duplication service, so management must address each of the above issues effectively for the company to remain successful.

Questions:

1. Why are ADS's customers' customers moving towards VMI arrangements?
2. How will this impact ADS's business? How can ADS management take advantage of this situation?
3. How should ADS manage logistics?
4. Why are the large national retailers moving towards a direct shipment model?

5) Table below shows the annual usage in Rupees of 10 types of items:

SLNO	ANNUAL USAGE UNITS x 1000	UNIT COST Rs.
1	30	0.10
2	300	0.15
3	2	0.20
4	60	0.10
5	5	0.30
6	300	0.10
7	10	0.05
8	7	0.10
9	20	0.10
10	5	0.20

(a) Draw graphically ABC Curve and establish percentage of 'A', 'B' and 'C' class items.

(b) Do you think that ABC classification follows arbitrary norms?

(c) Establish mathematically how ABC analysis can reduce the inventory locked up.

(d) Form an 'ABC – VED' matrix and formulate buying norms.

6) In a Board meeting, a decision was taken by the Board of Directors to reduce the Inventory holdings by 10%. The following data are given:

a) The average Inventory value of the company – Rs. 290 crores
b) The company follows 'Q' System for ordering
c) EOQ was computed with 15% carrying cost and Rs. 200/- cost/order
d) Safety stock carried for strategic logistical reasons – Rs. 90 Crores.

Note:- You are not supposed to tinker with the existing logistical strategy or attempt any reduction or lay-off of purchase establishment.

Give your proposals to the top management with logical mathematical reasoning.