Directorate of Distance Education

UNIVERSITY OF JAMMU

JAMMU

SELF LEARNING MATERIAL

B.COM. SEMESTER-VI

SUBJECT : LOGISTIC MANAGEMENT **UNIT I–IV**
COURSE NO. : BCG-604 **LESSON NO. 1–12**

Course Co-ordinator

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http:/www.distanceeducationju.in
Printed & Published on behalf of the Directorate of Distance Education, University of Jammu by the Director, DDE, University of Jammu, Jammu.

LOGISTIC MANAGEMENT

REVIEW & EDITING :

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Printed by :- Rohini Printers / 2022 / 400

UNIVERSITY OF JAMMU
B.COM. SIXTH SEMESTER

LOGISTIC MANAGEMENT

C.No. BCG 604

Max Marks = 100
Internal assessment = 20
External exam. = 80

OBJECTIVE: The course is designed to explain basic theory and techniques of logistics to examine the issues and problems associated with logistics in a changing business environment and to show how logistics could improve enterprise effectiveness.

UNIT-I: INTRODUCTION

Meaning of logistics and its interface with production and marketing; Types of logistics; Logistics management- Meaning, scope and importance, need for logistic management and logistical activities. Logistic system design.

UNIT- II: WAREHOUSING MANAGEMENT SYSTEM

Nature and importance of warehousing; Relationship between warehousing and other logistic functions; Types of warehouses; Decisions regarding optimal warehousing network; Warehouse facility development; Uses of warehousing management system.

UNIT- III: TRANSPORTATION PLANNING SYSTEM

Transportation system planning; Role of transportation in logistics; Trip generation and distribution; Load planning- Transportation modes, carrier selection decisions, other activities of transport managers,

UNIT- IV: LOGISTICS AUDIT AND CONTROL

Concept and importance of logistics audit and control; Elements of logistics control system; Types of control system; Significant aspects of control systems; Types of corrective action.

BOOKS RECOMMENDED

1. Bhat, K. Shridhara : Logistics Management, Himalaya Pub. House , New Delhi
2. Ballalu - Renald H : Business Logistics Management
3. Beal ,K : A Management Guide to Logistics Engineering
4. Benjamin, S.B : Logistics Engineering and Management.
5. Bowersox, D J : Logistics Management - A System Integration of and closs, D J Physical distribution.
6. Christopher, M. : Logistics and Supply Chain Management: Strategies for Reducing Costs And Improving Services.
7. James, C.J. and : Contemporary Logistics, Wood Donald F
8. Shapiro, R : Logistics Strategy- Cases and Concepts
9. Bell G. et al. : The Business of Transport

NOTE FOR PAPER SETTER

Equal weightage shall be given to all the units of the syllabus. The external Paper shall be of the two sections viz, A & B of three hours duration.

Section-A: This section shall contain four short answer questions selecting one from each unit. Each question shall carry 5 marks .A candidate shall be required to attempt all the four questions. Total weightage to this section shall be of 20 marks.

Section-B: This section shall contain eight long answer questions of 15 marks each. Two questions with internal choice shall be set from each unit. A candidate shall have to attempt any four questions selecting one from each unit. Total weightage to this section shall be of 60 marks.

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MODEL QUESTION PAPER
LOGISTIC MANAGEMENT

Max marks:- 80
Time allowed:- 3 hrs

Section- A (Marks .20)

Attempt all the four questions. Each question carries five marks.

1. Explain the concept of logistics management?
2. Explain the uses of warehousing management system?
3. Briefly discuss the role of transportation in logistics?
4. Explain briefly the elements of logistics control system?

Section- B (Marks 60)

Attempt any four questions selecting one from each unit. Each question carries 15 marks.

1. What is logistics? State its various components?

   Or

   Explain the need for logistics management?

2. Explain the various operations of warehousing?

   Or

   Enumerate the relationship between warehousing with other functions of logistic management?

3. Explain the various activities of transportation managers?

   Or

   Discuss the general criteria for carrier selection?

4. What is logistics audit. How is it done?

   Or

   Discuss the three types of corrective actions used in logistics control systems?

C. No. :- BCG-604	**UNIT-I**
SEMESTER: VI	**LESSON: 1-3**

INTRODUCTION

STRUCTURE

1.1 INTRODUCTION

Business logistics is the planning process as well as the implementation of efficient and effective storage of raw materials, inventory, finished goods and services. It also refers to the flow and transportation of product from the warehouse to the consumer. Service organizations also value business logistics. Logisticians make certain that materials and information is provided at the time of service delivery. Logistics are an integrated approach. An efficient and effective logistics system needs an integrated approach where all the elements of logistics have to be considered to get a balanced service level that includes transit time, reliability and above all, cost. If a company chooses a slower mode (e.g. waterways) of transport to get a lower transport cost, the company may have to bear higher inventory and warehousing costs and the transit time will be higher. Another issue to be considered is that due to the requirement of multiple handling at modal transport, reliability remains an important issue. Also another such balancing act is to choose between frequent delivery with small lots and less frequent delivery with bigger lot size (e.g. of raw material). In the case of frequent with smaller lot supply will incur higher transport costs but lower inventory and warehousing costs. Thus the managers responsible for hiring transport and warehousing services have to liaison with the inventory manger to make a trade off and adopt the best policy for getting logistics services. Another issue that may need to be considered is that part of the transport chain may be unreliable, which could be due to a number of factors, such as bureaucratic border crossing formalities or loss or theft issues. Today we are living in a truly global village. We buy many products from stores such as Tesco that receives thousands of items from all over the world, every day or week. Each item has an individual transport chain using multi-modes. When sourcing a particular product from a foreign country, the logistics manager must have knowledge of the logistics service level in that country as well as countries in transit. The Logistics Performance Index (LPI) is produced by the World Bank. The LPI for 2012 offers ranking of countries worldwide based on a survey of logistics service operators working in these countries. They survey collected feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. The LPI consists of both "qualitative and quantitative measures and helps to build profiles of logistics friendliness for these countries. It measures performance along the logistics supply chain within a

country and offers two different perspectives: International and Domestic. International LPI provides qualitative evaluations of a country in six areas by its trading partners e logistics professionals working outside of the country. Domestic LPI provides both qualitative and quantitative assessments of a country by logistics professionals working inside it. It includes detailed information on the logistics environment, core logistics processes, institutions, and performance time and cost data."

1.2 OBJECTIVES

After completion of this lesson you shall be able to know:

- Concept and meaning of logistics
- Types of logistics
- Concept of Logistics management
- Need for logistic management and logistical activities
- Logistic system design

1.3 MEANING OF LOGISTICS AND ITS INTERFACE WITH PRODUCTION AND MARKETING

1.3.1 Meaning of Logistics

The word "logistics" is derived from the Greek adjective logistikos meaning "skilled in calculating." The first administrative use of the word was in Roman and Byzantine times when there was a military administrative official with the title Logista. There were divisions in the military who were responsible for the supply of necessary arms, ammunition and rations as and when they were needed, for example when they had to move from their own base to a forward position. In that situation the logistics division would provide all the necessary support to move the arms, ammunitions, tents, foods etc. In the ancient Greek, Roman and Byzantine empires, there were military officers with the title 'Logistikas' who were responsible for financial, supply and distribution matters.

In 1991, the council of logistics management defined logistics as:

"Logistics is the process of planning, implementing and controlling of efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption for the purpose of conforming to customer expectations."

Bowersox and Closs offers a more organised definition in the year 1996, which is as follows:

Logistical Management includes the design and administration of a system to control the flow of materials, work-in-progress, and finished inventory to support business unit strategy."

Thus, a comprehensive definition of logistics can be given as follows:

"Logistics management refers to designing, developing, producing and operating an integrated system, which responds to customer expectations by making available he essential quantity and quality of products as and when required in order to provide best customer service at least possible costs".

The concept and nature of Logistics

"Logistics is an internal combination of inter related managerial functions that ensures a smooth flow of raw materials, semi-finished goods and finished goods from the first production point to the point of consumption. Thus, the range of logistics includes a set of activities, like procurement, material handling, storage and warehousing.

The Oxford English dictionary defines logistics as; "The branch of military science having to do with procuring, maintaining and transporting material, personnel and facilities." Another dictionary defines logistics as "The time related positioning of resources." Logistics is also commonly seen as a branch of engineering which creates "people systems" rather than "machine systems", but the modern logistics concept and practice is about providing cost and time effective services for non-military, mainly commercial activities. This service includes the transport of goods from one point to another, warehousing them in a suitable place, inventory, packaging, and other administrative activities such as order processing. Generally logistics is about adding "place utility" to a product meaning that, for example, a product needs to be moved from one point say Newcastle upon Tyne, UK to another point say Budapest, Hungary.

The product could be raw material to be processed (thus will also need material management) in a factory, or the product could be purchased in the finished form from the factory and to be distributed to the market for consumption.

In terms of "place utility" in logistics, this is due to the fact that a buyer and a seller of the product have agreed to sell and buy the product at certain conditions that include delivery price and time. As per the agreed conditions, a transport and/or logistics service provider will be hired (by the buyer or seller depending on the sales terms) to move cargo from the seller's premises to the buyer's premises. When it is in transit or under logistics service, the "product" will be termed as "cargo" or "goods". As per the agreement, the cargo may need to be stored in somewhere along the transit; this service is termed as 'warehousing' and depending on the necessity and type of cargo, the warehouse location, size, type etc. will be determined. The buyer may buy the product in a big lot for once in a month or every week in a smaller lot and this decision influences the level of inventory the buying company has to maintain. It can be noted that inventory costs capital and interest.

To determine the optimal size of the inventory level, there are concepts such as Just-in-time (JIT) which is a 'pull' technique meaning that the buyer will receive the product only when it is needed. This concept aims to have an effective inventory level of "zero". In contrast the traditional approach is the 'push' technique where, the buyer will buy the product a lot and will maintain a certain level of inventory. Such an inventory approach is discussed further in a later chapter. For the transport and warehousing services, the product will be suitably packed depending on the type of product it is. From the beginning to end there will be some administrative activities such bill of lading (B/L) issued by the transport service provider. The B/L contains details of the shipment of the product and gives title of the shipment to a specified party (here the buyer). B/L is a very important document used in inter-national trade to provide guarantees that the seller (exporter) receives payment and the buyer (importer) receives the product.

1.3.2 Interfaces among Purchasing, Production, Logistics, and Marketing

The purpose of production logistics is to ensure that each machine and workstation is

being fed with the right product in the right quantity and quality at the right point in time. The issue is not the transportation itself, but to streamline and control the flow through the value adding processes and eliminate non-value adding ones.

Production logistics can be applied in existing as well as new plants. Manufacturing in an existing plant is a constantly changing process. Machines are exchanged and new ones added, which gives the opportunity to improve the production logistics system accordingly.

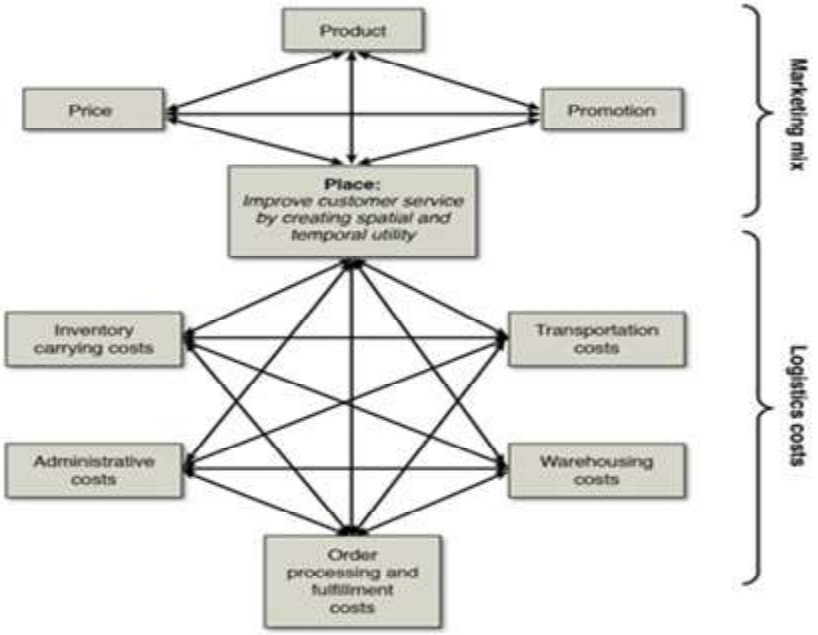
Production logistics provides the means to achieve customer response and capital efficiency. Logistics quality is defined in terms of performance "gaps" and is measured as the ability to distribute a product or materials in conformance with customer requirements and standards. It is also measured as the ability to deliver products, materials and services without errors, defects, mistakes, or other gaps from customers' expectations, where "customers" include both internal and external customers. For internal customers, logistics must facilitate and serve their functional capabilities in order to achieve process integration. Although not exhaustive, these 23 capabilities are most representative of their respective functional disciplines.

Supply-management interface capabilities shows the supply interfaces of specific logistics capabilities with production, marketing and the "platform" case of new product development. In keeping with the logistics focus of this research, channel supply capabilities are defined and measured in terms of spatial, physical, and systemic properties. Channel distribution is measured as the ability intensively to distribute materials and products to selected target markets. It is also measured as the ability to extensively distribute to wide geographical areas. In turn, logistics total cost minimization is measured as the capability to minimize total system costs so that cross-functional cost-tradeoffs are explicitly considered. It is also measured as process optimization, rather than functional sub optimization of isolated, individual functional capabilities. Together, channel distribution and total cost minimization make up the supply-management interface capabilities of logistics with production, marketing and new product development.

There are three dimensions of supply chain management:

- **Intra-functional coordination** which administers the activities and processes within the particular function (e.g., logistics) of a firm
- **Inter-functional coordination** between logistics and purchasing, logistics and production, and logistics and marketing among the functional areas of the firm
- **Inter-organizational coordination**, which takes place between legally separated firms such as manufacturers and their suppliers.

This emphasizes the inter-functional coordination between several business functions. For instance, the production of finished goods requires acquisition of raw materials, parts, and components, which triggers a set of purchasing activities. Also, the quality of incoming materials and parts obtained through purchasing often determines the quality of finished goods for sales and distribution. Thus, purchasing is tied to production, marketing, and logistics. From cost perspectives, an effort to lower logistics costs by consolidating smaller shipments and using a slower mode of transportation would increase lead time and consequently increase inventory carrying costs, while hurting customer services through the delayed deliveries. That is to say, a change in logistics activities directly influences the effectiveness and efficiency of production and marketing. In particular, logistics is closely linked to marketing through their roles in customer services. By the same token, real-time point-of-sales information fed by the retailer would prepare for the manufacturer to produce and keep the appropriate stock level and requires less need for large warehousing space. This example illustrates the influence of marketing on production and logistics. Considering these interdependences among purchasing, production, logistics, and marketing, a balancing act is needed to achieve the desired benefits of the firm as a whole. Such a balancing act can be put together effectively through supply chain integration.



The logistics and marketing interface

1.3.3 Theory of Constraints (TOC) for Supply Chain Management

The strength of the supply chain link can dictate the effectiveness and efficiency of the supply chain partnership and the ultimate success of the supply chain. To maximize the supply chain benefit, supply chain partners should uncover weak links and prevent variations in supply chain capacity (e.g., production/distribution capacity and inventory) and supply chain performances. Perhaps one of the most effective ways of doing so is to apply the theory of constraints (TOC) to supply chain management. The core idea in TOC is that every system such as profit-making firms must have at least one constraint that limits the system from getting more of whatever it strives for and consequently determines the output of the system. A constraint is anything in an organization that hampers the organization's progress or increased throughput. Thus, the firm's failure to manage this constraint leads to the significant decline in its productivity. The same TOC analogy can be made to the supply chain, where the weak supply chain link can limit the effectiveness and efficiency of the entire supply chain. In other words, the supply chain will fail at the weakest link.

For example, the part production slowdown and the subsequent delivery delays caused by the upstream supplier would increase the lead time for the downstream manufacturer and distributor and then result in product shortages at the retailer. These product shortages would not allow the retailer to meet customer needs and consequently would deteriorate customer services. In this example, the supplier's production capacity will become the system's (supply chain's) constraint. In TOC terms, the supplier production capacity will be regarded as the "drum" that sets the beat for the entire supply chain. The size of the inventory held by the supplier will be viewed as the "buffer," because it buys time needed to recover from the anticipated disruptions occurring in the upstream supply chain. The "rope" is symbolic of the link between the upstream and downstream supply chains, where the rate of the final sales or distribution does not exceed the supplier's production capacity.

This drum-buffer-rope (DBR) logic of TOC thinking would protect against variability at the constraint and ensure the continuous improvement of the supply chain processes. Considering the usefulness of TOC thinking to supply chain management, the supply chain partners may consider the following TOC focusing steps to optimize the supply chain benefits. Identify the weakest link in the supply chain.

1. Decide what to do to get the most out of the weakest link (constraint) without committing to potentially expensive changes.
2. Adjust the rest of the supply chain processes to a "setting" that would enable the constraint to operate at the maximum effectiveness.
3. Take whatever action is required to eliminate the constraint.
4. Once the current constraint is broken, keep on looking for other constraints to continuously improve the supply chain performances.

1.4 TYPES OF LOGISTICS

Return Logistics (Reverse Logistics)

In order to increase the sales as well as the market share, many companies advertise that their goods will perform well over a period of time. The customer is, therefore, led to believe that in case he buys the product of that company, he is assured of

satisfactory performance of the product. But at the same time, it is very much obvious that the company cannot assure the satisfactory performance of each and every of its product which is sold in the market. Few of the products sold may not perform as advertised over the specific period of time. Such products need to be brought back by the company to confirm good customer service. Multination Companies (MNCs) to protect their market image and to stall its competitors from grabbing its customers, recall immediately the defective or substandard product from the market. Product recall is a critical competency resulting from increasingly rigid quality standards product expiration dating responsibility for hazardous consequences. The company has, therefore, to take into account the defective goods that would be returned while framing the total logistical system network and calculating the total cost of such a system of network. Incorporating the goods returned in the total logistical systems network and cost is called as Return Logistics. Return Logistics requirement' also result from the increasing number of laws prohibiting random scrapping and disposal on one hand, while encouraging recycling of waste such as beverage containers, packaging materials, etc. The most significant aspect of return logistical operation is the need for maximum control when a potential health liability exists. E.g.: a contaminated drug in the market is extremely dangerous and the company has to recall all the stock of contaminated drug.

Military Logistics

Military logistics is the art and science of planning and carrying out the movement and maintenance of military forces. In its most comprehensive sense, it is those aspects or military operations that deal with: Design, development, acquisition, storage, distribution, maintenance, evacuation, and disposition of material, evacuation, and hospitalization of personnel, acquisition or construction, maintenance, operation, and disposition of facilities.

Third Party Logistics (3PL)

3PL, Third Party Logistics describes businesses that provide one or many of a variety of logistics related services. Types of services would include public warehousing, contract warehousing, transportation management, distribution management, freight consolidation. A 3PL provider may take over all receiving, storage, value added,

shipping, and transportation responsibilities for a client and conduct them in the 3PL's warehouse using the 3PLs equipment and employees or may manage one or all of these functions in the clients facility using the clients equipment, or anything combination of the above. 3PL can be defined as the "Business of proposing physical distribution reforms to a client and undertaking comprehensive physical distribution services."

Third party logistics (3PL), a new business model for physical distribution, originated in the U.K. & became highly popular in U.S. in the 1990s. 3PL providers offer innovative alternatives to clients in the form of comprehensive logistics services. Because 3PL requires that providers have intimate access to the corporate strategy of their clients, relationships are based long term contracts as a rule.

The growing demand for 3PL can be attributed to both demand, & supply side factors. (1) faced with deregulation & growing competition, transport companies are seeking new business opportunities, & (2) clients are seeking to outsource their logistics operations cut costs & focus management resources on core businesses.

Fourth Party Logistics

Traditionally, suppliers and big corporations have been meeting the demands by increased inventory, speedier transportation solutions posting on-site service engineers and many times employing a third party service provider. Today they need to meet increased levels of services due to e-procurement, complete supply visibility, virtual inventory management and requisite integrating technology.

Now corporations are outsourcing their entire set of supply chain process from a single

design, make and run integrated comprehensive supply chain solutions. This evolution in supply chain outsourcing is called Fourth Party Logistics- the aim being to provide maximum overall benefit. Thus a fourth party logistics provider is a supply chain integrator that assembles and manages the resources, capabilities and technology of its own organization with those of complementary service provider to deliver a comprehensive supply chain solution. It leverages the competencies of third party logistics providers and business process managers to deliver a supply chain solution through a centralized point of contact. As the fourth party logistics provider caters to

multiple clients, the investment is spread across clients-thus taking the advantage of economies of scale.

Cost Effectiveness of Fourth Party Logistics

Revenue growth by enhanced product quality, product availability, and improved customer service -all facilitated by the application of leading technology. Operating cost reduction can be achieved through operational efficiencies, process enhancements and procurements. Savings will be achieved by complete outsourcing of supply chain functions and not just selected components. Fixed capital reductions will result from capital asset transfer and enhanced asset utilization. The fourth party logistics organization will own physical assets through freeing up the client organization to invest in core competencies. Emergence of fourth party logistics is a new concept in supply chain outsourcing. With the rapid advancements of technologies, it will be easier to reap the benefits of fourth party logistics concept. Thus fourth party logistics is the future of supply chain management.

Inbound Logistics

Creation of value in a conversion process heavily depends on availability of inputs on time. Making available these inputs on time at point of use at minimum cost is the essence of Inbound Logistics. All the activities of a procurement performance cycle come under the scope of Inbound Logistics. Scope of Inbound Logistics covers transportation during procurement operation, storage, handling if any and overall management of inventory of inputs. Several activities or tasks are required to facilitate an orderly flow of materials, parts or finished inventory into a Manufacturing complex. They are sourcing, order placement and expediting, transportation, receiving and storage. Overall, procurement operations are called inbound logistics. Inbound logistics have potential avenues for reducing systems costs.

Delivery time, size of shipment, method of transport & value of products involved are different from those of physical distribution cycles. Normally delivery is large as a low cost transportation mode is chosen. As the value of inventory is low, size of shipment is large & transit inventory costs are low. Value added goods are to be made available in the market for customers to perceive value. Finished goods are to be distributed

through the network of warehouses and supply lines to reach the consumer through retailers's shops in the market. During conversion value is added to the raw materials and as a result value of the inventory in this case is very high unlike inputs. Now the size of shipment, modes, of transport and delivery time are different as compared to inputs. Activities of shipment, distribution performance cycle come under the scope of Outbound Logistics. They are order management, transportation, warehousing, packaging, handling etc.

1.5 LOGISTICS MANAGEMENT

Logistics management ensures the proper and timely distribution, storage and reclamation of needed materials. It uses a variety of applications from material productions to commodity delivery to military manoeuvres.

"Logistics management is the most widely used term and encompasses logistics not only in the private business sector but also in the public/government and non-profit sectors." There is confusion about the definition of logistics due to the fact that a number of terminologies are used to describe logistics management including the following:

- Logistic Management
- Business Logistics Management
- Integrated Logistics management
- Materials Management
- Physical Distribution Management
- Industrial Logistics Management
- Procurement and Supply
- Product Flow Management
- Marketing Logistics Management

Logistics involves an integrated approach with the integration of information, transportation, inventory, warehousing, material handling, and packaging, and recently

added security. There are varying definitions due to the varying scope and understanding of Logistics.

"Logistics involves getting, in the right way, the right product, in the right quantity and right quality, in the right place at the right time, for the right customer at the right cost".

"Logistics concerns the efficient transfer of goods from the source of supply through the place of manufacture to the point of consumption in a cost-effective way whilst providing an acceptable service to the customers.

The Charter of the Institute of Logistics and Transport maintains that logistics should aim "to deliver exactly what the customer wants at the right time, in the right place and at the right price".

Logistics is "the process of designing, managing and improving such supply chains, which might include purchasing, manufacturing, storage and, of course, transport."

1.6 NEED FOR LOGISTIC MANAGEMENT AND LOGISTICAL ACTIVITES

Effective logistics management is important to companies for a number of reasons, both positive and negative. Good logistics management ensures that products are shipped in the most economical, safe, efficient and timely manner. This results in cost savings for the company and more satisfied customers. In contrast, poor logistics management can result in damaged or delayed shipments, which can then lead to dissatisfied customers, returns and scrapped products. The consequences of these problems include higher costs and customer relation problems. In order to avoid these results, effective logistics management activities includes careful planning, proper software system selection, proper vetting and selection of outsourced vendors, and adequate resources to handle the processes.

1. Maintaining Competitive Edge

Successful business logistics provide a competitive edge against other organizations. It provides a system or process by which customer needs can be fulfilled in a more efficient manner. A business should strive to provide shipments of merchandise in a

more accurate and fast manner than competitors do. The Internet has made it possible for many companies to do this.

2. Building Good Consumer Relations

Providing product in an efficient manner, which business logistics helps to do, also helps to build good consumer relations. This is not only important for immediate monetary gain, but also because good customer relations can mean more business. One of the best ways to advertise and grow your business is to provide good, quality service that customers will tell other customers about.

3. Creating Finished Product

A business needs to ensure there are enough raw materials available to make finished products. Without quality goods, a business cannot make quality product. Having enough products stocked is also necessary for supply and demand purposes and to maximize customer satisfaction.

4. Providing Organization

Each time a product is created, business logistics can help to ensure the process goes efficiently. It is important that inventory be tracked, transported, stored and manufactured in a way that accommodates all of an organization's departments. Controlling this flow so that each department knows what to do and what is expected will help to ensure that the company's plans and goals stay on track.

5. Manages and coordinates the flow of supplies

Logistics manages the flow of supplies to match the needs of the producer with the schedule of sales to customers. Logistics coordinates the flow of information, providing feedback about sales, financing when due, and the delivery of product from various suppliers. With the increase in global sources of suppliers as well as global consumer markets, the use of logistics to coordinate production and distribution is growing in importance.

6. Meets customer demands on time

Logistics management is a supply chain management component that is used to meet

customer demands through the planning, control and implementation of the effective movement and storage of related information, goods and services from origin to destination.

7. Assists business

Logistic management systems capitalise on making improvements in freight management, load building and optimisation, mode and carrier selection, freight rating and audits, plus load tendering and real time logistics. Logistics firms that use this software gain a competitive advantage over their rivals, as it allows them to successfully deal with cost pressures such as rising fuel prices, increasing loads as a result of customer demands, and the trend towards smaller, more frequent dispatches. These lead to more frequent and timely deliveries, which then increase in satisfaction and returning clients.

8. Reduce business' costs

Fleet management software also has a positive effect on driving habits, as it enables to track if the driver is taking a good route, speeds, plus brake usage. This also allows companies to react in advance if the driver's behaviour could become key factor in excessive fuel consumption and/or vehicle depreciation. The data from fleet management software also monitors the wear and tear of a vehicle, meaning companies can negotiate on spare parts in advance. Logistics management helps companies to reduce expenses and improve customer service. However, a business needs logistics management software if it wants to fully take advantage of these benefits.

9. Efficiently manages commercial on-road vehicles

No, absolutely not! It depends on how much you want to spend and the size of your business, but logistics management systems can be applied to improving the efficiency of your rail, shipping and air-cargo planning and dispatches. It isn't cheap, but like logistics management systems for on-road commercial vehicles, this software is designed to improve the efficiency of your business, increasing customer happiness and decreasing costs.

Logistics Management Activities

Logistics involves the integration of the production and delivery of a product or service in order to ensure efficient and effective management. Originally, logistics was used in the military to coordinate the delivery of soldiers and weapons to the right place at the right time. The critical nature of the place and timing in war required special integration and precision. Logistics consists of identifying the steps in a production value chain, ensuring just in time (JIT) delivery of the inputs for an assembly process, coordinating the flow of information, and the scheduling of delivery. Logistics manages the flow from supplier to customer in order to ensure that supply and product inventory is not accumulated or wasted. An efficient production and delivery process prevents the tying up or loss of valuable capital.

While logistics is a process used by many companies (made famous by Walmart, for example), it is used increasingly as a business model by various warehouse and distribution companies (such as UPS and Fedex). It typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory control, supply/demand planning and management of third-party logistics services providers.

Logistics management is a supply chain management component that is used to meet customer demands through the planning, control and implementation of the effective movement and storage of related information, goods and services from origin to destination. Logistics management helps companies reduce expenses and enhance customer service. The logistics management process begins with raw material accumulation to the final stage of delivering goods to the destination. By adhering to customer needs and industry standards, logistics management facilitates process strategy, planning and implementation.

Various activities of logistic management includes:

1. Proper Planning

The first step to accomplishing a task is planning. Now, planning encapsulates various factors. It involves procuring the goods, storage facilities, and delivery of products to the exact location. Apart from these, the other parameters are - time, transportation,

and the costs. A supply chain operative should be able to devise the flow chart for the whole operation. The purpose of planning is to attain maximum work in the least possible time. At the same time, the planning should aim at maximizing the profits. Proper planning is a wise plan, but an experienced manager will be able to prepare for the unforeseen circumstances as well.

2. Adopt Automation

In the age of automation, technology plays a major role in increasing the efficiency of an organization. Automation has a vital role in the business process optimization. There is valuable software that can be deployed in the logistics process. For example, business process software can be integrated that provides timely updates regarding the movement of goods. The operator and the client will get details regarding the goods that are dispatched from the supplier, procurement of the goods at the warehouse, and lastly, delivery of the goods at the destination. This saves a considerable amount of time because manual interference is eliminated. Moreover, accurate tracking help in improving overall process management. Similarly, the account details and employee details can be managed using specific software developed for these tasks. Therefore, the logistics firm should embrace the technology for increasing productivity.

3. Value Relations

The team is an essential aspect of an organization that is responsible for the growth. Whether it's the delivery guy or the warehouse manager, everyone should be perfect in their respective field of work. For this, you need to invest in proper training of the employees. Regular training workshops keep the employees updated with the latest trends in the logistics industry. This helps in increased efficiency and satisfaction of the clients. Logistics manager with impeccable interpersonal skills is crucial for the organization. There are times when the things don't work according to the plan. In this situation, instead of panicking, you need a reliable person who can sort out the issues with utmost efficiency. Moreover, the manager should have authoritative contacts in the industry. This can be beneficial in tapping the business opportunities.

4. Warehouse Management

Effective logistics management is incomplete without proper warehouse management.

Warehouse operations are considerably dependent on the type of goods.

For example, perishable goods, such as dairy products, needs refrigeration facilities. Grains should be stored in moisture free environment. Similarly, the specifications vary according to the products. The logistics firm should aim at developing the warehouse inventory so that there is minimum wastage of goods. Moreover, maximize the storage capacity of the warehouse. Usage of vertical storage columns is recommended. Effective implementation of the software for sequencing the products is necessary because there should be no delay while locating the product when the order is placed. The warehouse staff should be well-trained for the warehouse operations.

5. Efficient Transportation

Transportation department can be analyzed to decrease the expenses of the logistics firm and at the same time, it can be revamped for faster delivery of the products. Following factors should be considered for efficient transportation:

- Determining the best delivery route. A logistics firm should opt for the shortest yet safest route. This is beneficial for saving money as well as time.
- Cost-effective packaging that ensures low investment and safety of goods as well. Optimize the packaging so that it occupies less volume and it does not increase the weight of the package.

6. Measure and Improvise

Logistics network optimization is incomplete without integrating measurement, analysis, and feedbacks. When you deploy new strategies in the system, you need to measure the output. This is important as it intimates the success or failure of the strategy.

Measurement tools and software should be integrated that easily determines and classifies the information as per the requirement. Your future planning is heavily dependent on the measured information.

7. Analyze the metrics

It related to different operations. This includes cycle time metrics, cost metrics, and

service metrics. Generous feedbacks help in improvising. The ideas and suggestions of the employees should be recorded periodically. This ensures that you generate a pool of ideas and at the same time, it reveals any flaws in the system.

1.7 LOGISTIC SYSTEM DESIGN

A frequent problem in logistics system design is that projects are undertaken piecemeal, without an organized framework for analysis. Consequently, systems are developed that are too complex or too inflexible to change as the program environment changes.

Many logistics systems include the expiration date on the inventory file card. While this may be convenient, it is much more important to include the expiration date directly on the item itself, and to strictly enforce a FEFO issue system. These storekeeping procedures are common sense. Nonetheless, it is usually helpful to develop simple storage guidelines, wall charts, or checklists for warehouse staff. The storekeeping function, like any other function of the logistics system, requires little more than orderliness and efficiency. A warehouse that looks neat and organized probably is well managed; a warehouse that does not appear to be so certainly is not.

Purpose of a logistics system

To obtain and move supplies and equipment in a timely fashion to the places where they are needed, at a reasonable cost. Matters are complicated by the fact that equipment and supplies usually cannot go directly from their source to the end user; they frequently must be held as inventory at one or more intermediate points along the way.

Physical Structure of the System

A logistics system's physical structure consists of two things: stationary facilities and the transportation links between those facilities. Logistics jargon further distinguishes those facilities that are outside the system (such as drug manufacturers) from which commodities are supplied; these are called "sources." Facilities that receive supplies from a source (such as a central medical store) are called "primary supply points." Facilities that dispense commodities to end users are called "outlets." Whatever names are used, there are six important things to know about the facilities: 1. Where is the

facility located? 2. How is it staffed? 3. What is the actual need for each commodity at the facility and how does this need vary over time? 4. What is the facility's storage capacity? 5. What are the storage conditions, and are they suitable for the items being stored? 6. How is the inventory controlled, and is it secure? In describing the physical structure of the logistics system, it is important to note the number of links into each facility. The more links there are, the more confused the system is likely to be. At the top, the primary supply points probably will receive commodities from a number of sources. At lower levels of the system, however, it is usually desirable to limit each facility to receiving supplies through only one link (possibly with a different link for emergency backup).

Management Structure of Logistics Systems

The essential questions in understanding the management structure of a logistics system are:

Who decides what (and when and how many) commodities move through a link from one facility to the next, and how does he/she decide?

There are two general types of logistics systems:

1. Allocation or "push" systems

2. Requisition or "pull" systems

In an allocation system, the higher-level facility decides what commodities move down the system and when they move down. It "pushes" them through the system. In a requisition system, the lower-level facility orders commodities as the need arises, thus "pulling" supplies through the system. The advantages of a requisition or "pull" system are that it can be based on current information about actual needs, and thus, in theory, is more accurate and less wasteful than an allocation system. Decision making is decentralized to lower levels and each manager has a narrower scope of concern. The disadvantages of requisition systems are related directly to these advantages. Requisition systems will work only if accurate information about needs exists or can be obtained, and if lower level staff have sufficient management training and support to make appropriate decisions about ordering. Allocation or "push" systems are,

therefore, appropriate when accurate information on needs is not available or where management skill is concentrated at higher levels of the service system. If demand significantly exceeds supply, an allocation system must be used to divide scarce commodities among competing facilities. Where allocation systems are used, every effort should be made to base allocations on appropriate estimates of actual need. This management structure may differ at different levels of the system; higher levels may requisition and then allocate to lower levels. Even at a single level, the system may be mixed. A regional warehouse might allocate stock to a health center every three months, but the health center may be able to request additional supplies, if needed, in the interim. Also, it may be desirable to use different procedures for equipment, which is essentially a one-time problem, than for supplies, which must be restocked on a continuing basis. In addition to the question of who makes the decisions to move commodities, there is the question of how the decision is made. It already has been stated that the decision should be based on a projection of actual need; such an assessment is called forecasting or quantification. A full discussion of forecasting is beyond the scope of these few pages; here it is only important to note that an adequate forecasting process must consider three things:

Information Flow

Three things happen in a logistics system: commodities move down through the system, commodities are held in inventory at various points, and commodities are dispensed to users for subsequent consumption. Accordingly, there must be three different types of records in the logistics information system:

1. **Stock keeping records:** These must include inventory control cards, but may also include additional records for accountability and prevention of theft.
2. **Transaction records:** These include records of the amount shipped from one facility to the next and records of amounts ordered (for requisition systems).
3. **Consumption records:** While some programs do without these, it is much better to have log books to record quantities dispensed to each client and a regular report that summarizes these data for higher-level management use in forecasting and resupply decisions. Decisions regarding the level of accountability and control

in the logistics system should weigh the level of effort and the amount of paperwork required. In some cases, it may be less expensive to permit a certain amount of theft or shrinkage rather than to create a complex and unwieldy information system.

Types of Inventory Control Systems

There are two primary questions to answer in logistics system design.

(1) Who will make the ordering decision?

(2) What is the smallest amount of information on which those decisions can be based?

The ordering decision must answer two questions: 1. How much should be ordered? 2. When should it be ordered? A full discussion of the types of logistics systems is beyond the scope of this paper. In theory, however, there are only three different types: 1. Fixed order size, variable order interval systems 2. Fixed order interval, variable order size systems 3. Combination systems In a fixed order size, variable order interval (or order point) system, a specific fixed amount of a commodity is ordered whenever inventory falls below a certain level, called the reorder point. Thus, for example, the decision rule might be, "Whenever there are fewer than 500 capsules of tetracycline, order 1,000 more." The trick is to choose the reorder point so the new shipment is guaranteed to arrive before the remaining supply is exhausted. The advantage of this type of system is that it gives control on an item-by-item basis and thus minimizes excess stock. The disadvantage is that it is difficult to predict the the transportation schedule and to batch many items for shipment. Therefore, where transportation is difficult or time-consuming, such systems are less appropriate. A simple version of a fixed order size, variable order interval system is a two-bin system, in which goods are packed in standard-sized bins that correspond to the reorder point. Each outlet initially is issued two bins. Supplies are drawn from one bin until it is empty, and then a new order is placed (preferably using a preprinted order form packed at the bottom of the bin). Supplies are then drawn from the second bin until it is exhausted, by which time the replacement bin should have arrived, and the procedure is repeated. The advantage of the two-bin system is that it requires no record keeping at the facility using it. In a fixed order interval, variable order size system, the ordering

time is fixed at, for example, once per quarter, with the size of the order depending on stock remaining and projected use. The advantage of this type of system is that many items can be batched and shipped at the same time, thus reducing transportation problems and costs. A mixed, or combination system uses both strategies at the same time. Stocks are reviewed on a fixed schedule, but an order is placed only if inventory has fallen below a fixed reorder point. In logistics jargon, such systems are known as systems, where s is the reorder point, and S is the amount that is requisitioned. S may be a predetermined absolute quantity, but it is more common to order the difference between the stock on hand and the desired maximum amount the facility wishes to store. This latter case is called a min-max inventory control system

Storekeeping

The systems for physical control of inventory at each facility will vary depending on staff and storage space available. A number of general concerns should be addressed at each location, however. The first consideration is security of the physical inventory. Minimum security measures include-

1. Ensuring that all stock movement is authorized by locking the storeroom, limiting access to persons other than the storekeeper and his/her assistants, and ensuring that both incoming and outgoing stock matches documentation.
2. Verifying authenticity of documentation by spot-checking signatures and so forth.
3. Periodically verifying inventory records by a systematic count of physical inventory. The second consideration is the facility's physical layout.

The ideal storeroom should have-

1. Two different points for receipt and dispatch of goods to provide for orderly flow of materials and to reduce opportunities for clerical error or theft.
2. A fixed location for each stocked item, with appropriate conditions (temperature, humidity) for the items being stored.
3. A separate secure area for valuable items.
4. Adequate access to all items in the storeroom to allow for first-to-expire, first-

out (FEFO) handling. Beyond these considerations, storage and handling of materials are governed by the characteristics of the products. Items with high turnover should be most easily accessible. Heavy items should be stored near the ground. Expensive items should be stored in the most secure area. For drugs and other perishables, temperature and humidity requirements must be considered. Perishable items must be appropriately dated, preferably with the expiration date. If the manufacturer does not include the expiration date, it should be estimated from the manufacturing date or, if no other date is available, from the delivery date.

Many logistics systems include the expiration date on the inventory file card. While this may be convenient, it is much more important to include the expiration date directly on the item itself, and to strictly enforce a FEFO issue system. These storekeeping procedures are common sense. Nonetheless, it is usually helpful to develop simple storage guidelines, wall charts, or checklists for warehouse staff. Figures 6 and 7 provide examples. In summary, the storekeeping function, like any other function of the logistics system, requires little more than orderliness and efficiency. A warehouse that looks neat and organized probably is well managed; a warehouse that does not appear to be so certainly is not.

Elements of Logistics

There are five key elements of logistics: transport, warehousing, inventory, packaging, and information processing

Transport

It is the major component of most logistics services. The key aspects of transport management include modes of transport (such as road, rail, waterways, air, pipeline, multimodal or intermodal), transport infrastructure, geographical condition, type of delivery (such as overnight express, normal, long distance), load planning (in the cargo unit), routeing and scheduling.

Warehouse management

It include the location, number (linked to the warehousing policy as to central versus

decentralised concept), size (again linked to the warehousing policy), type of storage (such as for refrigerated cargo, electronics, garments) and material handling equipment.

Inventory management

It includes the strategic decisions as to what to stock, how much to stock, and where to stock. Inventory management is sometimes confused with warehouse management; inventory management is about the amount of stock of the product or raw material whereas warehouse management deals with the housing aspect of this stock. All products (raw material, semi-finished, finished) need packaging.

Packaging and unitisation

Packaging and unitisation are also important aspects of logistics. The key elements of packaging and unitisation include the type, cost, etc. that is linked to the value and the type of product. For example, for high value goods, the packaging and unitisation cost can be high whereas for the raw material the cost has to relatively lower and more affordable.

Elements of Logistics Management

- Selecting appropriate vendors with the ability to provide transportation facilities
- Choosing the most effective routes for transportation
- Discovering the most competent delivery method
- Using software and IT resources to proficiently handle related processes

In logistics management, unwise decisions create multiple issues. For example, deliveries that fail or are delayed lead to buyer dissatisfaction. Damage of goods due to careless transportation is another potential issue. Poor logistics planning gradually increases expenses, and issues may arise from the implementation of ineffective logistics software. Most of these problems occur due to improper decisions related to outsourcing, such as selecting the wrong vendor or carrying out delivery tasks without sufficient resources. To resolve these issues, organizations should implement best logistic management practices. Companies should focus on collaboration rather than competition. Good collaboration among transportation providers, buyers and vendors

helps reduce expenses. An efficient and safe transportation provider is also vital to business success.

Logistics Management Functions

Logistics management functions include customer service, sourcing and procurement, production planning and scheduling, packaging, and assembly. Logistics management is part of all the levels of planning and execution, including strategic, operational and tactical. Further, it coordinates all the logistics activities, and it integrates logistics activities with other functions, including marketing, sales, manufacturing, finance and information technology.

Logistics management process

Logistics management generally consists of processes for inbound and outbound logistics traffic. Inbound logistics is the process of moving goods from suppliers into a warehouse, then into a production facility to make products. Inbound logistics can include raw materials, tools, component parts, office equipment and supplies. Outbound logistics is the process of moving finished products out of warehouse inventory and shipping them to customers.

Logistics management software

Logistics management software includes functions and processes that enable companies to manage and execute product storage and delivery. Logistics management applications run the gamut from large enterprise resource planning systems that include comprehensive and integrated functions to specialized applications that only handle a few functions. Logistics management functions that are a part of ERP systems are usually integrated with other business functions in the system, like sales, finance, procurement and human resources. More specialized logistics management applications focus on ware houses transportation management, and supply chain planning and supply chain management. Some logistics management software is designed to be configurable for various industries, while others are aimed at specific industries. Logistics management software generally began as on-premises systems, but more cloud or hybrid cloud options are now available. Prominent logistics management software vendors include SAP, Oracle, IBM, Microsoft, Infor,

Epicor, JDA Software, Manhattan Associates, High Jump, PTC, Coupa, Kinaxis and GEP.

Examples of Logistic Management

For a computer manufacturer, inbound logistics might involve electronics parts, computer chips, cables, connectors, molded casings and shipping cartons. Outbound logistics involves the finished computer and associated peripheral devices. Meanwhile, for a furniture manufacturer, inbound logistics could involve wood, glue, fabrics, screws, nails, paint and safety glasses, while outbound logistics would involve the finished furniture. Logistics processes also include reverse logistics, or the management of all the functions used to return goods and materials. Reverse logistics takes goods from the customer or final destination and returns them to the originating organization, where they can be reused, repaired, remanufactured or recycled.

1.8 SUMMARY

Logistic management means to design, develop, produce and operate an integrated system that satisfies the customer by supplying right quality goods in the market on time. Due to the change in business functions, there has been a transformation in the concept and scope of the logistics within the range of management. Business logistics have modernised from the shipment dock to the boardroom of global enterprises. Logistics management has become a strategic topic in the overall industrial sector due to its significance and motto of providing with the best customer service at the least logistics costs. So, logistics management has the ability to make an unbeatable long-term competitive advantage in the market place. the achievement of this mission is possible by following operational objectives of logistics management of customer satisfaction.

1.9 GLOSSARY

Logistics: The branch of military science having to do with procuring, maintaining and transporting material, personnel and facilities.

Logistics Management: Logistics management is the most widely used term and encompasses logistics not only in the private business sector but also in the public/

government and non-profit sectors.

Supply Management: Supply management involves the planning and coordination of materials that are needed in a certain location at a specific time to support production or activity (as in the case with military supply). Supply logistics must include transportation of the materials and storage as well as a means for evaluating the level of supply at different stages of the process to make sure the flow of materials matches need.

Distribution: Distribution involves managing how a supplied and stored material is then dispersed to the locations it is needed. This involves issues of material movement (loading, unloading and transportation), tracking of stock and accountability of use (recording how the supply is used and by whom).

Production: Production logistics manages the stages of combining distributed supplies into a product. This can involve coordination of a manufacturing or assembling process and in the case of applications such as military production, the logistics of coordinating space and areas for production to occur. In construction as well, production logistics will include the staging of material to coordinate with the phase of building taking place.

Reverse Logistics: Reverse logistics involves the reclamation of material and supplies from a production or assembly process. For instance, in the logistic management of a construction project, reverse logistics plans for the removal of excess material and re-absorption of the material into a stock supply. In military applications, it is commonly used for exit strategy planning and coordinating the transfer of materiel and equipment back to a storage base from an area where military exercises were performed.

Theory of Constraints (TOC): To maximize the supply chain benefit, supply chain partners should uncover weak links and prevent variations in supply chain capacity (e.g., production/distribution capacity and inventory) and supply chain performances. The core idea in TOC is that every system such as profit-making firms must have at least one constraint that limits the system from getting more of whatever it strives for and consequently determines the output of the system.

1.10 SELF ASSESSMENT QUESTIONS

1. Explain the types of logistics. Discuss the advantages of logistic management.

2. What is the logistics system design?

3. Discuss the concept of working capital?

4. Explain the interfaces among purchasing, production, logistics, and marketing?

1.11 LESSON END EXERCISE

1. Explaing the concept of logistic system design in deta

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2. Describe the need for logistics management and logistics activities.

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1.12 SUGGESTED READING

1. Logistics and Supply Chain Management: D.K., Aggarwal

2. Business Logistics/Supply chain Management: Ronald H., Ballou

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C. No. :- BCG-604 **UNIT-II**

SEMESTER: VI **LESSON: 4-6**

WAREHOUSING MANAGEMENT SYSTEM

STRUCTURE

2.1 INTRODUCTION

The process of physical handling of goods in and out of the warehouse is an extensive and costly operation. To keep costs as low as possible, it is essential that quantity and placement of the items are accurate. To have efficient warehouse processes, the company must define the warehouse in terms of layout, put-away and pick logic, as well as internal replenishment information.

Warehouse Management Systems is aimed at companies that need to receive and ship products, while maintaining an optimum space usage and knowing specifically where all products are stored at any given time. Goods can either be stored in predefined (fixed) bins or in random (floating) bins, depending on the need for optimization and the expertise of the warehouse personnel.

The Warehouse Management Systems granules provide functionality for executing more advanced warehouse processes such as handling items within a warehouse by zone and bin level, handling directed put-away and pick, and the development of an automated data capture system (ADCS). The flow of inventory through the warehouse can be divided into three basic processes:

- Receiving items at the warehouse and making them available.
- Handling items for internal distribution/movement/production.
- Picking and shipping items to customers or other locations.

Each process can consist of a series of warehouse handling activities. Receiving items involves the physical receiving of items when they arrive at a warehouse and then putting them away (from the receiving area into the stocking/handling area). Warehouse Management Systems also provides the cross-docking functionality as part of the receiving process. Cross-docking is a means of saving time and effort by directing items on orders awaiting shipment from the receive zone directly to the ship zone without placing them into storage. Handling items involves repacking or completing items for sale, inventory counting, supplying production, or simply moving for optimization of space. Shipping items involves picking items from inventory and handing them to the shipping agent whom delivers them to

customers.

To have an efficient operation, warehouse managers must know which items are to be shipped or are to be used in production and which are expected to arrive. In this way they can estimate the expected workload and allocate warehouse resources accordingly. Employees in sales and purchase departments need to be able to see what stage in the warehousing process a particular order has reached.

1.2 OBJECTIVES

After completion of this lesson you shall be able to know:

- Nature and importance of warehousing
- Relationship between warehousing and other logistics functions
- Types of warehouses
- Decision regarding optimal warehousing network
- Warehouse Facility Development
- Uses of Warehouse Management System

2.3 NATURE AND IMPORTANCE OF WAREHOUSING

We need different types of goods in our day-to-day life. We may buy some of these items in bulk and store them in our house. Similarly, businessmen also need a variety of goods for their use. Some of them may not be available all the time. But, they need those items throughout the year without any break. Take the example of a sugar factory. It needs sugarcane as raw material for production of sugar. You know that sugarcane is produced during a particular period of the year. Since sugar production takes place throughout the year, there is a need to supply sugarcane continuously. But how is it possible? Here storage of sugarcane in sufficient quantity is required. Again, after production of sugar it requires some time for sale or distribution. Thus, the need for storage arises both for raw material as well as finished products. Storage involves proper arrangement for preserving goods from the time of their production or purchase till the actual use. When this

storage is done on a large scale and in a specified manner it is called 'warehousing'. The place where goods are kept is called 'warehouse'. The person in-charge of warehouse is called 'warehouse-keeper'.

Warehousing refers to the activities involving storage of goods on a large-scale in a systematic and orderly manner and making them available conveniently when needed. In other words, warehousing means holding or preserving goods in huge quantities from the time of their purchase or production till their actual use or sale.

Warehousing is one of the important auxiliaries to trade. It creates time utility by bridging the time gap between production and consumption of goods.

Nature of Warehousing:

In economic context, warehousing creates time utility, i.e. it increases the values of the goods in storage by balancing the forces of supply and demand. Thus, goods are shipped to the warehouse and held in storage until demand becomes sufficient to allow distribution. In today's marketing trend, warehousing is required to:

1. provide buffer stock as to guard against loss of production, ensure batches of economic size and stable supply,
2. safeguard the stock from environmental damage and risk of theft, and to
3. have an efficient inventory management system.

Though warehousing still remains a necessary element in the distribution of some products, for many, the warehousing may mean difference between success and failure.

Importance of Warehousing:

Warehouse management is essential to any logistics system, which is an essential part of supply chain management. While some erroneously view a warehouse simply as a storage facility, some warehousing process elements will play a

substantial role in ensuring that the entire supply chain system functions efficiently. In fact, there are a number of benefits that a warehouse offers.

Central location:

A warehouse is a central location that allows shippers to receive, store and distribute products. As products arrive at the warehouse, the responsibility for the products will transfer to the personnel in the warehouse. Safety measures should be established. In addition, the product's organization influences shipping times. For this reason, opt for wooden pallets which make your products easy to move.

Value-adding:

The primary objective of a logistics system is to increase efficiency and clientele service by reducing cycle times and lowering overall costs. Storage offers added value to the logistics system allowing businesses to keep an inventory so that products ordered are shipped on time.

Economic benefits:

Storage reduces delivery costs not only for business but also for customers since the products are shipped from a central location and not from multiple locations. In a similar light, storage can effectively manage supply and demand. Since businesses need to remain competitive, the economic benefits produced by a warehouse that is running efficiently will positively impact the profitability of the entire process.

Other benefits :

1. Regular production:

Raw materials need to be stored to enable mass production to be carried on continuously. Sometimes, goods are stored in anticipation of a rise in prices. Warehouses enable manufacturers to produce goods in anticipation of demand in future.

2. Time utility:

A warehouse creates time utility by bringing the time gap between the production and consumption of goods. It helps in making available the goods whenever required or demanded by the customers.

Some goods are produced throughout the year but demanded only during particular seasons, e.g., wool, raincoat, umbrella, heater, etc. on the other hand, some products are demanded throughout the year but they are produced in certain region, e.g., wheat, rice, potatoes, etc. Goods like rice, tobacco, liquor and jaggery become more valuable with the passage of time.

3. Store of surplus goods:

Basically, a warehouse acts as a store of surplus goods which are not needed immediately. Goods are often produced in anticipation of demand and need to be preserved properly until they are demanded by the customers. Goods which are not required immediately can be stored in a warehouse to meet the demand in future.

4. Price stabilization:

Warehouses reduce violent fluctuations in prices by storing goods when their supply exceeds demand and by releasing them when the demand is more than immediate productions. Warehouses ensure a regular supply of goods in the market. This matching of supply with demand helps to stabilise prices.

5. Minimisation of risk:

Warehouses provide for the safe custody of goods. Perishable products can be preserved in cold storage. By keeping their goods in warehouses, businessmen can minimise the loss from damage, fire, theft etc. The goods kept in the warehouse are generally insured. In case of loss or damage to the goods, the owner of goods can get full compensation from the insurance company.

6. Packing and grading:

Certain products have to be conditioned or processed to make them fit for human use, e.g., coffee, tobacco, etc. A modern warehouse provides facilities for processing, packing, blending, grading etc., of the goods for the purpose of sale. The prospective buyers can inspect the goods kept in a warehouse.

7. Financing:

Warehouses provide a receipt to the owner of goods for the goods kept in the warehouse. The owner can borrow money against the security of goods by making an endorsement on the warehouse receipt. In some countries, warehouse authorities advance money against the goods deposited in the warehouse. By keeping the imported goods in a bonded warehouse, a businessman can pay customs duty in installments.

2.4 RELATIONSHIP BETWEEN WAREHOUSING AND OTHER LOGISTIC FUNCTIONS

The important relationship between warehousing and other logistic functions are discussed as under:

Warehousing is an essential part of product distribution. Whenever a product is produced and exported to another country there arises a need for warehousing before making the final distribution of the product. These days companies are involved in international operation it may like store the items whose demand is likely to rise in future. A highly volatile price may make companies to use warehousing as a protection against losses. Some time market opportunities for certain products may escalate their demand for a short while; companies need to store such products in order to meet the higher demand. Certain type of products produced in a particular season but sold throughout the year. In order to meet the demand throughout the year, warehousing becomes very important. The following are the aims of warehousing. Whereas, Logistic is the function that enables the flow of materials from suppliers into an organization through operations within the organization out to the customers. It is derived from the Greek word "logistikos'

which means 'to reason logically' It is basically consists of all operations required for goods (both tangible and intangible) to be made available in markets or at specific destinations. According to Council of Logistic Management (USA) "Logistics us the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption for the purpose of conforming the customer requirements".

Functions of Warehousing:

1. Storage:

This is the basic function of warehousing. Surplus commodities which are not needed immediately can be stored in warehouses. They can be supplied as and when needed by the customers.

2. Price Stabilization:

Warehouses play an important role in the process of price stabilization. It is achieved by the creation of time utility by warehousing. Fall in the prices of goods when their supply is in abundance and rise in their prices during the slack season are avoided.

3. Risk bearing:

When the goods are stored in warehouses they are exposed to many risks in the form of theft, deterioration, exploration, fire etc. Warehouses are constructed in such a way as to minimise these risks. Contract of bailment operates when the goods are stored in wave-houses. .

4. Financing:

When goods are deposited in any warehouse, the depositor gets a receipt, which acts as a proof about the deposit of goods. The warehouses can also issue a document in favour of the owner of the goods, which is called warehouse-keeper's warrant. This warrant is a document of title and can be transferred by simple endorsement and delivery. So while the goods are in custody of the warehouse-

keeper, the businessmen can obtain loans from banks and other financial institutions keeping this warrant as security. In some cases, warehouses also give advances of money to the depositors for a short period keeping their goods as security.

5. Grading and branding:

On request warehouses also perform the functions of grading and branding of goods on behalf of the manufacturer, wholesaler or the importer of goods. It also provides facilities for mixing, blending and packaging of goods for the convenience of handling and sale.

6.Transportation:

In some cases warehouses provide transport arrangement to the bulk depositors. It collects goods from the place of production and also sends goods to the place of delivery on request of the depositors.

7. Protection of goods:

A warehouse provides protection to goods from loss or damage due to heat, dust, wind and moisture, etc. It makes special arrangements for different products according to their nature. It cuts down losses due to spoilage and wastage during storage.

8. Processing:

Certain Commodities are not consumed in the form they are produced. Processing is required to make them consumable. For example, paddy is polished, timber is seasoned, and fruits are ripened, etc. Sometimes warehouses also undertake these activities on behalf of the owners.

Logistic Functions

International logistics involves movements that cross borders, and these movements are considerably more complex than domestic ones. Many international movements go aboard ship/air/road, and the entire process of moving through ports and being at sea is time consuming. Complicating matters, differences between time zones can limit

the hours when verbal communications can take place. Also, the documentation required for international logistics are varied and complicated, often requiring the services of experts. And today, inventory-in-transit is managed as if it were inventory-in-place, increasing the information management complexity and demands of international logistics. The firm's international logistics department is responsible for the management, communications, control, and planning of the logistics activities. Specific activities or functions, all of which fall under the business firm's international logistics umbrella, include the following, which may be categorized in terms of usually being associated with outbound movements, inbound movements, or overall logistics management Demand forecasting, order management, packaging, labeling, documentation flow, customer service and parts and service support are typically associated with outbound flows.

Logistics activities that are related to both sales and procurement include inventory management, materials handling, transportation management, warehouse and distribution center management, returned products, salvage scrap disposal, inter-plant movements, plant and warehouse site selection, and movement of people. All logistics functions today are assisted by information systems as well, and many firms consider information systems related to logistics functions as themselves a part of logistics management. The various separate logistics activities listed will be discussed, but one should realize that they must be planned and executed in coordination with each other and with other functions in the firm's supply chain. Forever present is the idea of cost trade-offs the logistics manager may pay more for one element of service in order to save an even larger amount on a different element.

Logistic Functions

1	*Planning functions* Location selection Supplier selection Supplier contracting Scheduling
2	*Equipment functions* Selection Allocation Sequencing Positioning Inventory control Ordering Repair
3	*Terminal functions* Gate checks Location control
4	*Handling functions* Pick-up Consolidation Distribution Expediting Diversion Transloading

5	*Administrative functions* Order management Document preparation Customs clearance Invoicing Inventory management Performance evaluation Information services Communications
6	*Warehousing functions* Receiving Inventory control Reshipment
7	*Pre/post-production* Sequencing Assorting Packaging Postponement Marking
8	*Transportation functions* Modal co-ordination Linehaul services Tracking and tracing

Outbound Logistics Functions

Outbound logistics for the exporting firm are covered those mostly associated with marketing include demand forecasting, order management, packaging and labeling, and documentation. Note that every firm has its own methods of selling overseas, and

often uses different arrangements in different markets.

Demand Forecasting

Demand forecasting is carried on in conjunction with the firm's marketing staff and its principal overseas distributors and is used by the firm to project sales. This translates to production and procurement needs for the next planning period. These in turn translate into direct logistical requirements that include both delivery to customers and receipt of raw materials or components for assembly. Since the logistics staff is also involved with order management, it also has very early information about what customers are actually ordering. This is important intelligence for others in the firm who are planning and scheduling production and may wish to make alterations because of changes in demand. Note that the free flow of accurate demand forecasts is essential among the members of a supply chain to ensure a smooth flow of goods from origin to final consumer. Thus demand forecasting is equally important to managers of inbound movements.

Order Management

Order management starts with the receipt of an order from an overseas customer. It may be obtained by the firm's salesperson, be telephoned or faxed in, come by mail, or arrive electronically through EDI, email, or the World Wide Web. The first step in most international order management systems is to verify the accuracy of the order; that is, make certain that the various documents accompanying the order contain no internal errors that might mean the customer was uncertain about what he or she was ordering. The next step is to verify the customer's credit, or ability to pay.

Packaging

Three purposes are served by packaging identifying the product, protecting it, and aiding in handling. Identification serves a variety of purposes, from automated recognition of the product through bar coding to promotional purposes packages make the product stand out on a store shelf and say "take me home" to the customer. The protective function is to protect the product and, in some instances, to keep the product from damaging surrounding items. Packaging also makes handling the product

in distribution a much simpler task. The choice of packaging materials is influenced by concerns for environmental protection. Containers that can be recycled, or are made of recycled materials, are enjoying increased demand.

Labeling

Labeling has several functions, the principal of which is to describe the contents of a package. Labeling is usually in the language of the exporting nation, although it is often advisable to have it in the importing nation's language as well. The buyer may intend to have the same shipping carton used for the international move serve for the domestic move as well, in which case additional labeling may be applied. Today, a common request would be to have bar code labels applied.

Documentation

Documentation is the preparation and handling of all the documents accompanying a shipment. In international movements, all documents must be present at the point where the goods are passing through the importing nation's customs and inspection posts. In recent years, computers and the electronic preparation and presentation of documents through EDI and the World Wide Web have made documentation less of a burden. International shipments require many more documents than domestic shipments. For example livestock must be accompanied by a veterinarian's inspection certificate when its exported. Documentation also links the shipment to payment for the product, a form of control necessary to insure that goods are not shipped without regard to their payment status.

Customer Service

Customer service involves an array of activities to keep existing customers happy. It makes sense to focus on customers you already have, encouraging repeat Customer service functions are important to a firm's success. In a survey of logistics practice worldwide, firms listed customer service performance ahead of six other performance variables in terms of importance to the success of logistics within their firm. Customer service ranked ahead of such concerns as lowered logistics costs and delivery speed and dependability.

Parts and Service Support

Parts and service support are another element of customer service. Equipment that has been sold must be maintained. Buyers of capital equipment insist on knowing that their purchase will be kept in running order for many years, and thus prompt delivery of repair parts is necessary. Air freight is often used for that purpose. Repair parts inventories are expensive to maintain and often must be justified on different criteria than are used for the main product lines. Parts and service support is an element of customer service although, in fact, buyers of a product may shift to another firm for long-term service support. In many trades special parts lists exist showing the inter-changeability of various competitors' parts. In an era when long-term partnerships are increasingly common, manufacturers of capital goods are recognizing that post-sales activities are important.

Inbound Logistics Functions

Three functions associated with inbound logistics are production scheduling, procurement, and handling returned products. Either a manufacturing firm or a wholesale/retail firm must first forecast demand, and then determine what must be purchased for use in the production process or to stock inventories. Handling returned products is more of an issue for domestic transactions than for foreign ones because the difficulties in returning a product across borders may erase any advantages of doing so.

Production Scheduling

Scheduling of production is done with the assistance of the logistics staff. Production is scheduled in an attempt to balance demand for products with plant capacity and availability of inputs. In the international arena, one must take into account anticipated changes in relative values of currencies, longer distances and times for materials to travel, quotas on imports, etc. Some firms are truly international in stature and try to develop products that can be manufactured and sold in many parts of the world. One example is the Ford Focus, which is a "world designed" vehicle that one can spot variants of in many countries. Inbound materials and components must be scheduled to fit into the production process. The production process itself is scheduled to fulfill

existing and planned orders, and is thus dependent on accurate sales forecasting. Manufactured products must be scheduled for shipment to wholesalers, retailers, and customers.

Procurement

Closely related to production scheduling is procurement (or purchasing), since many of the inputs needed for production must be procured from outside sources, known as vendors. Boeing, for example, relies on about 10,000 vendors worldwide. The procurement cycle has been visualized as having four major components in a process that is an input to manufacturing. First, an order is received based on a manufacturer's production schedule or on a supplier's stocking needs. Second, the supplier schedules the necessary production. Third, components are manufactured and shipped. And fourth, the components are received at the manufacturer's location.

Returned Products

In domestic markets, there are many categories of returned products. A few are subjects of product recalls, meaning that a safety defect or hazard has been discovered and the products are removed from the shelves and both retailers and consumers attempt to return them to the manufacturer or to some intermediary. Some returned goods are those that have been on the shelves too long, and are no longer fresh. Then there are products that the customer is returning to be repaired or replaced. Some products are returned to be recycled in some way or another. Finally, there are products that may have been placed on consignment, never sold, and are being returned. The firm doing business internationally will have to realize that in many national markets where the product is being sold, some returns can be expected for reasons given in the previous paragraph. Reverse flow channels must be established within those nations. Strict accounting controls are necessary to protect all parties in these sorts of transactions. Some care is also needed to insure that the returned product, thought to be scrapped, does not "reappear" to compete with one's other products in the same or perhaps in a different market. Increasingly firms are using information technology to facilitate reverse logistics flows. Firms accepting returns must categorize, approve, and specify procedures as far forward in the distribution channel as possible. Such gate keeping

functions can now be pushed down to the point of end-customer return, typically a retail store. Returned products may be examined for completeness and condition, scanned into the reverse logistics information system, and appropriate final disposition determined before the good leaves the retail location. Firms typically outsource the design and operation of such sophisticated reverse logistics systems. It is possible, although unlikely, to have products returned to the nation where they were manufactured. This does not happen frequently because of logistics costs and uncertainties regarding the items' value at its final destination point. Quite often returned products are disposed of inside of the nation in which they were sold to the end customer. This may involve repackaging and sale, salvage sale, or disposal (usually requiring some level of destruction to prevent the resale of defective goods)

2.5 TYPES OF WAREHOUSES

After getting an idea about the need for warehousing, let us identify the different types of warehouses.

You have learnt that warehousing caters to the storage needs of different types of commodities. In order to meet their requirement various types of warehouses came into existence, which may be classified as follows.

i. Private Warehouses

ii. Public Warehouses

iii. Government Warehouses

iv. Bonded Warehouses

v. Co-operative Warehouses

i. Private Warehouses - The warehouses which are owned and managed by the manufacturers or traders to store, exclusively, their own stock of goods are known as private warehouses. Generally these warehouses are constructed by the farmers near their fields, by wholesalers and retailers near their business centres and by manufacturers near their factories. The design and the facilities provided therein are according to the nature of products to be stored.

ii. Public Warehouses - The warehouses which are run to store goods of the general public are known as public warehouses. Anyone can store his goods in these warehouses on payment of rent. An individual, a partnership firm or a company may own these warehouses. To start such warehouses a licence from the government is required. The government also regulates the functions and operations of these warehouses. Mostly these warehouses are used by manufacturers, wholesalers, exporters, importers, government agencies, etc.

iii. Government Warehouses - These warehouses are owned, managed and controlled by central or state governments or public corporations or local authorities. Both government and private enterprises may use these warehouses to store their goods. Central Warehousing Corporation of India, State Warehousing Corporation and Food Corporation of India are examples of agencies maintaining government warehouses.

iv. Bonded Warehouses - These warehouses are owned, managed and controlled by government as well as private agencies. Private bonded warehouses have to obtain licence from the government. Bonded warehouses are used to store imported goods for which import duty is yet to be paid. Incase of imported goods the importers are not allowed to take away the goods from the ports till such duty is paid. These warehouses are generally owned by dock authorities and found near the ports.

v. Co-operative Warehouses - These warehouses are owned, managed and controlled by co-operative societies. They provide warehousing facilities at the most economical rates to the members of their society.

2.6 DECISION REGARDING OPTIMAL WAREHOUSING NETWORK

Warehouse decisions are important and require close attention in supply chain network. It involves a number of important decisions, i.e. ownership decision; feasible locations for the warehouses; optimal number and capacity of the warehouses; size of the warehouses; and finally internal warehouse management. In supply chain network, number of warehouses and locations are considered as supply chain network design decisions and involved in major capital investments and has a long-term effect on the supply chain performance. A decision framework is proposed for warehouse decisions

in supply chain. In the proposed decision framework, the constant sum model is applied for determination of the priority value for feasible locations.

The fierce competition that crept deep into today's business environment has certainly forced the business world to make some radical changes in their business processes in order to improve their quality, delivery speed, and service. In order to rise up to the ever growing expectations of customers for enhanced quality, faster delivery and greater reliability, both manufacturer and service personnel are desperately looking for better ways to manage their material flows. This has shifted everyone's attention towards an effective and efficient supply chain management. One of the most important tasks of supply chain manger is to decide the location, number, and capacity of warehouses in the supply chain considering qualitative factors and different costs. The multiple criteria must be considered in the warehouse site selection decision. Some of the techniques used for global analysis of locations for warehouses are the following: factor qualification systems, gravitational methods, linear programming techniques with exact or heuristic and cluster and cost analysis. The four most significant cost factors for deciding the number of warehouses are: cost of lost sales, inventory costs, warehousing costs, and transportation costs. The cost of lost sales is extremely important to any company but also the most difficult to calculate and predict and varies from company to company and from industry to industry. The cost of inventory increases with the number of facilities because every company has safety stock at every facility. Some companies have specific warehouses dedicated to a particular product or product group. A model for jointly examining the effects of facility location, transportation modes and inventory related issues on the overall objective of minimising the distribution design costs incurred by a firm. The integrated model permits a more comprehensive evaluation of the different trade-off that exists among the three strategic issues and has attempted to provide insight into the inclusion of realistic transportation, inventory, and location costs in a distribution network design model. But the qualitative issues are not considered. The different factors that should be considered when evaluating the optimal number of warehouses include: distribution network, the level of customer service required; the number of customers; their location and buying habits; and the amount and type of electronic data interchange taking place between producers and consumers. Ma and Davidrajuh (2005) proposed a design approach for optimal configuration of

the distribution chain, including the number and locations of retailers and wholesalers and the assignment of retailers to wholesalers considering the quantitative factors only.

2.7 WAREHOUSE FACILITY DEVELOPMENT

Warehouse Facility means any funding arrangement, other than a Residual Funding Facility, with a financial institution or other lender or purchaser under which advances are made to a Warehouse Entity. In other words, the borrowing of funds by a retail lender on a short-term, revolving basis using the loans as collateral. This form of interim financing is used to raise funds to make the loans and carry the loans until they are securitized (packaged and sold out of the warehouse to the investor). Proceeds from the sale are then used to reduce the warehouse loan.

Warehousing Facility Development

1. Maximise and optimise all available space. Rather than expand the footprint of your warehouse, consider better use of vertical space. Adding taller storage units and the right equipment to pick and store material can help you keep more in the same square footage, rather than adding expansion costs. In addition, think about the type and variety of shelving used. Storing small items on pallet racks wastes space, and makes it easy to misplace items. Rather than using the same racks throughout your warehouse, you may need various types of shelving for different materials. Also, try using standardised bins to help keep shelves neat and orderly.

2. Lean Inventory. Adopting lean inventory for your warehouse is just as important as it is in manufacturing. The basic premise of lean is only what you need, and nothing more. Possibly reduce or eliminate safety stocks, and try to get suppliers to deliver smaller quantities more frequently.

3. Adopt enabling technology. A warehouse management system (WMS) or an ERP system with a strong WMS module can improve efficiency by suggesting the best routes and methods for picking or put-away. In addition, the system provides automated pick lists that can be sent to mobile readers and devices to help eliminate mistakes and reduce wasted time and paper. Your warehouse will be neater and greener. Using barcode or radio frequency identification (RFID) readers can improve

accuracy of transactions, and reduce picking errors. In fact, research conducted at *the University of Arkansas* shows that using RFID increased inventory accuracy by 27 per cent in just 13 weeks.

4. Organise workstations. Organising workstations improves productivity because workers do not have to search for tools or equipment. Use the "5S" method from lean manufacturing to ensure your workstations are as organised as possible. It consists of: Sort; Set in order; Shine; Standardize; and Sustain - all techniques designed to keep clutter at bay, reduce errors, and improve safety and organisation.

5. Optimise labour efficiency. If your WMS doesn't have the ability to generate efficient picking plans, create them manually. Analyse your material usage patterns, and store high-volume items together near the front of the warehouse to eliminate travel time. Also, store items that are frequently sold together near one another. Basically, you will streamline operations if you try to keep the items you pick most often in the most accessible locations to eliminate picking delays.

2.8 USES OF WAREHOUSING MANAGEMENT SYSTEM

Uses of Warehousing Management System

Warehousing offers many advantages to the business community. Whether it is industry or trade, it provides a number of benefits which are listed below.

i. Protection and Preservation of goods:

Warehouse provides necessary facilities to the businessmen for storing their goods when they are not required for sale. It provides protection to the stocks, ensures their safety and prevents wastage. It minimises losses from breakage, deterioration in quality, spoilage etc. Warehouses usually adopt latest technologies to avoid losses, as far as possible.

ii. Regular flow of goods:

Many commodities like rice, wheat etc. are produced during a particular season but are consumed throughout the year. Warehousing ensures regular supply of such seasonal

commodities throughout the year.

iii. Continuity in production:

Warehouse enables the manufacturers to carry on production continuously without bothering about the storage of raw materials. It helps to provide seasonal raw material without any break, for production of finished goods.

iv. Convenient location:

Warehouses are generally located at convenient places near road, rail or waterways to facilitate movement of goods. Convenient location reduces the cost of transportation.

v. Easy handling:

Modern warehouses are generally fitted with mechanical appliances to handle the goods. Heavy and bulky goods can be loaded and unloaded by using modern machines, which reduces cost of handling such goods. Mechanical handling also minimizes wastage during loading and unloading.

vi. Useful for small businessmen:

Construction of own warehouse requires heavy capital investment, which small businessmen cannot afford. In this situation, by paying a nominal amount as rent, they can preserve their raw materials as well as finished products in public warehouses.

vii. Creation of employment:

Warehouses create employment opportunities both for skilled and unskilled workers in every part of the country. It is a source of income for the people, to improve their standards of living.

viii. Facilitates sale of goods:

Various steps necessary for sale of goods such as inspection of goods by the prospective buyers, grading, branding, packaging and labelling can be carried on by the warehouses. Ownership of goods can be easily transferred to the buyer by transferring the warehouse keeper's warrant.

ix. Availability of finance:

Loans can be easily raised from banks and other financial institutions against the security of the warehouse-keeper's warrant. In some cases warehouses also provide advance to the depositors of goods on keeping the goods as security.

x. Reduces risk of loss:

Goods in warehouses are well guarded and preserved. The warehouses can economically employ security staff to avoid theft, use insecticides for preservation and provide cold storage facility for perishable items. They can instal fire-fighting equipment to avoid fire. The goods stored can also be insured for compensation in case of loss.

4.6 SUMMARY

This chapter deals with warehousing management system. Warehousing can also be defined as assumption of responsibility for the storage of goods. By storing the goods throughout the year and releasing them as and when they are needed, warehousing creates time utility. In the same vein, warehousing provides time and place utility (primarily time) for raw materials, industrial goods, and finished products, allowing firms to use customer service as a dynamic value-adding competitive tool. The warehouse is where the supply chain holds or stores goods. Functions of warehousing include: transportation consolidation; product mixing; cross-docking; service; protection against contingencies; smoothing basic warehouse decisions: ownership-public versus private; centralized or decentralized warehousing; how many; location; size; layout; what products where. In order to meet their requirement various types of warehouses came into existence, which may be classified as follows. i. private warehouses ii. public warehouses iii. government warehouses iv. bonded warehouses v. co-operative warehouses. However, any warehouse is said be an ideal warehouse if it possesses certain characteristics, which are given below: i. warehouse should be located at a convenient place near highways, railway stations, airports and seaports where goods can be loaded and unloaded easily. ii. mechanical appliances should be there to loading and unloading the goods. This reduces the wastages in handling and also minimises handling costs. iii. adequate space should be available inside the building to keep the

goods in proper order. Ware houses meant for preservation of perishable items like fruits, vegetables, eggs and butter etc. should have cold storage facilities. v. proper arrangement should be there to protect the goods from sunlight, rain, wind, dust, moisture and pests. vi. sufficient parking space should be there inside the premises to facilitate easy and quick loading and unloading of goods. vii. round the clock security arrangement should be there to avoid theft of goods. viii. the building should be fitted with latest fire-fighting equipments to avoid loss of goods due to fire. Warehouses perform the following functions: i. storage of goods ii. protection of goods iii. risk bearing iv. financing v. processing vi. grading and branding vii. transportation. Whereas Logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods, including services and related information, from the point of origin to the point of consumption. The goal of logistics is to successfully meet customer requirements. This definition includes inbound, outbound, internal and external movements. The major logistics function are:

a. Warehousing : Under this goods are stored after manufacturing till the time they are required for consumption.

b. Inventory management: Goods like raw materials which are required for day to day operations of the business also need to be properly stored and kept track of.

c. Transportation : Goods need to be transported from one place to another. They may have to be shipped from supplier location to factory and thereafter from factory to customer. Warehousing offers many advantages to the business community. Whether it is industry or trade, it provides a number of benefits which are listed below. i. protection and preservation of goods; ii. regular flow of goods; iii. continuity in production; iv. convenient location; v. easy handling; vi. useful for small businessmen; vii. creation of employment; viii. facilitates sale of goods; ix. availability of finance; x. reduces risk of loss.

2.9 GLOSSARY

Warehousing: A warehouse may be defined as a place used for the storage or accumulation of goods. The function of storage can be carried out successful with the help of warehouses used for storing the goods.

Warehouse Management System: A warehouse management system (WMS) is software and processes that allow organizations to control and administer warehouse operations from the time goods or materials enter a warehouse until they move out.

Logistic: Logistics is used more broadly to refer to the process of coordinating and moving resources - people, materials, inventory, and equipment - from one location to storage at the desired destination.

2.10 SELF ASSESSMENT QUESTIONS

1. Explain the relationship between warehousing and other logistic functions.

2. Classify the various types of warehouses. Explain them briefly.

3. What is meant by public warehouse? State any three functions of a public warehouse.

4. Describe the advantage of warehouses to the businessmen.

5. Describe any six characteristics of an ideal warehouse.

2.11 LESSON END EXERCISE

1. What is meant by Warehousing?

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2. How is a bonded warehouse useful for the importers?

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3. Warehousing is one of the important auxiliaries to trade. Explain this statement in about 60 words.

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2.12 SUGGESTED READING

1. International Logistics: The Management of International Trade Operations: Pierre A. David.
2. Warehouse Management: A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse: Gwynne Richards.
3. The Handbook of Logistics and Distribution Management: Understanding the Supply: Alan Rushton.

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C. No. :- BCG-604 **UNIT-III**

SEMESTER: VI **LESSON: 7-9**

TRANSPORTATION PLANNING SYSTEM

STRUCTURE

3.1 INTRODUCTION

The integration and promotion of business activities have to involve transportation systems at various stages. Customers and firms can make business more efficient and easier through the help of e-commerce and the Internet. However, physical delivery still relies on the transportation system to finish the operations. The cost of transportation operation may be one-third of logistics costs. Meanwhile, transportation systems and techniques are needed in almost every logistics activity. Reform of business patterns has to consider transportation systems. Logistics system has a more and more important position in the society activities. Transportation and logistics systems have interdependent relationships that logistics management needs transportation to perform its activities and meanwhile, a successful logistics system could help to improve traffic environment and transportation development. Since transportation contributes the highest cost among the related elements in logistics systems, the improvement of transport efficiency could change the overall performance of a logistics system. Transportation plays an important role in logistics system and its activities appear in various sections of logistics processes. Without the linking of transportation, a powerful logistics strategy cannot bring its capacity into full play. The review of logistics system in a broad sense might help to integrate the advantages from different application cases to overcome their current disadvantage. The review of transport systems provides a clearer notion on transport applications in logistics activities. The development of logistics will be still vigorous in the following decades and the logistics concepts might be applied in more fields.

3.2 OBJECTIVES

After completion of this lesson you shall be able to know:

- Concept of transportation system planning in logistics management.
- Various concepts used in load planning process.
- Concept of trip generation and distribution.
- Need for load planning and various modes used in transportation.

◈ Various carrier selection decisions used in logistics management.

◈ Various activities undertaken by transportation managers.

3.3 CONCEPT OF TRANSPORTATION SYSTEM PLANNING

Concept and Meaning of Transportation system planning

Transportation planning is the process of defining future policies, goals, investments, and designs to prepare for future needs to move people and goods to destinations. As practiced today, it is a collaborative process that incorporates the input of many stakeholders including various government agencies, the public and private businesses. Transportation planners apply a multi-modal and/or comprehensive approach to analyzing the wide range of alternatives and impacts on the transportation system to influence beneficial outcomes.

Transportation planning is also commonly referred to as transport planning internationally, and is involved with the evaluation, assessment, design, and sitting of transport facilities (generally streets, highways, bike lanes, and public transport lines).

Transportation planning, or transport planning, has historically followed the rational planning model of defining goals and objectives, identifying problems, generating alternatives, evaluating alternatives, and developing plans. Other models for planning include rational actor, transit oriented development, satisfying, incremental planning, organizational process, collaborative planning, and political bargaining.

Planners are increasingly expected to adopt a multidisciplinary approach, especially due to the rising importance of environmentalism.

For example, in Hanoi, the increasing number of motorcycles is responsible for not only environmental damage but also slowing down economic growth. In the long run, the plan is to reduce traffic through a change in urban planning. Through economic incentives and attractive alternatives experts hope to lighten traffic in the short run

This attempt to reverse decades of underinvestment in the transport system has resulted

in a severe shortage of transport planners. It was estimated in 2003 that 2,000 new planners would be required by 2010 to avoid jeopardising the success of the Transport Ten Year Plan.

In 2006, the Transport Planning Society defined the key purpose of transport planning as:

"to plan, design, deliver, manage and review transport, balancing the needs of society, the economy and the environment.

The following key roles must be performed by transport planners:

- take account of the social, economic and environmental context of their work
- understand the legal, regulatory policy and resource framework within which they work
- understand and create transport policies, strategies and plans that contribute to meeting social, economic and environmental needs
- design the necessary transport projects, systems and services
- understand the commercial aspects of operating transport systems and services
- know about and apply the relevant tools and techniques
- must be competent in all aspects of management, in particular communications, personal skills and project management.

The UK Treasury recognises and has published guidance on the systematic tendency for project appraisers to be overly optimistic in their initial estimates.

Most regional transport planners employ rational model of planning. The model views planning as a logical and technical process that uses the analysis of quantitative data to decide how to best invest resources in new and existing transport infrastructure. Although a transportation planning process may appear to be a rational process based on standard and objective methodologies, it is often influenced by political processes. Transportation planning is closely interrelated to the public nature of government works

projects. As a result, transportation planners play both a technical and a coordinating role. Politicians often have vastly differing perspectives, goals and policy desires. Transportation planners help by providing information to decision makers, such as politicians, in a manner that produces beneficial outcomes.

This role is similar to transportation engineers, who are often equally influenced by politics in the technical process of transportation engineering design.

"An international integrated intermodal transport and logistics system" Endorsed by the Commission (2007 and 2012) It is the system that has the intermodal network of well designed, maintained and interconnected highways, railways, inland waterways, sea ports, river ports, airports or dry ports that, through modal shift.

Transportation engineering and transportation planning are two sides of the same coin aiming at the design of an efficient infrastructure and service to meet the growing needs for accessibility and mobility. Many well-designed transport systems that meet these needs are based on a solid understanding of human behaviour. Since transportation systems are the backbone connecting the vital parts of a city, in-depth understanding of human nature is essential to the planning, design, and operational analysis of transportation systems.

With contributions by transportation experts from around the world, Transportation Systems Planning: Methods and Applications compiles engineering data and methods for solving problems in the planning, design, construction, and operation of various transportation modes into one source. It is the first methodological transportation planning reference that illustrates analytical simulation methods that depict human behaviour in a realistic way, and many of its chapters. Emphasize newly developed and previously unpublished simulation methods. The handbook demonstrates how urban and regional planning, geography, demography, economics, sociology, ecology, psychology, business, operations management, and engineering come together to help us plan for better futures that are human-centered.

3.4 ROLE OF TRANSPORTATION IN LOGISTICS

Transportation is an expensive and emission-heavy process, making it an ideal target

for carbon footprint and cost reductions, but many companies overlook the importance of transportation management. Transportation is defined as the movement of people, animals and goods from one location to another. Modes of transport include air, rail, road, water, cable, pipeline and space. The field can be divided into infrastructure, vehicles and operations. Transport is important since it enables trade between people, which in turn establishes civilizations.

Logistics is defined as, the art and science of obtaining, producing, and distributing material and product in the proper place and in proper quantities. 2) In a military sense (where it has greater usage), its meaning can also include the movement of personnel. The Council of Supply Chain Management Professionals (CSCMP) defines logistics as the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements.

Interrelationship between Transportation and Logistics Without well-developed transportation systems, logistics could not bring its advantages into full play. A good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality. The improvement of transportation systems needs the effort from both public and private sectors. A well-operated logistics system could increase both the competitiveness of the government and enterprises.

The effects of transportation on logistics activities transportation plays a connective role among the several steps that result in the conversion of resources into useful goods in the name of the ultimate consumer. It is the planning of all these functions and sub-functions into a system of goods movement in order to minimize cost maximize service to the customers that constitutes the concept of business logistics. The system, once put in place, must be effectively managed. Traditionally these steps involved separate companies for production, storage, transportation, wholesaling, and retail sale, however basically, production/manufacturing plants, warehousing services, merchandising establishments are all about doing transportation. Production or manufacturing plants required the assembly of materials, components, and supplies,

with or without storage, processing and material handling within the plant and plant inventory.

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Transportation forecasting technology tames the effects of market volatility and forges a strong link in the supply chain by turning logistics into a competitive advantage.

The benefits include:

Operational efficiency

Gaining visibility into promotions and volume changes due to supply chain shifts allows shippers to proactively identify capacity issues and cost-effectively secure transportation.

Carrier collaboration

Accurate forecasts by lane, mode, and temperature class can produce better customer

service, which in turn improves shipper loyalty. They also help carriers use assets more effectively, and reduce costs for both parties.

Spot shipment reduction

Avoid paying premium rates for spot shipments by gaining the confidence to reserve capacity in advance of orders.

Mode conversion and sustainability

Long-range visibility into shipping needs facilitates conversion to more efficient intermodal transportation, reducing costs and carbon emissions. Visibility also helps shippers better organize assets to reduce deadhead miles and partial truckload shipments.

Visibility

Proper transportation management begins with a transportation management system (TMS). A TMS will automatically tender loads, track shipments, and gather and analyze historical performance data. This data, often referred to as big data, allows a company to see what's happening in its shipping operations. Once visibility is gained into transportation operations, changes can be implemented to increase efficiency and customer satisfaction, reduce transportation spend, and optimize packaging or storing procedures that are harmful to overall supply chain goals.

Inventory Flow

Effective transportation management keeps a company's whole supply chain running smoothly. With successful transportation execution, inventory can be kept lean and can be moved in and out of a warehouse quickly and efficiently. This improves warehouse efficiency, reduces overall lead time and saves money on storage. Supply chain disruptions can be costly, while hurting customer satisfaction and loyalty. Creating effective inventory flow through transportation avoids damage caused by disruption.

Sustainability

Consumers are more and more aware of what it is they're buying and what ideals a

company subscribes to. As was mentioned earlier, transportation is an emission-heavy industry. Customers want to buy from companies who take social responsibility seriously and work hard to reduce its carbon footprint and minimize its energy consumption. Having inefficient transportation processes increases these environmentally-hazardous processes and can make a product unappealing to a customer due to the harm that comes with it.

Preferred Shipper Status

The ATA estimates the transportation industry is currently short 48,000 truck drivers. This shortage is expected to grow to 239,000 by 2022. A truck capacity crunch is due to the significant lack of drivers. Since there is much less trailer space to go around, shippers must compete to secure capacity. A company that has optimized transportation processes, such as short dwell-times and long tender lead times, will be a preferred shipper and have an easier time finding capacity because carriers will want to work with someone who boosts their efficiency. Having access to reliable capacity in the coming years can save a company significantly on overall logistics costs and can continue to provide a high level of service for customers.

Customer Satisfaction

The processes in between procurement and shipping can be long and complicated, but out of all of these processes, transportation is the one where a company has direct contact with a customer. The point of delivery reflects the competency of the entire organization - if a company is constantly delivering products late, the customer will have a very negative view of this company and will likely not use their services again. Last mile logistics, the last stretch before delivery, is complicated, costly, and it is often this part of delivery that causes disruptions and delays. Proper management of transportation can ensure high delivery performance and consistent customer satisfaction.

3.5 TRIP GENERATION AND DISTRIBUTION

3.5.1 Trip generation

Trip generation is the first step in the conventional four-step transportation forecasting

process (followed by trip distribution, mode choice, and route assignment), widely used for forecasting travel demands. It predicts the number of trips originating in or destined for a particular traffic analysis zone.

Trip Generation is the first step in the conventional four-step transportation forecasting process (followed by destination choice, mode choice, and route choice), widely used for forecasting travel demands. It predicts the number of trips originating in or destined for a particular traffic analysis zone.

Every trip has two ends, and we need to know where both of them are. The first part is determining how many trips originate in a zone and the second part is how many trips are destined for a zone. Because land use can be divided into two broad category (residential and non-residential) we have models that are household based and non-household based (e.g. a function of number of jobs or retail activity).

For the residential side of things, trip generation is thought of as a function of the social and economic attributes of households (households and housing units are very similar measures, but sometimes housing units have no households, and sometimes they contain multiple households, clearly housing units are easier to measure, and those are often used instead for models, it is important to be clear which assumption you are using).

At the level of the traffic analysis zone, the language is that of land uses "producing" or attracting trips, where by assumption trips are "produced" by households and "attracted" to non-households. Production and attractions differ from origins and destinations. Trips are produced by households even when they are returning home (that is, when the household is a destination). Again it is important to be clear what assumptions you are using.

Typically, trip generation analysis focuses on residences, and residential trip generation is thought of as a function of the social and economic attributes of households. At the level of the traffic analysis zone, residential land uses "produce" or generate trips. Traffic analysis zones are also destinations of trips, trip attractors. The analysis of attractors focuses on non residential land uses.

The conventional four-step paradigm evolved as follows: Types of trips are considered. Home-based (residential) trips are divided into work and other, with major attention given to work trips. Movement associated with the home end of a trip is called trip production, whether the trip is leaving or coming to the home. Non-home-based or non-residential trips are those a home base is not involved. In this case, the term production is given to the origin of a trip and the term attraction refers to the destination of the trip.

Residential trip generation analysis is often undertaken using statistical regression. Person, transit, walking, and auto trips per unit of time are regressed on variables thought to be explanatory, such as: household size, number of workers in the household, persons in an age group, type of residence (single family, apartment, etc.), and so on. Usually, measures on five to seven independent variables are available; additive causality is assumed.

ITE Trip Generation procedures

The Engineer's Trip Generation informational report provides trip generation rates for numerous land use and building types. The planner can add local adjustment factors and treat mixes of uses with ease. Ongoing work is adding to the stockpile of numbers; over 4000 studies were aggregated for the current edition.

ITE Procedures estimate the number of trips entering or exiting a site at a given time (sometimes the number entering and exiting combined is estimated). ITE Rates are functions of type of development, and square footage, number of gas pumps, number of dwelling units, or other standard measurable things, usually produced in site plans. They do not consider location, competitors, complements, the cost of transportation, or many other obviously likely important factors. They are often estimated based on very few observations (a non-statistically significant sample). Many localities require their use to ensure adequate public facilities for growth management and subdivision approval.

In mode choice, trips are assigned to a mode (usually auto or transit) based on what's available in a particular zone, the characteristics of the household within that zone and the cost of the mode for each mode in terms of money and time. Since most trips by

bicycle or walking are generally shorter, they are assumed to have stayed within one zone and are not included in the analysis. Finally, in route assignment, trips are assigned to the network. As particular parts of the network are assigned trips, the vehicle speed slows down, so some trips are assigned to alternate routes in such a way that all trip times are equal. This is important because the ultimate goal is system-wide optimization, not optimization for any one individual. The finished product is traffic flows and speeds for each link in the network.

Ideally, these models would include all the different behaviours that are associated with transport, including complex policy questions which are more qualitative in nature. Because of the complexity of transport issues, this is often not possible in practice. This results in models which may estimate future traffic conditions well, but are ultimately based on assumptions made on the part of the planner. Some planners carry out additional sub-system modelling on things like automobile ownership, time of travel, location of land development, location and firms and location of households to help to fill these knowledge gaps, but what are created are nevertheless models, and models always include some level of uncertainty.

The post-analysis phase involves plan evaluation, programme implementation and monitoring of the results. Johnston notes that for evaluation to be meaningful it should be as comprehensive as possible. For example, rather than just looking at decreases in congestion, MPOs should consider economic, equity and environmental issues.

The goal of trip generation is to predict the number of trips, by purpose, that are generated by and attracted to each zone in a study area. Trip generation is performed by relating the number or frequency of trips to the characteristics of the individuals, of the zone, and of the transportation network. The zone that contains the home end of home-based trips or the origin end of non-home-based trips is considered to have produced the trip, while the destination zone where an out-of-home activity will be undertaken is considered to have attracted the trip.

3.5.2 Trip distribution

Trip distribution usually occurs through an allocation model that splits trips from each

origin zone into distinct destinations. That is, there is a matrix which relates the number of trips origin a ting in each zone to the number of trips ending in each zone. In t his matrix, there are a number of origin zones, M, and a number of destination zones, N. The origin zones include all the destination zones but may also include some additional ones. The reasons that there would be different numbers of zones for the origin and destination models are that crime data for other jurisdictions are not available but that a sizeable number of crimes that occurred in the study jurisdiction are committed by individuals who lived t hose other jurisdictions. If it were possible to obtain crime data for the city of Baltimore, then it would be prefer able to have the same number of zones for both the origin file and the destination file.

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3.6 LOAD PLANNING

Load planning encapsulates the various ways of loading a consignment, whether to have pallets, whether single units. There can be a mix of various units-pallets, single

units barrels etc. Also there might be different kind of requirements of certain consignment like refrigeration, liquid holding; all these can be planned to be transported even in a single vehicle.

Load planning has a great impact on the cost of transportation for the client, for the transporter it has an impact on the transit time.

Load planning is a process in the transportation industry that sees shipments being combined, often turned into larger loads, to decrease the amount of vehicles needed to transport goods and therefore making trips more efficient. In this age of technological advancements and cost cutting, we've also been able to develop systems and software that dissects shipments and calculates the best way of transportation when routing is concerned.

The software takes aggregate models of the shipments and creates the most optimized shipment combinations. However, these programs are still very much in the testing stages, and we still rely heavily on highly skilled workers to streamline transportation in the trucking industry. There are multiple facets to the duties and responsibilities of someone who works in load planning, and it's far from just cramming as much stuff into one truck or van as you possibly cannot only is that inefficient, it's just plain lazy. Load planners have to have a grasp on multiple facets of the industry, not just how to properly load a transport vehicle.

Carrier selection is an essential and important part of the process, as well as juggling things like which shipping lanes to use, what the priority of shipments is, what the past cost and performance of specific routes and carriers has been and much more. All of these will combine to give you an indication of how efficient, convenient and cost effective a shipment will be. Your job as a load planner will be to maximize cost and efficiency, based on all of these factors.

If you're looking for a rewarding job that involves a lot of planning, calculating and number crunching within the vast realm of automotive career, load planning specialists are in high demand. The transportation industry depends on skilled individuals to ensure the maximum efficiency of shipments, as costs are rising and any leg-up companies can get on streamlining their business while lowering costs is nothing short of revolutionary.

Role of Transport in Logistics Management

Transport is a major component of the logistics management because it relates to the movement or flow of goods from point-of-origin to point-of-consumption. Transport is a factor in creation of time utility because it can determine how fast and how consistently products move from one point to another. The decisions about logistics management related to transport includes operating one's own transport versus hiring transport, mode, carrier, and service selection, method of freight consolidation, vehicle routing and crew and trip scheduling, and equipment selection, replacement, and acquisition (purchase, lease, or rent). Transport cost represents approximately 40 to 50 percent of total logistic cost and 4 to 10 percent of the product selling price, so the authors conclude that transport decisions directly affects the total logistics costs. In logistics perspectives, three factors that are fundamental to transport performance include cost, speed, and consistency. The cost of transport is the payment for moving between two places and the expenses related to maintaining in-transit inventory. Logistical system should utilize transport that minimizes total system cost, so it means that the least expensive method of transport may not result in the lowest cost of logistics. Speed of transport is the time required to complete a specific movement. Faster transport service may charge higher, so selecting method of transport should stay balance between speed and cost of service. Finally, consistency reflects the dependability of transport which always shows as the most important attribute of quality transport.

3.6.1 Mode of Transport and Characteristics

Railroads

The railroad is a long hauler which moves the raw materials and low valued manufactured products. The author also explains that there are two legal forms which are common carriers and private carriers. A common carrier sells its transport service to all shippers, but private carriers are owned by shippers with the usual intent of serving only the owner. The advantage of railroad is to transport large tonnage over long distance, but disadvantage of railroad is having high fixed cost due to expensive equipment, right-of-way and tracks, switching yards, and terminal. However, railroad has low variable operating cost.

Motor Carriers

Motor carrier is a part of any firm's logistics supply chain because almost every logistics operation needs the motor truck from the smallest pickup truck to the largest tractor-semitrailer combination. Similarly to railroads, motor carriers have two types which are for-hire and private carriers. Motor carriers commonly transport manufactured commodities over relatively short distance. The commodities include textile and leather products, rubber and plastics etc. The major advantage is ability to provide service to any location. However, weather condition and highway traffic can disrupt motor service and effect transit time reliability.

Air Carriers

Air carriers offer a very fast and fairly expensive mode of transport. Airlines have a high fixed cost in infrastructure and equipment. The commodities are the high-valued items or time-sensitive emergency shipments that have to travel a long distance. The shipments that are less than 500 pounds including high-value but light weight and high-tech products are suited for air carriers, the advantage of air carriers are direct flight possible to all ports of the world and speed much higher than any other mode of transport. However, disadvantages are high freight rate, possible delay due to bad weather, more restrictions on size and weight.

Water Carriers

Shipper can use water carriers in combination with other mode of transport. Water service on the average is slower than rail and availability and dependability can be effected by bad weather. Loss and damages cost from water carriers are considered low relatives to other modes.

Modes of transport

The way goods are moved around the country hasn't changed all that much over the years. Ships, trains, trucks and planes for smaller shipments remain the primary methods of shipping. What has changed is how large the shipments are and how they are tracked by software. We now see smaller, more personalized orders, more frequent shipments and a predominant rise of e-commerce in logistics. There has

been a lot of innovation, and transportation has become more nimble because of it.

Ocean liners are giant ships used to transport goods. These ships traverse regular routes on fixed schedules. Liner vessels include container ships, bulk carriers and tankers. Container ships carry most of the world's goods, while bulk carriers transport raw materials like coal or iron ore, and tankers transport oil, petroleum and other chemicals.

Because they can carry a lot of cargo, up to several warehouses-worth of goods, liner ships are very efficient. Although shipping has been around for a very long time, today's ships can carry more cargo and are more fuel- efficient.

Trains

There are two main options when it comes to shipping goods by rail.

- Carload service: If your business is located close to a rail station, you can load freight directly onto or into rail cars and have it delivered to its destination.
- Intermodal service: This involves having your freight loaded into trailers then trucked to the rail station where the freight is loaded onto the train. At the final destination, trailers are loaded back onto another truck and delivered.

Rail shipping has several benefits. It's cost-effective and environmentally friendly because trains use less fuel than trucks to transport goods across the country.

Trucks

A semi or trailer truck, also known as a freight truck, transports items larger than 150 pounds. If your shipment exceeds 10,000 pounds, an entire freight truck is required to move it. Some companies also offer an LTL (Less Than a Truckload) option. In this shipping situation, you will only pay for the space you use.

Shipping by truck has some advantages. You have greater flexibility than you do with a train. Transportation is direct, rather than the go-betweens needed with a train, and transit times are often shorter. However, trucking causes environmental damage, trucks are subject to accidents and inclement weather may cause delays.

Planes

Shipments by plane will cost your company the most but will deliver goods the fastest. Light shipments that need to arrive quickly will benefit from a plane shipment. In 2016, Amazon leased 40 planes in order to ship its goods more quickly and efficiently, and in 2017 the company announced plans to build a $1.5 billion hub for its own cargo airline.

Changes to the Logistics Industry

Companies used to talk a great deal about inventories. In fact, it was once a topic each night on the news. Today, large companies such as Amazon are trying to understand human behavior and predict where and when people will need products, instead of worrying about inventories. Overall, companies now keep much lower inventories than they did in the past

New manufacturing methods may also have an impact on logistics. The possibilities created by 3-D printing, for example, might one day allow companies to manufacture goods in-house rather than making them in one spot and shipping them to another.

So while software, drones, automated trucks and 3-D printing are slowly changing some of the methods of logistics, the trains, ships, trucks and planes won't be disappearing from the supply-chain model anytime soon.

Business functions in logistics management:

- Facility Network
- Warehousing, Material Handling, and Packaging
- Integrated Logistics Management
- Order Processing
- Transport
- Inventory

Logistics requirement have increased to serve consumers who want and demand

quicker response times and more convenient offerings. Moreover, it is also pressured by consumers related to the prices, so the company needs to control its supply chain as efficiently as possible.

Importance of Logistics

Logistics is about creating value in terms of time and place, so good logistics management means the activities that contribute to the process of adding value. Logistics management is related directly to minimising the cost which can derive benefits to the consumers and to the firm's shareholders. Logistics management can result of the profit squeeze and potential profit leverage because it is the area to significantly save cost which has greater impact in the firm's profitability that increasing sales volume would have.

Characteristics of Modes of Transportation

There are many forces that bring about new challenges in logistics management. Some of them originate in the shipper community, carrier community and consumers themselves such as the growing concern for the environmental impact of the products they purchase. In the research, the authors also explain five logistics challenges that influence transport choice which are transport capacity shortages, international growth, economies of scale, security concern, and environmental and energy use concerns.

Transport Capacity Shortage

The issue is relevant to all transport modes. In motor carriers, capacity is limited due to tighter hours-of-service regulation, driver shortage, and higher toll that strain truck capacity. Railroads are operating at or near capacity and they have been reluctant to make a huge investment, so it put more pressure on motor carrier industry and more truck on road.

International Growth

International growth is a challenge for logistics management because it involves activities related to international trade such as providing adequate transport and

storage, getting items through custom, delivering to foreign location in timely fashion at an acceptable cost. Customers have become more demanding in terms of requiring special features or adaptations to a standard product. Therefore, the challenge is that suppliers have to fulfill the individual customer demand profitably by integrating the supply chain process to satisfy the demand.

Economies of Scale

The issue relate to shipment size because full truckloads can minimize the cost associated with the capital expenditure for equipment. Economies of scale also involves in handling of inventory. It is cheaper to ship cases than ship individual units and also cheaper to ship in pallets than to ship individual cases. The concept is similarly to Stock and Lambert (2001). The authors explain that inventory is required if a firm is to realize economies of scale in purchasing, transport, and manufacturing. Moreover, when the firm purchases material in larger volume, it reduces transport cost per unit because full truckload and rail car shipments receive lower transport rate than smaller shipments of less than truckload (LTL) or less than carload (LCL) quantities.

Security concerns

Security issue and supply chain must relate together because terrorist attack can impact the business operation. Need of security and efficiency should stay balance because if the need is overwhelming, it can cause delay of logistics process.

Environmental and Energy Concerns

A growing concern over the environment and energy challenges to logistics managers. Logistics is a part of firm that should become environmental friendly, and the role of logistics managers have been increasing because their decision have a major impact on environment. They should deliver the green products to consumers to maintain the good image of the firm. However, the challenges of logistics managers is that how to incorporate environmental management principles into their daily decision making process. The author also mentions about mode selection impacting on the environment. Rail and barge use less energy than road haulage and air cargo. Logistics

managers have the greatest ability to influence environmental issue involving pollution and natural resources preservation.

(IMO) and similar regulatory bodies provide a wide range of study to increase environmental awareness and consequent tougher regulatory on the environment. Marine pollution is a matter of oil pollution after accidents at sea or the deliberate discharge of pollutants in the process of washing tanks. The pollution also comes from the loss overboard of containers or deck cargoes of chemicals, fertilizers and similar products. Air pollution results from emissions, and noise pollution also come from busy roads or near major airports. In the result, companies need an environmental audit to review their operation regularly with the preparation and adoption of training programmes to create awareness of environmental issues.

3.6.2 Carrier Selection Decision

The Carrier decision making process is the stage that includes mode choice and carrier selection which can identify relevant transport performance variables, select mode of transport and carrier, negotiate rates and service levels, and evaluate carrier performance.

Mode and carrier selection is important because shipper can reduce the number of carriers with whom they do business. When shippers have high volume, they get bigger discount and higher level of service that result in lower transport costs. Meanwhile, carriers prefer to deal with fewer shippers with large consistent volume over long period of time. Process of selection is involved with behavioural approach which includes environmental and organizational factors. The performance of the transport carrier may influence the effectiveness of the entire logistics function of a company and the process of carrier selecting is an important to the company's success.

There are five factors that are influent the choice of transport containing company characteristics and philosophy, market structure, product characteristics, customer characteristics, and environmental issues. Firstly, the company should concern its marketing, financial, and operation strategies. Marketing can determines customer service offer and customised to meet different customers' needs. Financial is also

involved with the profit objectives. Secondly, market structure is essential consideration. In competitive market, delivery may be the key factor influencing customers' selection. Thirdly, product characteristics are involved with weight, size, and shape. Next, customer characteristics can impact on profitability. The company should check customer profile, order cycle, and customer after-sales service requirements. Finally, environmental issues can influence transport decisions because in some countries, government is influent in transport policy.

3.6.3 Selecting and Making Decision Process in Carrier Selection

Four decision stages:

- Search
- Choice
- Post-choice Evaluation
- Problem Recognition

There are four decision stages occur in the mode/carrier selection decision which are problem recognition, search, choice, and post-choice evaluation. Firstly, the problem recognition is the stage that is affected by a variety of factors such as customer orders, dissatisfaction with existing mode/carrier, and changes in the distribution patterns of firm. Next, customers will come to search process which they scan a variety of information sources. The possible source can be their past experiences, carrier sales calls, existing company shipping record, printed materials such as advertising brochures, and customers. This process can take a considerable of time. Then, the important stage is choosing. There are many critical attributes concerned in this stage, and executives will choose the mode/carriers that satisfy their requirements. Finally, transport executives evaluate the choice performance. Many firms use many techniques such as cost studies, audits, on-time pickup and delivery performance, and damage/claims reviews while some of them use statistical analysis.

Behavioural Approaches Related to Transport Study

Three assumptions associated with carrier choice are:

1. Economic positivism is explained that economic value related to the firm which determines the use of transport. This approach related to price and profit. The firm attempts to maximize short term revenue and minimize short term cost in a trading.

2. The second approach is called technological positivism which is associated between the physical aspects of commodity such as weight and volume and the transport system such as speed and frequency.

3. The last approach is perceptual approach which related to user interpretation of the situation rather than on physical attributes.

Important Attributes in Selecting Carriers

Shipper Perspectives

To make a decision, customers need to realize value in order to make a selection, so this part will review the important attributes for shipper to make the selection carrier criteria. Five most important carrier service attributes are availability of cargo space, low damage and loss record, accurate documentation, reliability of advertised sailing schedule, and courtesy of inquiry. The research also found that the factors of selecting carriers between import and export shipper are different in the factor of door to door transportation rates. The research also concluded that service factor is important factor for export customers. Key criteria for carrier selection includes a willingness to meet service expectation, an established track record of outstanding performance, a willingness to focus on continuous improvement, the ability to handle special needs and emergencies and a willingness to meet cost goals.

The most important fact in this example is that the carrier selected must have the physical capability to ship the product at the service level required-regardless, of mode, the company selecting a carrier is only concerned that their product arrives on time. This is a point that shows how the modal selection decision does not always

occur directly before carrier selection. This shift in the previously accepted process represents an emerging important trend regarding modal and carrier selection, and it will impact how this topic is studied and taught going forward. Future opportunities for research could exist in looking at how the shipper-carrier relationships are formed and some of the factors taken into consideration on both ends when a long-term, structured relationship is in its infancy. In addition to this, more research opportunities exist in looking at how this transportation selection decision process may be evolving from a step-by-step process to a more flexible, fluid decision-making process. Also, new trends will need to be analyzed as the transportation industry and global marketplace continues to evolve, especially in regards to trucking capacity. The capacity problems plaguing the trucking industry are likely to have a very large impact on the structure of the industry as well as the modal split, so there are a number of research opportunities ahead as this scenario unfolds.

3.6.4 Other Activities of Transport Manager

Transport managers are relied upon to ensure that operators are operating safely and compliantly. As such, all licence holders, aside from those holding restricted licences, are required to have an appropriate transport manager be in place.

Transport Managers can be either internal or external, but in order to perform this role they must be resident within the European Community. Internal transport managers should *effectively* and *continuously* manage the transport activities of the operator. They also must have a genuine link to the licence holder or the applicant. There are a number of ways in which a genuine link can be established, these include the Transport Manager holding the licence in their name or being an employee, either full or part-time of the operator.

An external transport manager, rather than committing to effectively and continually managing transport activities, must confirm that they will perform their work within the interests of the licence holder or applicant. Additionally, external transport managers can only perform that role for a maximum of 4 operators, where the combined fleet of authorised vehicles is 50 or less.

Job Duties and Tasks for Transportation Manager

1) Direct activities related to dispatching, routing, and tracking transportation vehicles, such as aircraft and railroad cars.

2) Plan, organize and manage the work of subordinate staff to ensure that the work is accomplished in a manner consistent with organizational requirements.

3) Direct investigations to verify and resolve customer or shipper complaints.

4) Serve as contact persons for all workers within assigned territories.

5) Implement schedule and policy changes.

6) Collaborate with other managers and staff members in order to formulate and implement policies, procedures, goals, and objectives.

7) Monitor operations to ensure that staff members comply with administrative policies and procedures, safety rules, union contracts, and government regulations.

8) Promote safe work activities by conducting safety audits, attending company safety meetings, and meeting with individual staff members.

9) Develop criteria, application instructions, procedural manuals, and contracts for federal and state public transportation programs.

10) Monitor spending to ensure that expenses are consistent with approved budgets.

11) Direct and coordinate, through subordinates, activities of operations department in order to obtain use of equipment, facilities, and human resources.

12) Direct activities of staff performing repairs and maintenance to equipment, vehicles, and facilities.

13) Conduct investigations in cooperation with government agencies to determine causes of transportation accidents and to improve safety procedures.

14) Analyze expenditures and other financial information in order to develop plans, policies, and budgets for increasing profits and improving services.

15) Negotiate and authorize contracts with equipment and materials suppliers, and monitor contract fulfilment.

16) Supervise workers assigning tariff classifications and preparing billing.

17) Set operations policies and standards, including determination of safety procedures for the handling of dangerous goods.

18) Recommend or authorize capital expenditures for acquisition of new equipment or property in order to increase efficiency and services of operations department.

19) Prepare management recommendations, such as proposed fee and tariff increases or schedule changes.

20) Conduct employee training sessions on subjects such as hazardous material handling, employee orientation, quality improvement and computer use.

21) Participate in union contract negotiations and settlements of grievances.

22) Provide administrative and technical assistance to those receiving transportation-related grants.

23) Direct procurement processes, including equipment research and testing, vendor contracts, and requisitions approval.

Transport Manager's Job Responsibilities

- The making of arrangements to ensure that the vehicles are maintained properly, including the inspection of vehicles at the appropriate time and the action taken to remedy defects found.
- The making of arrangements to ensure that drivers comply with drivers hours, rules and with speed limits.
- The reporting and recording of vehicle defects by drivers.

- The method of compilation and the accuracy of all records, which must be kept for a period of not less than 15 months.
- The making of arrangements to ensure that the vehicle/s are not overloaded.
- Ensuring that authorised vehicles will be kept at the authorised operating centre(s) when not in use.
- Where appropriate, notifying the relevant Traffic Commissioner (in writing) of all prosecutions and convictions concerning the operator, the drivers and himself within 28 days of the court hearing.
- Notifying the relevant Traffic Commissioner of his resignation.

The level of involvement of a transport manager within the business is particularly important in assessing whether the transport manager exercises continuous and effective control over the transport activities. This will be assessed in part through the time that is spent with the business. Even where there are only two vehicles on a licence, it will still be expected that a transport manager will spend 8 hours each week in this role. For a licence with 15 - 29 an operator is expected to have a full time transport manager. Therefore, a transport manager who lives abroad may struggle to demonstrate to the traffic commissioner that they are able to satisfy this role.

The requirements on a transport manager should be carefully considered before being entered into. A transport manager may be disqualified from acting as a transport manager by the traffic commissioner and this prohibition would apply across the whole of the European Union. Therefore, transport managers need to be alive to their obligations and ensure that they are satisfying them. For instance, if a transport manager's working hours are reduced, they should notify the traffic commissioner. Additionally, if a transport manager becomes aware of activity that they feel is inappropriate and they are uncomfortable with, they should seek advice as soon as possible. Transport managers should also resist being added to a licence in name only and having no connection with the operator. The alternative is action being taken directly against the transport manager.

3.7 SUMMARY

Transportation industry is centred on one specific idea i.e. lowering cost. While efficiency and speed rank high on the list of priorities for transportation companies, minimizing cost is the backbone of keeping the industry alive. High costs mean less efficient and readily available transportation of goods and services, which inevitably means less business, which could mean the bankruptcy of a company. Keeping costs low is at the forefront of every transportation company, because the more they can save means the more they can do. One of the things driving this quest for low costs is the concept of load planning. Transportation is just one of the great examples of automotive trades that can lead to a rewarding and stable job. The requirements on a transport manager should be carefully considered before being entered into. A transport manager may be disqualified from acting as a transport manager by the traffic commissioner and this prohibition would apply across the whole of the European Union. For carrier selection, the primary deciding factor tends to be service, with many shippers limiting the pool of carriers they can choose from based on a set service level threshold. All of the companies involved in this study, however, are concerned about future capacity. Therefore, the issue of contracting capacity is a major factor that will play a part in the future of carrier selection. A prevalent yet unexpected trend is for shippers to form strong relationships with carriers in an effort to mitigate the ill effects of a volatile, highly competitive globalizing market. These relationships are often seen to take precedence over the all-important factor of cost. This is due to the fact that in an unstable market companies need to feel comfortable that a carrier will be there with the capacity needed to support growing volumes and an economy emerging from recession. After determining exactly what factors play the most important roles in modal and carrier selection, a very important theme that has come from this research is the fact that these transportation selection decisions are not always made in a stepped process as was previously thought. Instead of first making the modal decision, then making a carrier decision, results of this research indicate that the decisions are beginning, to blend together, sometimes even being made simultaneously. For example, a company may choose mode and carrier primarily based on product characteristics-mode is not necessarily chosen first if the carrier has multi-modal capabilities.

3.8 GLOSSARY

Transportation Planning: Transportation planning is the process of defining future policies, goals, investments, and designs to prepare for future needs to move people and goods to destinations. As practiced today, it is a collaborative process that incorporates the input of many stakeholders including various government agencies, the public and private businesses.

Load Planning: Load planning is a process in the transportation industry that sees shipments being combined, often turned into larger loads, to decrease the amount of vehicles needed to transport goods and therefore making trips more efficient.

Carrier Selection Decision: The Carrier decision making process is the stage that includes mode choice and carrier selection which can identify relevant transport performance variables, select mode of transport and carrier, negotiate rates and service levels, and evaluate carrier performance.

Logistics Management: Logistics management is the most widely used term and encompasses logistics not only in the private business sector but also in the public/ government and non-profit sectors.

Trip Generation: Trip generation is performed by relating the number or frequency of trips to the characteristics of the individuals, of the zone, and of the transportation network. The zone that contains the home end of home-based trips or the origin end of non-home-based trips is considered to have produced the trip, while the destination zone where an out-of-home activity will be undertaken is considered to have attracted the trip.

Distribution: Distribution involves managing how a supplied and stored material is then dispersed to the locations it is needed. This involves issues of material movement (loading, unloading and transportation), tracking of stock and accountability of use (recording how the supply is used and by whom).

3.9 SELF ASSESSMENT QUESTIONS

1. Explain how carrier selection decisions are taken during load planning process?

2. Explain various activities that transport managers undertakes?

3. Discuss the concept of transportation planning system.

4. Explain the concept of trip generation and distribution process?

3.10 LESSON END EXERCISE

1. Explain transportation system planning in detail.

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2. Describe the need for transportation in logistics.

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3. Explain the process of trip generation and distribution in detail.

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4. Describe various activities of transport managers in detail.

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3.11 SUGGESTED READING

1. Logistics and Supply Chain Management: D.K., Aggarwal
2. Business Logistics/Supply chain Management: Ronald H., Ballou
3. The role of transportation in logistics chain: Sreenivas and Sriniva
4. Key Factors and Trends in Transportation Mode and Carrier Selection Keith Roberts 2012

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C. No. :- BCG-604 **UNIT-IV**

SEMESTER: VI **LESSON: 10-12**

LOGISTIC AUDIT AND CONTROL

STRUCTURE

4.1 INTRODUCTION

This chapter deals with issue of logistic audit. In current time this area isn't regulated with any standard or norm. Logistic audit is focused on diagnosis of logistic processes of company which are specific for every sector of business.

Audit in general represents synonym for control, verification and mostly is connected with accountant or economical audit. Nowadays, is the auditing approach extended to other areas and serves mainly as a tool for improving quality of management and business outcomes. Every logistic chain must be carefully scheduled and managed, because its quality and efficiency reflects the quality of services company. Therefore for increase of the performance is necessary to perform control and monitoring of individual processes in the company. This particularly refers to the main business processes which are the purpose of existence the company.

Further, goal of logistics is to supply the required goods on time, to desired location, in required quantity and quality at minimum cost with minimum impact on the environment. Processes which provide transport and supplement of resources in terms of business, are corporate logistics. It is divided into external and internal logistics. Transport is provided in following triad: between supplier, manufacturer and customer. Since this is a collateral of materials, semi-products and products that create added value to next step, where they are transported, it is necessary to pay them their area of interest. Even though it has been processed a large number of contributions in areas of logistics and planning, it is still an area which in practice is not clearly defined. That is logistics audits, focusing primarily on internal logistics.

4.2 OBJECTIVES

After completion of this lesson you shall be able to know:

- Concept and importance of logistic audit and control
- Elements of logistic control system
- Types of control system

◈ Significant aspect of control systems

◈ Types of corrective action

4.3 CONCEPT AND IMPORTANCE OF LOGISTIC AUDIT AND CONTROL

CONCEPT OF LOGISTIC AUDIT

Logistics is the process/chain management of transport/flow and the storage of goods and services from its origin to its consumption. Logistics, by definition is coordinating complex operations involved in the moving of people, equipment, and supplies. The primary objective of Logistics Audit is to match the logistic requirements and customer service expectations, taking the market dynamics into consideration, and to identify areas for improvement to achieve customer service excellence.

In a logistic audit (potential analysis / logistic due-diligence) the current logistic system and its services are compared with the requirements. In particular, the performance of the processes and structures are checked. The purpose is to identify possible routes of failure and spheres of action for improving the quality and performance of the logistics system in general, and the logistic processes in particular. The procedure is done in five steps: requirements analysis; performance analysis; process analysis; structural analysis and benchmarking.

A freight logistics audit will generally cover both inbound and outbound transportation as well as other logistics related activities such as stock management, warehousing or trade compliance.

A Logistics audit will invariably start with gathering quantitative and qualitative data from key stakeholders and with analyzing and interpreting this information. The main departments collaborating in data collection and interviews will typically be Logistics and Transportation as well as Warehousing, Purchasing, Production, Trade Compliance, Customer service and IT departments. All these departments are involved directly or indirectly in the supply chain and can provide a valuable insight on the situation as well as benefit from the outcomes of the audit.

Typical findings will generally relate to the (without being limited to) logistics sourcing strategy, customs compliance performance, HTS management, freight optimization and consolidation, order and stock management, ERP and logistics systems interaction, process streamlining and unification, premium transportation limitation and regulation, logistics provider portfolio strategy and contract management.

The ultimate purpose of the logistics audit is to objectively evaluate the entire process in order to identify any inefficiencies, bottlenecks, and waste. Provide suggestions for improvements and modifications summarized on "to-be" maps and adequately prioritized. Specific recommendations, action items and risk assessments will accompany these suggestions and solutions to help with their implementation.

In a nutshell, a freight logistics audit will identify good working practices and improvement or optimization opportunities inside the logistics chain of an organization through an objective assessment and data benchmarking and moreover, will map a road leading both to qualitative service improvement and logistics savings and cost avoidance.

Objectives

The objectives of a logistic audit are:

- To point out the weaknesses of the logistic system and/or its subsystems.
- To estimate the impact and potential for performance improvements.
- To identify and demarcate the largest potential areas for improvement.

Procedure

The potential analysis consists of five individual steps, which together cover all relevant aspects for auditing a logistic system.

Step 1 - Requirements Analysis

Collection of logistic service requirements of all customers (end customers, market, sales, etc.) and the critical assessment of these requirements.

Do these requirements correspond with the company strategy?

Is there an appropriate ratio of the costs for meeting the requirements and its benefits?

Are there any articles which cause higher costs than benefits and are not required by the customer?

Are there any key customers which should be given delivery preference?

What are the service levels and the agreed delivery time for different customer groups? If value-added services are offered, what would the financial and customer side effects be of a reduction or improvement of those services?

The requirements collected as a result of this analysis must be critically examined, because in surveys individuals may exaggerate or overemphasize their requirements. For example, customers may demand a 24 hour service or express deliveries, but if the customer is charged for this service (e.g. express surcharge, packaging surcharge) many will prefer to waive the services. In addition, not all services actually fit with the corporate strategy.

Step 2 - Performance Analysis

The performance analysis examines at what cost, with what efficiency and with what quality the logistical services are provided. For this purpose, by means of an input-output analysis, the cost (direct and indirect) for each logistic service is determined.

In general, the performance and quality of individual logistic processes are raised and evaluated on the basis of key performance indicators (KPIs). In detail, performance analysis consists of:

Analysis of bottlenecks

The bottlenecks in the supply chain are unveiled by analyzing the average waiting times or capacity times. There are also areas in which utilization ratio may never rise above 70-80% for example, and thus these areas may be overstaffed.

Analysis of residence and processing times

Logistic functions differ in practice, often in relation to availability or speed of service provision. In particular, there is often a mismatch with regards to the mean residence

time and actual processing time of an order. For example, the warehouse is staffed 24/7, because the products must be delivered the next morning.

Analysis of redundancies

Most positions in companies are staffed by two or more employees to ensure the service delivery, in case of failures caused by illness, etc. This should be carefully checked: Is a complete redundancy on technical systems really necessary or would it be enough to keep the redundancy only for certain subsystems? Furthermore, is a single member of staff sufficient with a better coordination of the process flows?

Analysis of lead times and completion dates

Which business units exceed the defined lead times and completion dates more often? Why is that happening and what extra costs arise by exceeding the lead and completion times?

Error Analysis

Are there any working stations where a disproportionate number of errors occur? What costs are caused by error handling?

Analysis of cost centers and logistic cost

What are the main and relevant logistic costs? Depending on the kind of business, the transportation, warehousing or packaging can be the main cost drivers. Have they been identified? The cost reduction programs should start here.

Step 3 - Process Analysis

The process analysis examines all the logistics processes, from the customer to the supplier. This may reveal differences between customer expectations and actual logistic performance. The following ten potential fields should be taken into account:

Logistics units - Which loading equipment is in use, and what costs are assigned to these loading units? Is the use of loading units appropriate for each case?

Master Data - Is there an adequate logistics database? Who is responsible for

master data maintenance? What quality is the master data?

Times - Are the times coordinated within the company? Are the defined times meeting the market requirements? Are there any bottlenecks and points of failure?

Costs - Can cost rates be assigned to the services? Who is responsible for ensuring the prices per service are appropriate? How do you validate whether prices are appropriate according to the market requirements?

Stocks - Where are the stocks maintained and why? How do you control the stocks from a strategic point of view, but also on the operational level? Which stock keeping procedures and policies are available?

Quality - Is there a quality management system in place and what quality standards are used? Who is responsible for quality improvements? How are the failures tracked? Is there a system in place for continuous improvements?

Interfaces - Is collaboration internally/externally organized, and how is this done? Which entities are processed manually and electronically?

Planning/Process Control - Are the resources optimally planned? Who decides on the disposition quantities and how? Are standardized programs being used?

Supply Chain - Which supply chains are in place or can be classified for the company, and which are considered as critical (in terms of cost, time, quality and risk)? Who manages these supply chains, under what procedure and in which institutional form?

Make or Buy - Which parts are produced internally and what is bought from external providers? Who decides whether to make or buy, and who regularly performs comparative calculations?

Step 4 - Structure Analysis

The structure analysis checks whether the existing system structures meet the requirements and what improvements are possible. On the basis of tree diagrams, the interrelationship between the areas are depicted and possible spheres of action

are identified. The following questions must be clarified:

Is the site and distribution structure appropriate to the market requirements and company strategy respectively policy? In what regulatory environment is the company involved?

Are the responsibilities and tasks within and between the sites organized in an optimal manner?

Is it possible to generate service improvements and cost savings by centralization/ decentralization?

Is the number of tiers in relation to the plant, the production and procurement correct according to the market demands, service level agreements and quality targets?

Step 5 - Benchmarking

Benchmarking considers the company's own performance relative to the industry, competitors, other divisions or in relation to a theoretical optimum. This can help highlight weaknesses and strengths in the company's own structure. These services need to be compared comprehensively. Only analyzing the service performance, delivery capability, delivery time, and adherence to schedules is not sufficient. If costs are not also considered, you will receive a distorted view. When starting a benchmarking project, it is also important to take the environmental conditions (different regulations, different customer structure, etc.) into account.

IMPORTANCE OF LOGISTIC AUDIT

The purpose of logistic audit is implementation a comprehensive diagnosis of logistics processes and corporate functions and subsequent determination the program of changes in individual steps. Main goal of logistic audit is description of current state of corporate logistic and determination the specific activities to change and improvement of logistic processes. The result of logistic audit is:

- Description current state of system,
- Identification so-called "constraints or bottleneck" of the system,

- Proposal of measures for elimination of deficiencies,
- Setting of priorities to attain desired state.

The audit provides a basis for the efficient and effective project progression as all processes from goods receipt to goods out are examined. The suggested course of action for the project identifies the key processes with the highest potential for improvement. But the structure within the organization will also be specified and developed. Improvement measures are checked for maximum profitability and the best solution concepts are integrated into an implementation plan. From our own project experience, we know that the costs for a logistics audit will, in general, pay for itself within 3-4 months.

A logistics audit removes process bottlenecks by means of restructurings. Service levels and the quality of logistics will be increased, and logistics areas can be used optimally. A logistics audit is, therefore, the first step to sustainably improve the location.

Basic principles of logistic audit

The basic principles of logistics audit in any company are:

- Objectivity of processing logistics audit - objectivity reflects objectively facts which are actual in the time of implementation audit,
- Confidentiality of commercial information,
- Commercial independence of the auditor - auditor isn´t bound by a third person who may have the benefit of any audit results,
- Professional independence of the auditor - auditor can´t be an employee of the evaluated company,
- Repeatability - when the audit is repeated the comparability of results must be secured,
- Control of results - final report of executed audit must be checked in terms of content and formal side at least with one other external auditor.

Processing of logistic audit

There are a many companies which offer an external elaboration of logistic audit in the company. Each company has already its specific approach to implementation the logistic audit. General procedure of implementation logistic audit can be described based on following steps:

1. **Presentation of methodical of logistic audit.** Before starting audit, an auditor has to inform the customer by appropriate form with the basic principles and methodology by which the audit will be carried out.

2. **Preparation of logistic audit.** In this step, it is necessary that the auditor to becomes familiar with the company, its departments and focusing. The main task of auditor is to define main and support processes in company i.e. to determine which processes contribution to the fulfillment of the mission of company in the greatest extent.

3. **Setting the goals of audit.** Before starting the audit is necessary determine the goals which have to be achieved by audit. Based on these goals will be decided what the main goal of audit is. It can be whole logistic chain or its specific part (selected logistic processes).

4. **Audit processing.** In this step, is necessary to identify all relevant processes in the company and describe its course or compile a process map. This step consists from two phases. The first phase is analysis of current state of company. Here are collected all relevant information based on selected goals in order to investigate the factors that influence the achievement of the priorities. The auditor by means of observation, communication with employees and company management creates objective view about material, financial and information flows, its mutual links. The second phase is evaluation of current state. Auditor prepares and evaluates obtained data on the basis of established qualitative and quantitative indicators.

5. **Results evaluation.** After determination so-called "constraints or bottleneck", auditor suggests measures for its removal. He also may order the activities for

application in company. These activities will be carried out according to priorities (necessary mid urgent and recommended activities). The role of auditor is not only to perform the above mentioned steps but also to propose a budget and calendar for application of the proposed changes in practice.

Process Approach to the Logistic Audit

In the practice, implementation audit of logistic chain in company or logistic audit is closely related with implementation of process management. As a basic foundation for the realization of logistic audit in company is to examination the processes and compilation the process maps.

Process approach to the logistic audit is based on reality that only comprehensive description of processes leads to the successful optimization and to the increase of performance of the system. In-house processes have to be a tool for achieving the vision and goals of the company. These processes have to be interlinked and each process must have meaning. Therefore, setting goals of processes and measurable indicators is very important. Is necessary to know how process fulfils the goal (measuring of results).

Also is very necessary monitored if the fulfillment of the goal contributes to fulfillment goals of whole company. It follows that the definition of goals must begin at the level of highest management of the company. Therefore, in third phase of the logistic audit - Setting goals should be designed strategic goals that the company wants to achieve through the pursuit of partial goals of audit.

For successful audit is necessary to determine main processes. Main processes are those which create the value in form of product / service for customer. This processes are created by chain of value added which represent key area business of organization. Main processes directly contribute to fulfill the mission of the company.

CONCEPT OF LOGISTIC CONTROL

Controlling is a tool which increases the efficiency of enterprises functioning. It also serves improvement of enterprises' results and increases competitive dominance of a enterprise. Controlling is constantly being improved. That is why it is difficult to

find a complete definition of its importance in an enterprise. Controlling is often treated as a part of management or a subsystem of the management process. We can infer that controlling is:

- a system which supports management,
- enterprise management, which is oriented on its financial result,
- a process realised through planning, control and reporting,
- a general tool supporting a traditional management process,
- a modern method of enterprise management concentrated on realising assigned strategic goals.

The basic task of controlling is to enable a enterprise, its long-term existence. Because of a hierarchy of enterprise management and a time horizon, we can identify operational and strategic controlling. Strategic controlling is based on strategic planning which ensures achieving long-term results, whereas operational controlling is treated as a system of managing a enterprise's result during a short period, which is intended to achieve present goals regarding generating a profit thanks to the tools designed by strategically controlling.

It needs to be pointed out that the idea of controlling is very often mistakenly associated with already known concepts of management. The idea of controlling is to compare the real state of things with the plans and aims of a enterprise and to implement necessary corrections whenever any abnormalities occur in those plans. For this reason, controlling is very often wrongly associated with control only, whereas controlling processes deal not only control but with also with disposal, governing, planning and navigation. As there is a lack of a clear-cut definition of controlling in the literature, controlling processes have not been treated seriously by the management board of a enterprise. Nowadays we can observe an increasing interest in controlling tools but mainly in the aspect of financial controlling. Controlling is a management support system which by means of coordinating the processes of planning, organizing and control, as well as information gathering and processing, ensures effective business management to achieve the planned objectives.

Controlling integrates and coordinates the following in an enterprise:

- **Management functions -** planning, organization, management and steering, control, response and correction,
- **Activity areas -** sales, distribution, manufacturing, purchasing and supply, marketing, research and development, client support, warehousing and inventory, transportation, human resources management, outsourcing,
- **Management levels and stages** of developing management decisions (strategic, tactical and operative) in the long, medium and short term,
- **Value chains -** integrating the needs of the market and the customer, products, processes and resources, as well as business performance (financial and operational), affecting the improvement of efficiency and eliminating waste (including bottlenecks).

In a complex enterprise operating system processes integrate the work of many organizational entities and their resources, as well as suppliers, buyers and subcontractors in the supply chain. The ability to raise the value and competitiveness of a product depends on the possibility of the complex connection (operational and economic) of performance analysis and selection of methods for steering processes and resources in the chain.

IMPORTANCE OF LOGISTIC CONTROLLING

Logistics controlling, which is an important tool in supply chain, is becoming a real determinant in managing these multi-subjective structures. In this respect, the range of controlling is reaching far beyond the area of one particular enterprise. As supply chain is complex, logistics controlling integrates functions which are orientated on a product and technical processes and aspects of social integration. It is revealed in coordination and managing more and more participants in the process of creating value. Implementing controlling in a supply chain helps to share the risk minimize the level of engaged funds and application of sustainable development doctrine. It is done through perfecting one's qualifications with the help of business partners' qualifications. Strong cooperation and information exchange during each phase of the process of

creating a value allows for generating long-term profits which are competitive not only for the whole supply chain but also for the enterprise.

Systemic importance of controlling is due to the need for financial feedback (e.g. revenues, costs, return on assets) and operational feedback (e.g. performance, efficiency, level of utilization, reliability), and for shaping the factors of operational management - products, processes and resources - which determine the result achieved. Identification of the deviations from the target values within the values analysis creates a set of input data for values engineering - mapping the value of a product on the required characteristics of processes and resources in the supply chain (e.g. productivity, reliability, flexibility, efficiency, capacity, response time). Shaping processes and resources and their control makes it possible to achieve the planned results, among others, sales revenues, the level of costs, profitability and asset turnover and return on invested equity.

Decisions and resources shaping processes in the supply chain are taken on the basis of the analysis of a number of financial and operational data, among others:

- **Sales revenues -** by analyzing the number and value of sales in relation to the product range, time and place of sale and markets and distribution chains,
- **Costs -** by analyzing the direct and indirect costs, fixed and variable, costs of flow phases, resources and processes, and their calculation into products, orders and clients,
- **Result of an enterprise's activity -** by analyzing the profit to the size/value of total sales (return on sales) and sales by individual products, clients, markets,
- **Fixed and current assets -** by analyzing the structure and allocation of assets, the level of use and efficiency, turnover and return in relation to the flow of particular products, the value of sales and earnings achieved.

The processes and resources shaped by controlling in the supply chain result from the values of goals set for the enterprise and its potential and demands of clients, suppliers and subcontractors. Determining the methods of process management (e.g.

purchasing and supplies, warehousing, transportation, production, distribution), takes place at the stage of planning operational measures (e.g. Sales and Operations Planning - S&OP) and flows (materials, semi-finished goods, cargo) in the supply chain. Continuous feedback, taking into account the market response to the delivered product, is the basis for correcting the plans, norms, methods and parameters of steering processes, resource allocation, designing procedures and organizational structures and budgets (material and financial plans), etc.

Consistency in management in many areas and processes of an enterprise poses numerous and multidirectional tasks for logistics controlling

- Collection of data relating to the objectives and the current situation of the enterprise for the needs of planning, organization, control and management of activities, and the development of multi-section management information,
- Controlling financial results - e.g. revenues, costs, profits, effectiveness, liquidity, asset and equity turnover, cash turnover cycle and covering with operating capital,
- Controlling the results of operational processes and resources, e.g.: productivity, reliability, efficiency, capacity, level of use,
- Controlling the results of coordinating activities on the basis of total operating costs, labor productivity, productivity and resource effectiveness, and the effectiveness and reliability of logistics processes
- Controlling the results of centers of responsibility for costs, revenue, profit and investment,
- Analysis of client needs, the demand profile and competitive position of the product in relation to the characteristics of the product and the level of support,
- Transposition (mapping) the characteristics of the product on the processes and resources in the supply chain, process analysis and value chain analysis, and identification of needs for changes,
- Multidirectional analysis of the operating environment (property, financial and

information flows) for identifying signals of threats, problems, or needs to improve the supply chain and its development (including the simulation of alternative solutions),

- Developing and updating norms of operational activities and use of resources,
- Controlling procedures, instructions, methods and rules of operation, planning tables, calculation formulas and other instruments of operational management
- Reporting including: results, method of carrying out activities, deviations and their causes, threats and risks, projection and simulations

4.4 ELEMENTS OF LOGISTIC CONTROL SYSTEM

The basic difference between logistics and controlling in the aspect of coordination is that logistics play a sectional part in the service system and controlling plays the same part in the management system. Due to the complexity of the process of logistics management in a enterprise's logistics controlling applies to a very expanded area of activities. The place of logistics controlling in a controlling system of a enterprise allowing for the basic area of logistics controlling activities.

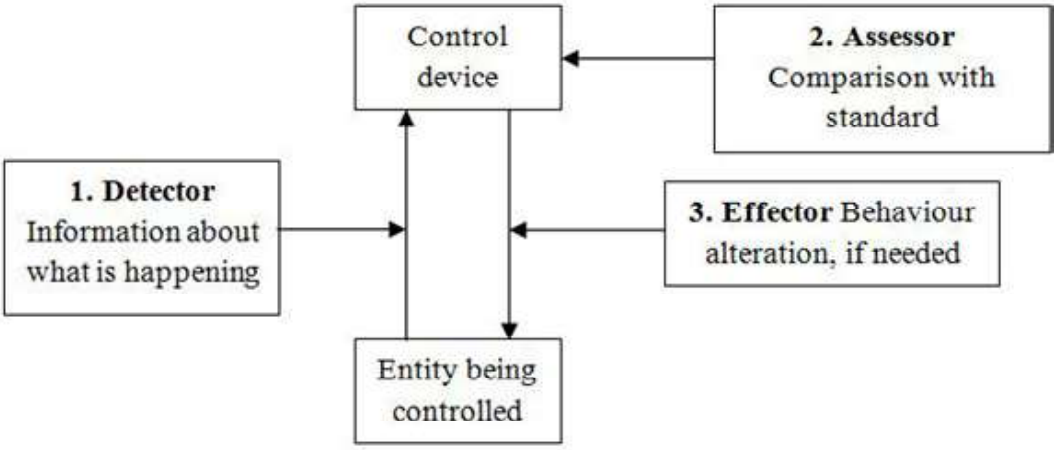
Elements of Logistic Control System

Every logistic control system has at least four elements:

1. **A detector or sensor -** a device that measures what is actually happening in the process being controlled.
2. **An assessor -** a device that determines the significance of what is actually happening by comparing it with some standard or expectation of what should happen.
3. **An effector -** a device (often called 'feedback') that alters behaviour if the assessor indicates the need to do so.
4. **A communications network -** devices that transmit information between the

detector and the assessor and between the assessor and the effector.

These four basic elements of any control system are given in the following diagram.



Elements of Control System

The functioning of these four basic elements is described in three examples of increasing complexity; the *thermostat*, which regulates room temperature; the biological process that regulates *body temperature*; and the *driver* of an automobile, who regulates the direction and speed of the vehicle.

Thermostat The components of the thermostat are (i) a thermometer (the detector), which measures the current temperature of a room; (ii) an assessor, which compares the current temperature with the accepted standard for what the temperature should be; (iii) an effector, which prompts a furnace to emit heat (if the actual temperature is lower than the standard) or activates an air conditioner (if the actual temperature is higher than the standard) and which also shuts off these appliances when the temperature reaches the standard level; and (iv) a communications network, which transmits information from the thermometer to the assessor and from the assessor to the heating or cooling element.

Body Temperature Most mammals are born with a built-in standard of desirable body temperature; in humans that standard is 98.6°F. The elements of the control

mechanism by which the body strives to maintain that standard are (i) the sensory nerves (detectors) scattered throughout the body; (ii) the hypothalamus centre in the brain (assessor), which compares information received from detectors with the 98.6°F standard; (iii) the muscles and organs (effectors) that reduce the temperature when it exceeds the standard (via panting and sweating, and opening the skin pores) and raise the temperature when it falls below the standard (via shivering and closing the skin pores); and (iv) the overall communications systems of nerves.

This biological control system is homeostatic - that is, self-regulating. If the system is functioning properly, it automatically corrects for deviations from the standard without requiring conscious effort.

The body temperature control system is more complex than the thermostat, with body sensors scattered throughout the body and hypothalamus directing actions that involve a variety of muscles and organs. It is also more mysterious; scientists know what the hypothalamus does but not how it does it.

Automobile driver Assume you are driving on a highway where the legal (i.e., standard) speed is 65 mph. your control system acts as follows: (i) Your eyes (sensors) measure actual speed by observing the speedometer; (ii) your brain (assessor) compares actual speed with desired speed, and, upon detecting a deviation from the standard, (iii) directs your foot (effector) to ease up or press down on the accelerator; and as in body temperature regulation, your nerves form the communication system that transmits information from eyes to brain and brain to foot.

But just as body temperature regulation is more complicated than the thermostat, so the regulation of a car is more complicated than the regulation of body temperature. This is because there can be no certainty as to what action the brain will direct after receiving and evaluating information from the detector.

For example, once they determine that the car's actual speed exceeds 65 mph, some drivers, wanting to stay within the legal limit, will ease up on the accelerator, while others, for any number of reasons, will not. In this system, control is not automatic; one would have to know something about the personality and circumstances of the driver to predict what the actual speed of the automobile would be at the end point of the process.

4.5 TYPES OF CONTROL SYSTEM

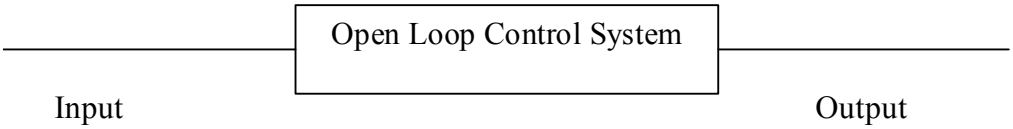
There are two types of control systems namely:

1. Open loop control systems (non-feedback control systems)

2. Closed loop control systems (feedback control systems)

Open loop control system

If in a physical system there is no automatic correction of the variation in its output, it is called an open loop control system. That is, in this type of system, sensing of the actual output and comparing of this output (through feedback) with the desired input does not take place. The system on its own is not in a position to give the desired output and it cannot take into account the disturbances. In these systems, the changes in output can be corrected only by changing the input manually.



These systems are simple in construction, stable and cost cheap. But these systems are inaccurate and unreliable. Moreover these systems donot take account of external disurbances that affect the output and they donot initiate corrective actions automatically.

Examples of open loop control systems:

1. Automatic washing machine

2. Traffic signal system

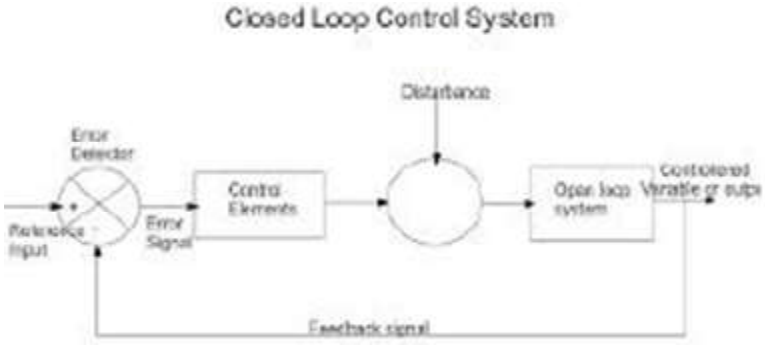
3. Home heating system (without sensing, feedback and control)

Any non-feedback control system can be considered as a feedback control system if it is under the supervisio of someone. Although open loop control systems have economical components and are simpe in design, they largley depend on human judgement. As an example, let us consider a home furnace control system. This

system must control the temperature in a room, keeping it constant. An open loop system usually has a timer which instructs the system to switch on the furnace for some time and then switch it off. Accuracy cannot be achieved as the system doesnot swith on/off based on the room temperature but it does as per the present value of time.

Closed loop control system

A closed loop control system is a system where the output has an effect upon the input quantity in such a manner as to maintain the desired output value.



An open loop control system becomes a closed loop control system by including a feedback. This feedback will automatically correct the change in output due to disturbances. This is why a closed loop control system is called as an automatic control system. The block diagram of a closed loop control system is shown in figure.

In a closed loop control system, the controlled variable (output) of the system is sensed at every instant of time, feedback and compared with the desired input resulting in an error signal. This error signal directs the control elements in the system to do the necessary corrective action such that the output of the system is obtained as desired. The feedback control system takes into account the disturbances also and makes the corrective action. These control systems are accurate, stable and less affected by noise. But these control systems are sophisticated and hence costly. They are also complicated to design for stability, give oscillatory response and feedback brings down the overall gain of the control system.

4.6 SIGNIFICANT ASPECTS OF CONTROL SYSTEMS

Imagine that you have the tendency to put on weight. It is in your genes and if you are not careful you might go the same way as several people in your family went earlier. So what do you do? You cut down on your food intake. It might help or may not. You start exercising, but you are alarmed to discover that you are building up a lot of needless muscle. Maybe the exercises you are doing are not suited to your constitution.

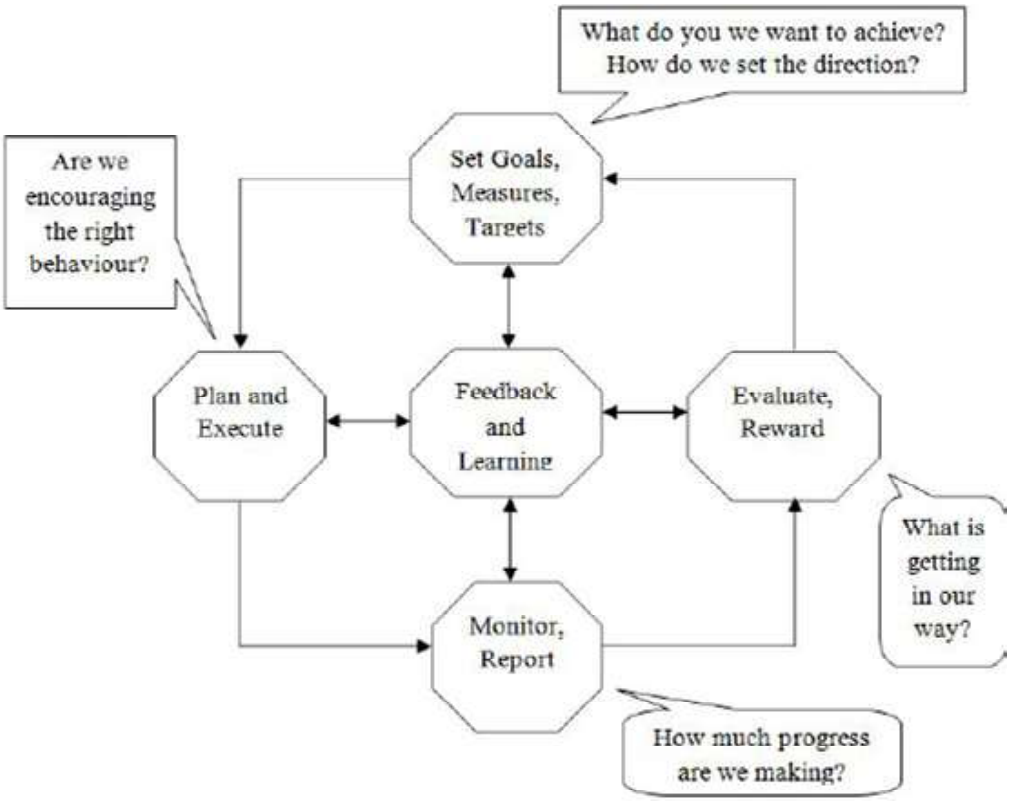


Fig: Control System

Then you change your method of exercising and you find that it works. You start shedding weight. This is weight control. It gives us control over our body and its

functioning. If such control is not exercised, we may not be able to do whatever we set out to do so. In a similar way, organizations need to be in control of them. An organization lacking in controls is bad for its employees and hence, bad for itself in the long run.

The ***purpose*** of all management and control systems is to achieve the goals and objectives of an organization with ease and at least cost. The ultimate purpose of any system is that it should be 'in control' instead of controlling people. It also aims at assisting management in the coordination of the parts of an organization and the steering of those parts toward the achievement of its overall purposes, goals and objectives.

The purposes of a management control system are:

- To clearly communicate the organisation's goals;
- To ensure that managers and employees understand the specific actions required of them to achieve organizational goals;
- To communicate results of actions across the organisation; and
- To ensure that managers can adjust to changes in the environment.

A control system is designed to bring unity out of the diverse activities of an organization as it seeks to fulfil its overall purpose. In the above following diagram shows the components of a management control system.

4.7 TYPES OF CORRECTIVE ACTION

Corrective action is often an effective means of identifying and correcting quality and compliance events within the organization that can arise through the result of complaints, audits, incidents, non-conformances, or any adverse events. Traditionally, the corrective action process is designed to handle systemic events-things that pose a major threat to the overall health of the quality management system (QMS) or environmental health and safety (EHS) system. The challenge becomes how to discern what constitutes a corrective action, and how to properly and efficiently handle it.

Although an important part of compliance, corrective action is often implemented and used inefficiently. Too many corrective actions, not enough data, or disjointed workflow can hinder a corrective action. The most important element to corrective action is ensuring that actions are taken quickly and effectively.

This chapter will discuss eight traits of successful corrective action. These capabilities will ensure that its effectiveness is not hampered, and that critical events are not lost in the midst of less significant events.

1. Workflow types for multiple types of corrective actions

There are many different ways people issue corrective actions, typically from different causes. For example, there could be a corrective action resulting from an internal audit, customer concern, or external source. These different types of corrective actions may have different workflows, and different people may need to be involved. A good corrective action process has multiple workflows used by different people. This is beneficial because a safety corrective action may not be the same as quality corrective action. Having a workflow system allows an organization to create multiple types of corrective actions based on the type of event. This helps an organization ensure the appropriate people are handling corrective actions.

2. Integrating adverse events into corrective action process

Having a corrective action system that is automatically integrated into an adverse-event tracking system (e.g., complaints, incidents, audits, non-conformances) eliminates double entry of data and automatically pulls data into the corrective action record. The organization should make sure there is a seamless transition from event detection to event correction. A corrective action can be tied directly to the source of the adverse event through automatic field updates and reciprocal links.

3. Not everything needs to be a corrective action

A lot of times, people open a corrective action for every adverse event, which leads to every event becoming a corrective action. However, best practices dictate that if a minor event can be immediately corrected, the organization should correct it right there. By nature, the corrective action system is designed to address systemic issues.

These issues are not just limited to minor events, but larger problems within the organization. Having a corrective action system that allows immediate corrections is an effective capability to have within the system. This can be done through its own "pre-corrective action" or investigation that will allow the organization to record the results of adverse events and go through investigations without going through the full corrective action process. This speeds the process and minimizes number of corrective actions.

4. Filtering

Many organizations will use time as a metric for prioritizing corrective actions. They will address those closest to their due date or most overdue. In this case, the organization could be unaware of a critical situation if it has not yet neared its due date. How can an organization effectively filter corrective actions? It needs to have a function that allows it to filter corrective actions by their critical nature. Most companies today use risk as a benchmark for filtering corrective actions; some use decision trees. By using risk management tools, an organization can prioritize an adverse event or investigation by its risk level. This is an objective means of determining what events have the most impact on the organization. By using risk-based filtering, organizations can filter corrective actions by what's most critical, not what's most overdue.

5. Action plans

Action plans drive effective corrective action management. In many cases, steps taken to correct anything in a corrective action are multifaceted. They may involve multiple people, actions, or could even be a full-blown project. The organization needs to look for a system that can create an action plan-assign roles, deliverables, and action items that need to happen to get to corrective action. A system that can outline a defined action plan with workflow and intelligent business rules, which in turn allows an organization to accomplish the goal of that plan within a set time period, is critical. Action plans lay out the steps and deliverables needed to accomplish set tasks during root cause and corrective action phases to make sure work is kept on track, and that due diligence is being met when conducting the corrective action. Automation

helps speed up the process and makes it more efficient, ensuring it is kept on track and in scope.

6. Measuring effectiveness

The ability to review a corrective action's effectiveness is critical. It must be a part of the workflow in the system, but there also needs to be a defined way to measure effectiveness. There are many ways to accomplish this. The big one is using concepts like risk-even decision trees. Using these methods, the organization can determine the risk level and whether it has been reduced. For example, verification of a corrective action ensures that the actions taken are effective. By conducting a risk assessment during verification, organizations are determining that the actions taken are not only effective, but also within acceptable risk parameters. If the risk is still too high, then perhaps the corrective action taken was not truly effective. Risk helps to further mitigate recurrence of a systemic issue.

7. Linking corrective action to change management

At the end of a corrective action, the organization may have something that has to change-processes, production, design, for example-in order to foster continuous improvement in the QMS or EHS system. Integrating corrective action with change management helps to streamline the results of a corrective action directly to change management and continuous improvement initiatives. Similar to linking adverse events to corrective action, an organization must link corrective action to change management, in order to properly transfer the data and results from one process to the next. A corrective action may lead to a full-blown change management initiative. It's important to link data from corrective action to change management to eliminate double entry of data, and to create traceability from the source of the adverse event to the corrective action to the changes that arise out of that corrective action.

8. Traceability and reporting

Corrective actions are an important part of any compliance system. Because they are critical, they need as much traceability and history as possible. So if an organization was to get audited (or were simply doing its due diligence), it must understand how

the corrective action came to be. It needs visibility from the source event to the corrective actions to take, to any change management. Having an integrated system, where there is an unbroken line from identification to correction to change, is critical. Look for a system that allows this level of traceability. Some systems can generate a corrective action history report that will take the entire "story" of that corrective action event into a single comprehensive report-a digital paper trail of corrective action. It is beneficial for audits, reporting metrics, and more to have this level of traceability.

4.8 SUMMARY

Logistic audit is standardized, evaluation and project process which is focused on logistics functions of corporate governance. It offers an independent and objective view on corporate operations and system of managing logistics. Therefore is an effective tool of continuous improvement of individual components of logistics processes.In current time, realization of logistic audit isn´t regulated with any standard or norm. This activity is voluntary for every company. Therefore the final decision about realization of logistic audit remains on the management of the company. Is important to remember that for the increase of performance is necessary to perform control and monitoring of individual processes. This particularly refers to the main business processes which are the purpose of existence the company. These checks can detect weak points of the system and thereby contribute to its further development. Contribution is processed in terms of solving grant problem VEGA 1/ 0701/14. In a logistic audit (potential analysis / logistic due-diligence) the current logistic system and its services are compared with the requirements. In particular, the performance of the processes and structures are checked. The purpose is to identify possible routes of failure and spheres of action for improving the quality and performance of the logistics system in general, and the logistic processes in particular. The procedure is done in five steps: requirements analysis; performance analysis; process analysis; structural analysis and benchmarking. Managing the efficiency of processes taking place in a enterprise is a complex issue. Controlling, assuming decisional support of processes should be treated as a useful tool for improving enterprise's efficiency. Considering the complexity of processes taking place in a

enterprise it is necessary to concentrate on one of the basic processes so as to have the possibility to analyse it in a complex way. The system of controlling, if developed in detail, can facilitate rationalisation of the scenarios of logistics flows involving the criterion of the highest, or satisfactory, efficiency of a enterprise. An effective logistics control system requires accurate, relevant, and timely information about activities and performance. A major source of this information is a logistics assessment, otherwise known as a logistics audit. The periodic assessment of logistics should be an integral part of the process of logistics strategy development. The logistics audit serves three main functions for any organization: Identification of key data required to manage costs, service, cycle times, response and quality; It allows for a better understanding of the current environment; It determines how well the system is meeting current business needs in a cost-effective, flexible and responsive manner, and how it is adapting to the changing marketplace. The process itself comprises eight major steps: determine consistency of strategic objective; determine customer requirements and preferences and obtain performance targets; detail current logistics operations and practice; analyze logistics data; identify programs and initiatives; prioritize projects; develop and implementation plan; implement and measure performance and improvement.

4.9 GLOSSARY

Logistic Audit: In a logistic audit (potential analysis / logistic due-diligence) the current logistic system and its services are compared with the requirements. In particular, the performance of the processes and structures are checked.

Logistic Control: Controlling is an instrument of management support which generates functional-covering information for the purpose of efficient leadership decisions and provides and guarantees an in-plant coordination of different areas with a look at the whole success.

Corrective Action: Corrective action is a process of communicating with the employee to improve attendance, unacceptable behaviour or performance.

4.10 SELF ASSESSMENT QUESTIONS

1. Define logistic control. Explain the importance of logistic audit and control.

2. Classify the various types of corrective action. Explain them briefly.

3. What is meant by logistic control system?

4. Describe the elements of logistic control system.

5. Describe the various types of control system.

4.11 LESSON END EXERCISE

1. What is meant by logistic audit?

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2. Describe the four elements of control system

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3. Define logistic control system.

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4.12 SUGGESTED READING

1. International Logistics: The Management of International Trade Operations: Pierre A. David
2. Management Control Systems, 2006 Edition, Tata McGraw Hill: Sekhar R C,
3. The Handbook of Logistics and Distribution Management: Understanding the Supply: Alan Rushton

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