MEASI INSTITUTE OF MANAGEMENT
CHENNAI – 600 014.

PRINCIPLES AND PRACTICE OF LOGISTICS MANAGEMENT

STUDY MATERIAL

IVst SEMESTER (FULL TIME)

NEW REGULATION SYLLABUS 2018-19

MASTER OF BUSINESS ADMINISTRATION

UNIVERSITY OF MADRAS

NOTES PREPARED BY

Dr.B.Latha Lavanya

MEASI INSTITUTE OF MANAGEMENT
CHENNAI – 600 014.

VISION & MISSION STATEMENTS OF THE INSTITUTE

VISION;

- To emerge as the most preferred Business School with Global recognition by producing most competent ethical managers, entrepreneurs and researchers through quality education.

MISSION;

- **Knowledge through quality teaching learning process**; To enable the students to meet the challenges of the fast challenging global business environment through quality teaching learning process.
- **Managerial Competencies with Industry institute interface**; To impart conceptual and practical skills for meeting managerial competencies required in competitive environment with the help of effective industry institute interface.
- **Continuous Improvement with the state of art infrastructure facilities**; To aid the students in achieving their full potential by enhancing their learning experience with the state of art infrastructure and facilities.
- **Values and Ethics;** To inculcate value based education through professional ethics, human values and societal responsibilities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 - Placement; To equip the students with requisite knowledge skills and right attitude necessary to get placed as efficient managers in corporate companies.

PEO 2 - Entrepreneur; To create effective entrepreneurs by enhancing their critical thinking, problem solving and decision-making skill.

PEO 3 - Research and Development; To make sustained efforts for holistic development of the students by encouraging them towards research and development.

PEO4 - Contribution to Society; To produce proficient professionals with strong integrity to contribute to society.

Program Outcome;

PO1 - Problem Solving Skill; Apply knowledge of management theories and practices to solve business problems.

PO2 - Decision Making Skill; Foster analytical and critical thinking abilities for data-based decision making.

PO3 - Ethical Value; Ability to develop value based leadership ability.

PO4 - Communication Skill; Ability to understand, analyze and communicate global, economic, legal and ethical aspects of business.

PO5 - Individual and Leadership Skill; Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

PO6 - Employability Skill; Foster and enhance employability skills through subject knowledge.

PO7 - Entrepreneurial Skill; Equipped with skills and competencies to become an entrepreneur.

PO8 - Contribution to community; Succeed in career endeavors and contribute significantly to the community.

Subject Code	Subject Name	L	T	P	S	C
PMF27	PRINCIPLES AND PRACTICEOF LOGISTICS MANAGEMENT	3	0	0	0	3

Course Objectives	
C1	To create an understanding on the concepts & functions of logistics.
C2	To explore the element of logistics & Inventory carrying
C3	To explore the functions of transportation warehousing & Practice
C4	To understand the operational need on effective logistic performance.

SYLLABUS

Unit. No.	Details	Hours
Unit I	**Concepts of Logistics** – Evolution – Nature and Importance – Components of Logistics Management – Competitive Advantages of Logistics – Functions of Logistics management – principles – Logistics Network – Integrated Logistics system.	11
Unit II	**Elements of Logistics and Inventory carrying** – Ware housing – Material handling – Order processing – Transportation – Demand Forecasting – Impact of Forecasts on Logistics and Performance measurements.	10
Unit III	**Transportation** – participants in Transportation Decisions – Modes of Transportation – Factors influencing Transport economics – documents in Transport Decision Making Warehousing / Distribution – Functions of Warehouse – benefits of Warehouse – Service – Warehousing Alternatives – Warehouse site selection – Factors while initiating Warehouse Operations – Warehouse Management Systems Packing and Materials Handling – Functions of packaging – Communication – Packaging cost – Types of Packaging Material – Unitization – Containerization – Designing a package factors affecting choice of packaging materials.	12
Unit IV	**Organization for effective logistics performance** – centralized and decentralized structures – stages of functional aggregation in organization, financial issues in logistics performance – Measures – Steps in ABC costing – Financial Gap Analysis integrated Logistics – Need for Integration – Activity Centers in Integrated Logistics Role of 3PL and 4PL – Principles of LIS.	12
	TOTAL HOURS	45

Reference Books

1.	Krishnaveni Muthiah Logistics Management and Seaborne Trade Himalaya Publishing House.
2.	D.K. Agarwal, Textbook of Logistics and Supply chain Management Mac Millian India Ltd.
3.	Martin Christoper, Logistics and Supply Chain Management Pearson Education
4.	Ronald H. Ballou, Business Logistics and Supply chain Management, Pearson Education

E-Sources			
1.	https://www.logisticsmgmt.com/		
2.	https://en.wikipedia.org/wiki/Logistics		
3.	https://www.logisticsmgmt.com/		
4.	https://www.edx.org/course/supply-chain-fundamentals-mitx-ctl-sc1x-2 2		
5.	https://www.mooc-list.com/tags/supply-chain-logistics		
Assessment Tools Used			
1.	Assignments	6.	Group Discussions
2.	Internal Assessment Tests	7.	Role play
3.	Model Exam	8.	Simulation
4.	Seminar	9.	Synetics
5.	Case Studies	10.	Quiz
Content Beyond Syllabus			
1.	Information Technology in Logistics Management		
2.	E-Logistics, Green Logistics		
3.	Logistics System Analysis & Design, E-LRM		
Additional Reference Books			
1.	Alan Harisson & Remko van Hoek, “Logistics Management and Strategy; Competing Through the Supply Chain”, FT Press, 2011		
2.	Martin Christofer. “Logistics & Supply Chain management” , Pearson Education Limited, 2005		
3.	G. Prastakos. Management Science; operational decisions in the Information Society, Stamoulis,2000 (in Greek)		
4.	Coyle et al., The Management of Business Logistics, Cengage Learning, 7th Edition, 2004.		
5.	Ailawadi C Sathish & Rakesh Singh, Logistics Management, PHI, 2011		

Course Outcomes		
CO. No.	On completion of this course successfully the students will;	**Program Outcomes (PO)**
C327.1	Have familiar about concepts, evolution and functions of logistics management.	PO4, PO6
C327.2	Be able to understand the elements of logistics, warehousing and material handling.	PO6, PO7
C327.3	Have better understanding about transportation, distribution, packaging etc.	PO6, PO7
C327.4	Possess better understanding and knowledge about integrated logistics and linguistic information system.	PO6

UNIT 1

Concepts of Logistics – Evolution – Nature and Importance – Components of Logistics Management – Competitive Advantages of Logistics – Functions of Logistics management – principles – Logistics Network – Integrated Logistics system.

Concepts of Logistics

Definition of Logistics:

Origin of Logistics:

- The word Logistics is derived from a Greek word "Logisticos" means Science of computing and calculating.
- This was first applied in Military Science.
- In Military Science Logistics is the "Procurement , Maintenance and Transportation of military materials and facilities and personnels".
- The US Airforce defined Logistics in 1981 as "The Science of planning and carrying out the movement and maintenance of forces".

Various aspects of Military Operation:

1. Design and Development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposal of materials.
2. Hospitalization and evacuation of personnel.
3. Construction, maintenance, operation, and disposition of facilities.
4. Acquisition or furnishing of logistical services.
5. Medical and health service support.

- In 1991, **Council of Logistics Management** defined logistics and came into existence in Physical Distribution management: "Logistics is the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from point of origin to point of consumption for the purpose of conforming the customer requirement".
- According to **Phillip Kotler**, "Market logistics involve planning, implementing and controlling physical flow of material and final (finished) goods from the point of origin to the point of use to meet customer requirements, at a profit."

- **Definition of Logistics Management:**

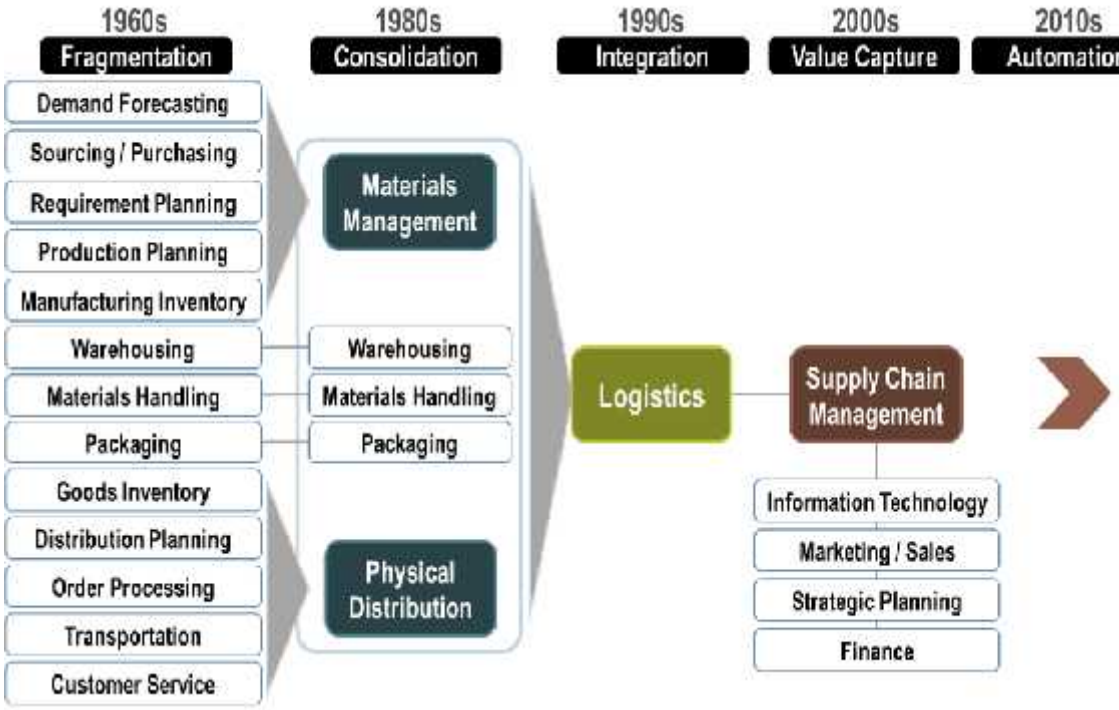
  It consists of the process of planning, implementing and controlling the efficient flow of raw materials, work in progress and finished goods and related information from the point of origin to the point of consumption with the view of providing satisfaction to the customers.

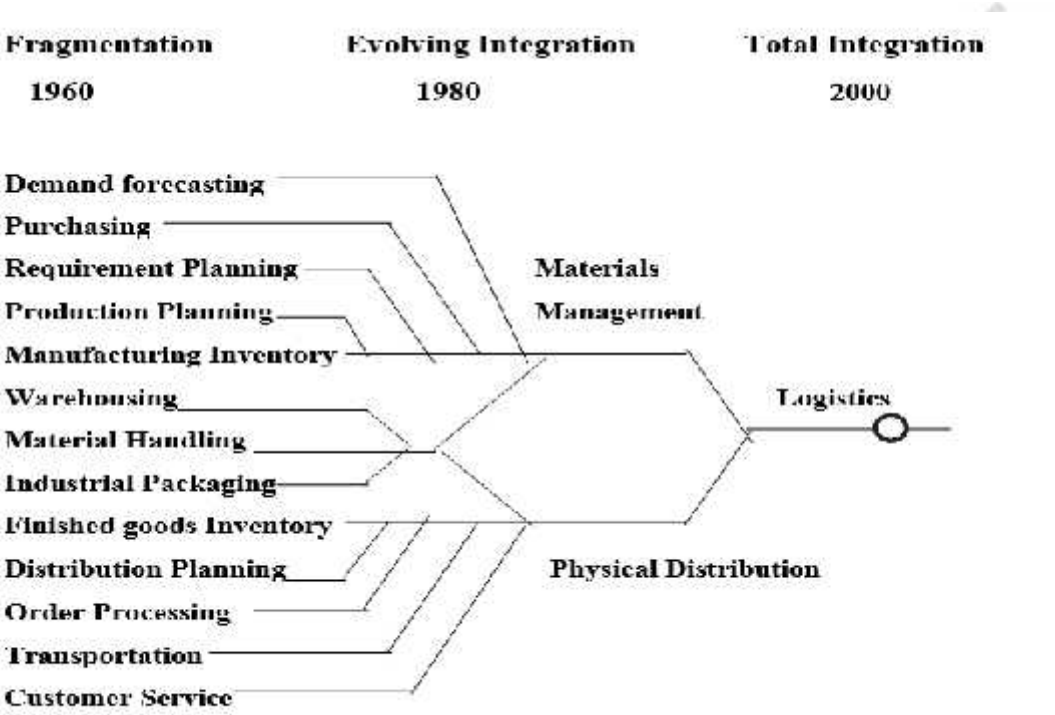
- **Definition of Logistics by Bowersox and Closs in 1996**

  i) **Logistics** is designing and managing of a system in order to control the flow of material throughout a corporation.

  ii) **Logistics Management** includes the designing and administration process of the system to control the flow of material, work in progress, and finished goods inventory to support the Business Unit Strategy (BUS)

Evolution of Logistics





Fragmentation 1960 This era was known as fragmentation because every thing that done was disintegrated

Evolving Integration: At this stage of time new concepts of Logistical management were evolving

Total integration: In the present scenario because of technological advances logistics has evolved as part of management

Phases for Logistics Concept

1. Independent business function Era(till 1950s)

In this time production were needed to increase due to higher demand because of war time shortages, in this phase logistical functions were limited only to warehousing and transportation of raw materials and finished goods

2.**Limited internally integrated business function Era**(1960s - 70s)

Industry has became competitive due to the entry of large number of players, so **cost control system** got importance here. physical distribution and Logistics were activities whose costs had Neither been carefully studied nor coordinated.

3.**Fully internally integrated business function Era**(1980s)

Businesses situations became more critical because of change in business functions, in an integrated logistics systems there is an interface between traditional activities of physical distribution and material management along with other functions of marketing and manufacturing like production planning and scheduling , sales forecasting inventory management and customers service.

4.**Externally integrated business function era**(1990s)

Due to liberalization ,rapid invention, new inventory management techniques like MRP ,JIT and increase in competition the business scenario became more critical.
The major objective of this era is the core competency by means of further streamlining the logistics systems with other supply chain members so as to achieve a higher level of specialization and reduce financial risks.

Purpose of logistics management

Logistics is the process of planning and executing the efficient transportation and storage of goods from the point of origin to the point of consumption. The **goal of logistics** is to meet customer requirements in a timely, cost-effective manner.

SCOPE OF LOGISTICS

The scope of logistics spans the organization from the procurement and management of raw material to the delivery of final product. There are 7 scopes

1) Ensuring smooth flow of all types of goods such as Raw materials, Work in progress, Finished goods.
2) Meeting customer expectations and requirements of goods and products.
3) Ensuring the delivery of quality products.
4) Offering best quality customer service at the least possible cost.
5) Integrating various managerial functions for optimization of resources.
6) Dealing with movement and storage of goods in appropriate quality.
7) Enhancing productivity and profitability.

COMPONENTS OF LOGISTICS

Concept of Logistics Mix

The concept of logistics is based on the system approach. The flow of material from a supplier to a manufacturing plant and finally to the end customer is viewed as a single chain, ensuring efficiency and effectiveness in sequential activities to achieve the objective of customer satisfaction at a reduced cost.

Logistics recognizes that all the activities of material movement across the business process are interdependent and need close coordination. These activities are to be managed as a system and not as functional silos. The functional areas of logistics termed “Logistics Mix” by **Martin Christopher**, consist of:

1.Information flow

a) Order registration
b) Order checking and editing
c) Order processing
d) Coordination

2.Warehousing

a) Material storage
b) Load unitizing and material handling
c) Size selection and network planning
d) Order picking and filling
e) Dispatch documentation

3.Inventory control

a) Material requirement planning
b) Inventory level decision for customer service objectives

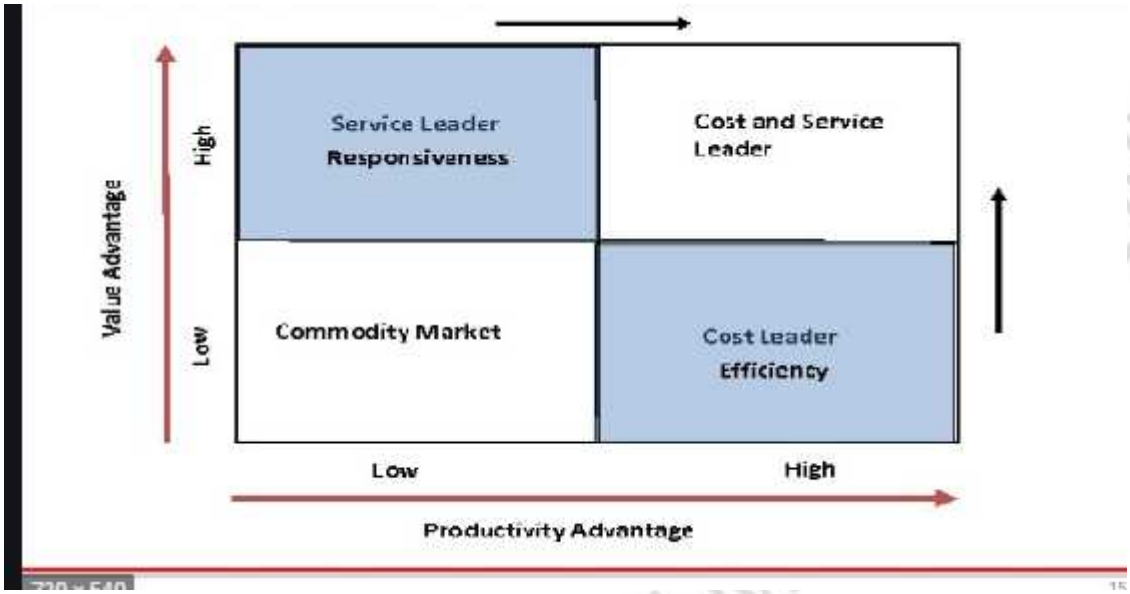
4.Packaging

a) For handling and damage prevention
b) For communication
c) For inter-modal transportation

5.Transportation

a) Route planning
b) Mode selection
c) Vehicle scheduling

COMPETITIVE ADVANTAGES OF LOGISTICS



CONCEPT OF LOGISTICS MANAGEMENT

1. Production concept

i. Build to order
ii. Build to stock
iii. Flexible order production
iv. Centers close to the production location

2. Inventory Concept

i. Regional distribution center
ii. market stock point in particular states or countries

Note:

(i) The actual work of logistics is supportive in nature. Logistical support is a must for

manufacturing and marketing operations.

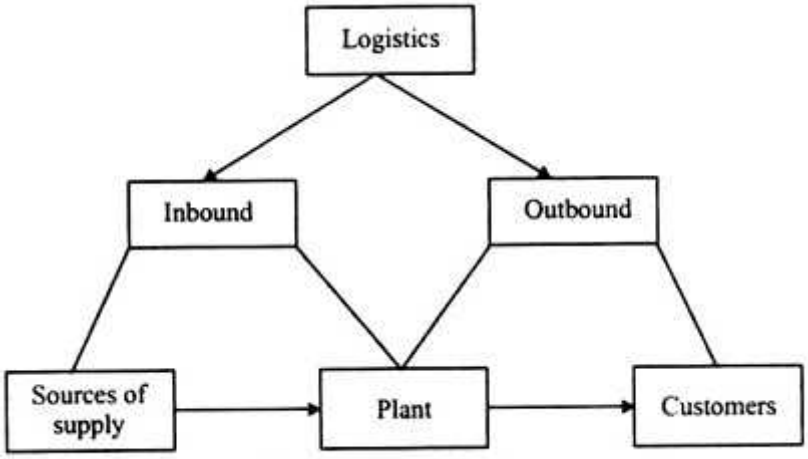
(ii) The concept of logistics is based on a total system view of the multitude of functions in movement of materials and goods from sources of supply to users. Accordingly, it forces management to think in terms of managing the total system; rather than just one part of it.

Classification of Logistical Activities:

Logistics (or Logistical Activities) may be Broadly Classified into Two Categories :

I. Inbound logistics; which is concerned with the smooth and cost effective inflow of materials and other inputs (that are needed in the manufacturing process) from suppliers to the plant. For proper management of inbound logistics, the management has to maintain a continuous interface with suppliers (vendors).

II. Outbound logistics (also called physical distribution management or supply chain management); is concerned with the flow of finished goods and other related information from the firm to the customer. For proper management of outbound logistics, the management has to maintain a continuous interface with transport operators and channels of distribution.



Scope of logistical activities

Significance (or Objectives) of Logistics Management:

Logistics management is significant for the following reasons:

(i) Cost Reduction and Profit Maximization:

Logistics management results in cost reduction and profit maximization, primarily due to:

1. Improved material handling

2. Safe, speedy and economical transportation

3. Optimum number and convenient location of warehouses etc.

(ii) Efficient Flow of Manufacturing Operations:

Inbound logistics helps in the efficient flow of manufacturing operations, due to on-time delivery of materials, proper utilisation of materials and semi-finished goods in the production process and so on.

(iii) Competitive Edge:

Logistics provide, maintain and sharpen the competitive edge of an enterprise by:

1. Increasing sales through providing better customer service

2. Arranging for rapid and reliable delivery

3. Avoiding errors in order processing; and so on.

(iv) Effective Communication System:

An efficient information system is a must for sound logistics management. As such, logistics management helps in developing effective communication system for continuous interface with suppliers and rapid response to customer enquiries.

(v) Sound Inventory Management:

Sound inventory management is a by-product of logistics management. A major headache of production management, financial management etc. is how to ensure sound inventory management; which headache is cured by logistics management.

Significance of logistics management – at a glance

1. Cost reduction and profit maximisation
2. Efficient flow of manufacturing operations
3. Competitive edge
4. Effective communication system
5. Sound inventory management.

Key Activities Involved in Logistics Management:

(i) Network Design:

Network design is one of the prime responsibilities of logistics management. This network is required to determine the number and location of manufacturing plants, warehouses, material handling equipment's etc. on which logistical efficiency depends.

(ii) Order Processing:

Customers' orders are very important in logistics management. Order processing includes activities for receiving, handling, filing, recording of orders. Herein, management has to ensure that order processing is accurate, reliable and fast.

Further, management has to minimize the time between receipt of orders and date of dispatch of the consignment to ensure speedy processing of the order. Delays in execution of orders can become serious grounds for customer dissatisfaction; which must be avoided at all costs.

(iii) Procurement:

It is related to obtaining materials from outside suppliers. It includes supply sourcing, negotiation, order placement, inbound transportation, receiving and inspection, storage and handling etc. Its main objective is to support manufacturing, by providing timely supplies of qualitative materials, at the lowest possible cost.

(iv) Material Handling:

It involves the activities of handling raw-materials, parts, semi-finished and finished goods into and out of plant, warehouses and transportation terminals. Management has to ensure that the raw-materials, parts, semi-finished and finished goods are handled properly to minimize losses due to breakage, spoilage etc. Further, the management has to minimize the handling costs and the time involved in material handling.

Material handling systems, in logistics management are divided into three categories:

1. Mechanized systems

2. Semi-automated systems

3. Automated systems

(v) Inventory Management:

The basic objective of inventory management is to minimize the amount of working capital blocked in inventories; and at the same time to provide a continuous flow of materials to

match production requirements; and to provide timely supplies of goods to meet customers' demands.

Management has to maintain inventories of:

1. Raw-materials and parts

2. Semi-finished goods

3. Finished goods

Management has to balance the benefits of holding inventories against costs associated with holding inventories like – storage space costs, insurance costs, risk of damage and spoilage in keeping stocks etc.

(vi) Packaging and Labeling:

Packaging and labeling are an important aspect of logistics management. Packaging implies enclosing or encasing a product into suitable packets or containers, for easy and convenient handling of the product by both, the seller and specially the buyer.

Packaging facilities the sale of a product. It acts as a silent salesman. For example, a fancy and decorative packaging of sweets, biscuits etc. on the eve of Diwali, makes for a good sale of such items.

Labelling means putting identification marks on the package of the product. A label provides information about – date of packing and expiry, weight or size of product, ingredients used in the manufacture of the product, instructions for sale handling of the product, price payable by the buyer etc.

Labelling is a strong sales promotion tool. The consumer who is persuaded to read the label may, in fact, try to buy the product; even though he/she had no such premeditation (advance idea).

(vii) Warehousing:

Storage or warehousing is that logistical activity which creates time utility by storing goods from the time of production till the time these are needed by ultimate consumers.

Here, the management has to decide about:

1. The number and type of warehouses needed and

2. The location of warehouses.

The above two decisions depend on the desired level of customer service and the distance between the supply source and final destination i.e. markets.

(viii) Transportation:

Transportation is that logistical activity which creates place utility.

Transportation is needed for:

1. Movement of raw-materials from suppliers to the manufacturing unit.

2. Movement of work-in-progress within the plant.

3. Movement of finished goods from plant to the final consumers.

Major transportation systems include:

1. Railways

2. Roadways

3. Airways

4. Waterways

5. Pipelines.

The choice of a particular mode of transportation is dependent on a balancing of following considerations:

1. Speed of transportation system

2. Cost involved in transportation

3. Safety in transportation

4. Reliability of transportation time schedules

5. Number of locations served etc.

Key activities involved in logistics management - at a glance

1. Network design
2. Order processing
3. Procurement
4. Material handling
5. Inventory management
6. Packaging and labelling
7. Warehousing
8. Transportation.

NATURE AND IMPORTANCE OF LOGISTICS

NATURE

1. Increase customer satisfaction-

Consumers demand better service, and this mandate creates a need for shippers to provide fast, accurate and quality service. Good management strategy is aimed to constantly optimize transportation processes and eliminate disruptions. Therefore, it has a direct impact on your customers' satisfaction. Improved customer service can bring a good reputation to a company's brand and help generate more business. The smoother the freight moving processes are within and beyond your company means that you will provide more value to your clients. Ultimately, well-handled logistics contributes to the overall positive customer's experience.

2. Visibility and insight for saving-

It is important to create visibility into a company's supply chain. Advanced transportation management systems (TMS) analyze historical data and track the real-time movement of goods in and out of a business. Logistics managers can use this information for process optimization and avoiding potential disruptions. TMS data analysis keeps a company's supply chain moving more efficiently, all while gaining operational insight.

(i)Advanced Transportation system

→Ultimate for a business is cost saving

KEY LOGISTICS MANAGEMENT ROLES

1. Increase revenue
2. Improved operating cost structure
3. Reduce overall transportation cost
4. Improve customer satisfaction

IMPORTANCE

1. Importance of logistics system leads to ultimate consumption of sales contact.
2. The buyer/ consumer is not interested on the promise of the seller that they can supply goods at competitive price.
3. The contract is essential to fulfill the commercia; and legal requirement.
4. A better delivery schedule is a good promotional strategy.
5. Timely delivery helps in getting repeated orders and thereby it creates goodwill for the suppliers.
6. Effective logistics system contributes immensely to the achievement of business and marketing objective of the firm.
7. Effective Logistics system helps in maximizing the value satisfaction of the customers ensuring quick deliveries in minimum time at a minimum cost.
8. Logistics system brings down or reduces the cost of carrying inventory, material handling, transportation and other distribution activities.

When the logistics system is good ?

1. Minimize the transportation cost.
2. increased production efficiency.
3. updated computer technology.

KEY FUNCTIONAL AREAS OF LOGISTICS MANAGEMENT

There are 6 key functional areas of logistics management, namely:

1. Inventory Planning and Management
2. Warehousing
3. Procurement of Goods and Services
4. Packaging and Storage
5. Transportation
6. Customer service
7.

LOGISTICS NETWORK MODELLING

When a company is designing its new logistics network, it will take into account all the location elements such as customer market, labor pool, quality of life requirements, and government incentives. When these elements have been analyzed, it is possible to create models which give companies more of an insight into the choices that they make.

There are a number of modeling techniques, which can be used, each coming with its own benefits and pitfalls. This article will look at the different types of modeling techniques that can be used to support the decisions made.

Modelling Techniques

The use of modeling techniques is important to companies who are deciding upon their new logistics network. The various modeling techniques can allow companies to look at a comparison of the functioning, cost efficiency, and customer service efficiency of the various logistics networks that have been proposed. Companies can look at the various modeling techniques and decide which one offers them the best insight into their network options.

1. Optimization Modeling

The optimization model is derived from the precise mathematical procedures that offer the best or optimum solution based on the mathematical formula used. This model is based on mathematical formula only.

This means that there is no subjective input to the model, only assumptions and data. The optimization model looks at data such as the level of customer service to be obtained, the number and location of distribution centers, the number of manufacturing plants, the number of distribution centers assigned to a manufacturing plant, and the inventories that must be maintained.

One optimization model that has been used for logistics networks is the model using linear programming, sometimes referred to as LP. This is particularly useful for linking supply and demand limitations of manufacturing plants, distribution centers, and market areas.

Given the goal of minimizing costs, linear programming can define the optimum facility distribution pattern, based on the constraints identified. However, as this uses mathematical formulas, there is no allowance for any subjective input.

2. Simulation Models

A simulation model is defined as creating a model that is based on the real world. When the model has been created, you can perform experiments on the model to see how changes made to the model can affect the overall cost of the logistics network.

For example, by changing the constraints on the network, it is possible using a simulation model to see how this affects the cost-effectiveness of the overall network.

For a simulation model to be effective, you need to collect significant amounts of data on transportation, warehousing, labor costs, material handling, and inventory levels, so that when you make changes to the constraints, the model accurately reflect the changes. However, the changes to the simulation model will not produce the optimum logistics network, as produced by the optimization model; it will just evaluate the changes that were made to the model. This type of model is very useful when companies have made general decisions on the network and want to see what the overall effect of any changes will be.

3. Heuristic Model

Similar to simulation models, heuristic models do not generate an optimum solution for a logistics network.

A heuristic model is used to reduce a large problem to a more manageable size. It has to be understood that heuristic models do not guarantee a solution and that a number of heuristic models may contradict or give different answers to the same question and still be useful to the overall creation of a logistics network.

Heuristic models are often referred to a "rule of thumb" which can be useful in creating a logistics network.

For example, a heuristic model can be used to consider the best site for a distribution center that is at least ten miles from the market area, fifty miles from a major airport, and more than three hundred miles from the next closest distribution center. A heuristic model will look at all areas that fit within the parameters defined and finds the areas best suited.

10 STEPS OF LOGISTICS NETWORK

To create an optimal network design/redesign, Frazelle recommends a 10-step logistics network design process:

1. Assess/evaluate current network.

2. Design and populate network optimization database.

3. Create network design alternatives, such as more or fewer hierarchies, multi-commodity flows, pooling opportunities, merge-in-transit, direct shipping, cross docking, and supply-flow optimization concepts.

4. Develop network optimization model.

5. Choose network optimization tool.

6. Implement network model in chosen tool.

7. Evaluate alternative network designs.

8. "Practicalize" recommended network structure.

9. Compute reconfiguration cost.

10. Make go/no-go decision.

INTEGRATED LOGISTICS SYSTEM

It is defined as a process of

1. Anticipating customer needs and wants

2. Acquiring capital

3.capital, material, people, technology, information(In order to meet the needs and wants, optimise the goods or services, develop a network to fulfil customer request in a timely manner.

OBJECTIVE:

In order to move the goods to the customers.

ACTIVITIES RELATED TO INTEGRATED LOGISTICS SYSTEM

1. Physical Distribution
2. Material Management
3. Logistics Engineering

4. Business Logistics
5. Logistics Management
6. Integrated logistics Management
7. Distribution Management
8. Supply chain Management

OPERATIONS OF INTEGRATED LOGISTICS SYSTEM

1.Inbound Logistics

2. Outbound Logistics

INTEGRATED LOGISTICS MANAGEMENT

Integrated Logistics is defined as " the process of anticipating customer needs and wants; acquiring the capital, materials, people, technologies and information necessary to meet those needs and wants; optimizing the goods-or-service-producing a network to fulfill customer requests; and utilizing the network to fulfill customer request in a timely way."

Integrated logistics is a service-oriented process. It incorporates actions that help move the product from the raw material source to the final customer.

OBJECTIVES OF ILM

1. rapid response
2. minimum variance
3. minimum inventory
4. minimise movement consolidation
5. life cycle support

FUNCTIONS/ OPERATIONS OF ILM

1. Inventory Flow
2. Physical distribution.
3. Manufacturing support.
4. Information flow.

Unit – II

Elements of Logistics and Inventory carrying – Ware housing – Material handling – Order processing – Transportation – Demand Forecasting – Impact of Forecasts on Logistics and Performance measurements.

Elements of Logistics

1. Customer Order Processing

Flow of Actions

- Filling up the order form
- Deciding the specifications of the product
- Deciding the quality check list of the product
- Deciding the delivery schedule
- Deciding the location of delivery Important Factors
- Cost of order processing
- whether the company is capable of producing a component
- Detailed list of specifications Techniques
- Electronic data Interchange (EDI)
- E-ERP or CPFR
- Web portal

2. Location Analysis

Flow of Actions

- Cost of transportation of raw materials and finished goods
- Proximity to suppliers
- Proximity to customers
- Availability and type of land
- Availability of secondary resources
- Availability of desired manpower at affordable cost
- Communal harmony
- Governmental regulation and taxation Important Factors
- Cost of operations as a percentage of sales
- Shelf life of product

3. Inventory Control

Flow of Actions

- On hand inventory analysis
- Communicating the quantity, quality and timing of material with the supply points.
- Getting the material of right quality, quantity and at right time Important Factors
- Inventory control at planning stage
- Lead time
- Cost vs. importance of raw material Techniques
- DRP and replenishment order control
- Fixed order interval system
- Economic order quantity with ROP system
- Selective inventory control (ABC, VED, FSN analysis etc.)
- Order forecasting using statistical tools

4. Material Handling

Flow of Actions

- Type of material (Business significance like raw material, finished goods etc.)
- Material handling requirements of the material (Fragile, inflammable)
- Cost ratio of material handling to material cost.
- Material default location, identification and traceability Important Factors
- Material breakage
- Pilferage
- Cost of material handling
- Number of handlings Techniques.
- Operational research
- Material flow analysis
- Computerized material retrieval system
- ASRS (Advanced Storage & Retrieval System)

5. Packaging

Flow of Action

- Packaging requirement for the material (Refrigeration, Fragile etc.)
- Primary packaging
- Secondary packaging
- Cost of packaging
- Transportation requirement for packaging (Vibration proof, water or moisture tight)

Important Factor:

1. Protection to product
2. Holding the product
3. Communicating the message to customers
4. Customer requirement for packaging
5. Reverse logistics for packaging
6. Recycling of packaging material
7. Cost of packaging Techniques
8. Standardized box packaging
9. Containerization of packaging
10. Direct part marking
11. ISO 14001
12. Recycling of packaging materials
13. Reusable packaging materials
14. Eco-friendly packaging materials
15. Bar coding
16. Bumpy bar coding
17. GPS tracking system
18. RFID

6. Transportation

Flow of Action

- Mode of transportation.
- Cost of product
- Speed of transportation
- Ambience requirement of material (Refrigeration, Vacuum)
- Cost of transportation
- Urgency of the product to customers Important Factors
- Urgency of the product
- Cost of product
- Cost of transportation Techniques
- Containerized transportation
- Cool Chain Transport (Refrigerated Vans/Containers)
- Multi-modal Logistics
- Milk Run Distribution systems
- Cross Docking
- Direct Shipment

7. Warehousing

Flow of Actions

- Location of the warehouse
- Inventory level at the warehouse
- Storage requirement of the product
- Packaging and repackaging requirement of the product
- Shelf life of the product Important Factors
- Availability of space
- Availability of proper material handling systems
- Strategic location
- Packing and Re-packing facilities
- Information and allied services Techniques
- Third Party Logistics
- Third party Warehousing

8. Customer Service

Flow of Actions

- Contractual services offered to client
- Type of customer service required for the product
- Location of the service centre
- Service level at the service centre
- Cost of service vs. replacement Important Factors
- contractual requirement of customer service
- Service quality
- Reverse logistics Techniques
- AMC (Annual Maintenance Contracts) and free replacements
- Limited (free) trial period
- Guarantee & warrantee
- User clubs
- Help lines, toll free number, call centers
- CRM

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.

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.

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:

Loans can be raised from the warehouse keeper against the goods stored by the owner. Goods act as security for the warehouse keeper. Similarly, banks and other financial institutions also advance loans against warehouse receipts. In this manner, warehousing acts as a source of finance for the businessmen for meeting business operations.

5. Grading and Packing:

Warehouses nowadays provide the facilities of packing, processing and grading of goods. Goods can be packed in convenient sizes as per the instructions of the owner.

Importance of Warehousing In the Development of Trade and Commerce:

Warehousing or storage refers to the holding and preservation of goods until they are dispatched to the consumers. Generally, there is a time gap between the production and consumption of products. By bridging this gap, storage creates time utility.

There is need for storing the goods so as to make them available to buyers as and when required. Some amount of goods is stored at every stage in the marketing process. Proper and adequate arrangements to retail the goods in perfect condition are essential for success in marketing. Storage enables a firm to carry on production in anticipation of demand in future.

A warehouse is a place used for the storage or accumulation of goods. It may also be defined as an establishment that assumes responsibility for the safe custody of goods. Warehouses enable the businessmen to carry on production throughout the year and to sell their products, whenever there is adequate demand.

Need for warehouse arises also because some goods are produced only in a particular season but are demanded throughout the year. Similarly certain products are produced throughout the year but demanded only during a particular season. Warehousing facilitates production and distribution on a large scale.

Benefits from Warehouses:

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.

MATERIAL HANDLING

Meaning of Material Handling:

Material handling may be considered a specialized activity for modern manufacturing units. From the time, the input material or raw materials enter the industrial unit and go out of the unit in the form of finished products, these are handled at all stages in between, no matter, on the shop floor or in the stores.

"Material handling" refers to the movement of materials from the store room to the machine and from one machine to the next machine or work station during the process of manufacture.

Functions of Material Handling:

Following are the important functions of material handling:

(i) To select machines/equipment and plant layout to eliminate or minimize material handling requirements, i.e., to select most efficient, safe and appropriate material handling equipment, which can fulfil material handling requirement at minimum cost.

(ii) To minimize the material handling cost by way of:

(a) Minimization of movement of semi-finished items during the production process.

(b) Planning movement of optimum necessary pieces in one unit.

(c) Minimization of distance moved.

(d) Increasing speed of material handling operation through mechanization.

(e) By elimination/minimization of back tracking and duplicate handling.

(f) By utilization of gravity for material handling.

(iii) To employ mechanical aids instead of manual labour to accelerate material movements.

Objectives of Material Handing:

(1) Costs Reduction by:

(i) Decreasing inventory level.

(ii) Utilising space to better advantage.

(iii) Increasing productivity.

(2) Waste Reduction by:

(i) Eliminating damage to material during handling.

(ii) Being flexible to meet specific handling requirements of different nature.

(iii) Making proper control over stock during in and out handling.

(3) Improve Productivity by:

(i) Increasing productivity per man-hour.

(ii) Increase in machine efficiency through reduction of machine down time.

(iii) Smoothing out workflow.

(iv) Improving production control.

(4) Improve Working Conditions by:

(i) Providing safe working conditions.

(ii) Reducing worker's fatigue.

(iii) Improving personal comfort.

(iv) Upgrading employees/workers to productive work.

(5) Improve Distribution by:

(i) Decreasing damage to products during handling and shipping.

(ii) Improving routing.

(iii) Improving location of storage facilities.

(iv) Increasing the efficiency of shipping and receiving.

Principles of Material Handling:

A material handling system should be able to move and store the material effectively with minimum effort, maximum safety and in the shortest time.

Following are some of the important guiding principles, of economical handling:

(1) Using the principles of containerization, unit load or palletization, materials to be moved should be aggregated into a larger unit size and the unit size should be same for all materials. The materials are typically carried on a pallet or some other standard size container for convenience in handling. The materials and containers are known as unit load. So the load should be as large as possible/practical.

(2) Transport the full unit load whenever possible instead of practical loads. Load the material handling equipment to its maximum safe limit loading.

(3) Minimize the distances moved by adopting shortest distances possible. Generally the realization of this principle is layout design dependent.

(4) Follow the straight-line flow rule i.e. the material-handling path should be a straight line. This rule is consistent with the principle of shortest distance.

(5) Minimize the non-move of terminal times. The total time required for movement of material is sum of the actual move time and time taken in loading, unloading and other allied activities which do not involve actual transport of material.

(6) Utilize gravity principle for assisting the movement of materials wherever possible with due consideration to safety and risk of product damage.

(7) Follow the mechanization principle. Employ mechanical aids in place of manual labour in order to speed up material movement, increase the efficiency and economy of the system where possible.

(8) Integrate the materials handling system with the other system working in the enterprise including receiving, production, inspection, packaging, storage, warehousing and transportation etc.

(9) Integrate the material flow with the flow of information required for handling and storage systems. Such information for various items moved should include identification, picks point and destination point in order to improve the efficiency of the system.

(10) Changes in sequence of production operations may be suggested in order to minimize back tracking and duplicate handling.

(11) Effective, efficient, safe, standard, appropriate flexible and optimum sized material handling equipment should be selected.

(12) The handling equipment should not interfere with the production lines.

(13) Run conveyors overhead and stack load on top of each other or in racks as high as safety permits.

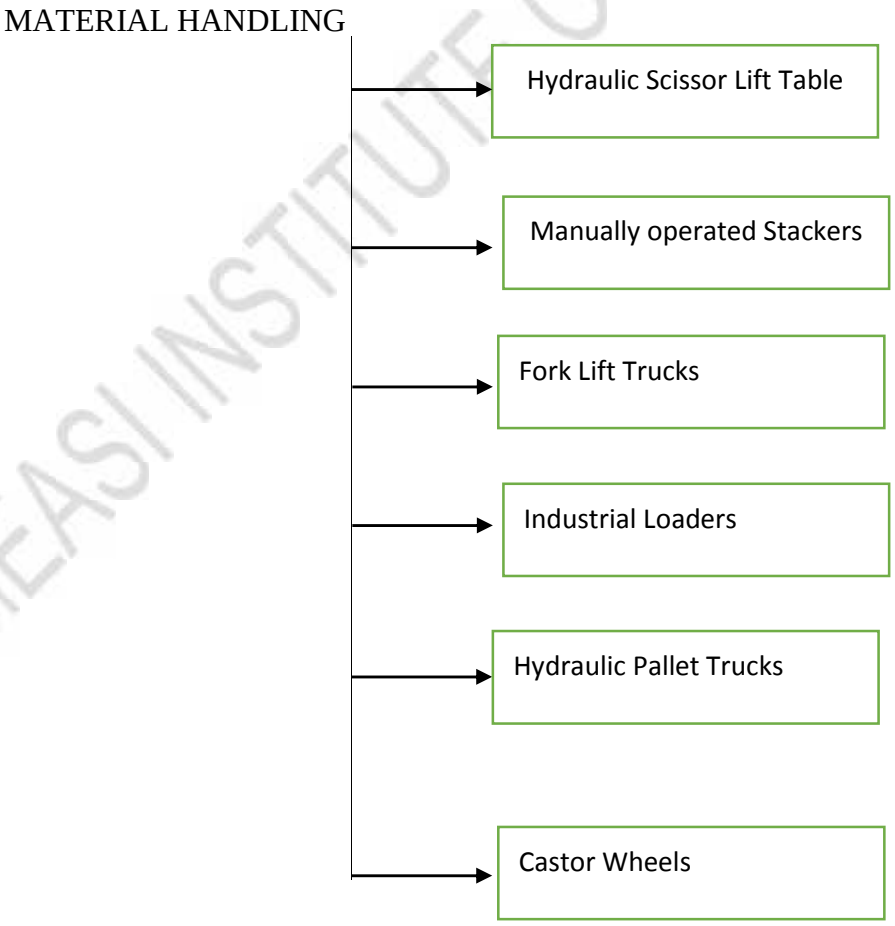
(14) Make accurate and complete analysis for installation, operation and maintenance cost of proposed devices (in case of suggested change).

(15) Provide right equipment at right time.

MATERIAL HANDLING EQUIPMENTS

1. Trolleys
2. Fork Lift
3. Trucks
4. MonoRail
5. Belt Conveyers
6. Roller Conveyers
7. Crane

CLASSIFICATION OF MATERIAL HANDLING



FACTORS AFFECTING THE SELECTION OF MATERIAL HANDLING EQUIPMENT

1. Production problem.
2. The capabilities of the handling equipment available.
3. The human element involved.

The ultimate aim is to arrive at the lowest cost per unit of materials handled.

1. The production problem factors are:

i. Volume of the production to be attained.
ii. Class of materials to be handled.
iii. The layout of plant and building facilities.

2. Capabilities of the handling equipment's available are:

i. Adaptability: The load carrying and movement characteristics of the equipment should fit the material-handling problem.
ii. Flexibility: Wherever possible, the equipment should have the flexibility to handle more than one material, class or size.
iii. Load Capacity: Equipment selected should have enough load-carrying characteristics to do the job effectively.
iv. Power: The equipment should have enough power available to do this job.
v. Speed: The speed of movement of the handling equipment should be as high as possible, within the limits of production process and plant safety.
vi. Space Requirements: The required to install or operate materials handling equipment is also an important consideration.
vii. Supervision required: The degree of automation in the handling equipment decides the amount of supervision required.
viii. Ease of maintenance: Equipment selected should be capable of easy maintenance at reasonable cost.
ix. Environment: Equipment selected must conform to any environmental regulations.
x. Cost: The cost of the equipment (capital investment) is an obvious factor in the selection. The various kinds of costs to be considered in addition to the initial purchase price of the handling equipment are:
    - Operating Costs
    - Installation Costs
    - Maintenance Costs
    - Power Requirements
    - Insurance Requirements

- Space Cost
- Depreciation Cost
- Salvage Value
- Time Value of money invested
- Opportunity Cost

3.The human elements/factors cannot be overlooked in the selection of materials handling equipment. They are:

i. The capabilities of the available manpower to operate the equipment
ii. Safety of personnel (those who operate it or come in contact with it)

TYPES OF MATERIAL HANDLING SYSTEM

1. Equipments oriented systems

a) Convey or Systems
b) Tractor transfer system
c) Fork lift truck
d) Industrial truck system
e) Underground system

2. Material Oriented Systems

a) Unit handling system
b) Bulk handling system
c) Liquid handling system

3. Methods oriented system

a) Manual systems
b) Automated systems
c) Job shop handling system
d) Mass production system

4. Function oriented system

a) Transportation systems
b) Conveying systems
c) Transferring systems
d) Elevating systems

ORDER PROCESSING

PROCESS is a series of interdependent task that transfer an input into output material of higher value for organisation Eg: Honda transfers steel, rubber, plastics into car and Dell transforms customer order into PC and MC Donalds transforms Meat and Potato into packed food.

Order Processing is also known as order fulfilment. Order Processing is a sequential process involving

1. Processing withdrawal limit
2. Selecting removal of unit from loaded unit.
3. Sorting assembling items.
4. Package formation. (weighing, labelling, packaging)
5. Order Consolidation. (Gather package into loaded unit for transportation, control, bill of loading)

ACTIVITIES IN ORDER PROCESSING

1. **ENQUIRY:** Preliminary response from prospective customers, generally following an advertisement or sales promotion campaign. Number of inquiries (and their conversion into sales revenue) is a measure of the Effectiveness of a firm's marketing efforts. Also spelled as enquiry.

2. **QUOTATION**: Quotations must be submitted as directed in the Request for Quotations, and on the form provided unless otherwise specified. Quotations must be typewritten or printed in ink. Quotations must be mailed or delivered in person. Quotations that are faxed or e-mailed will not be accepted. Quotations shall be submitted prior to the time fixed in the Request for Quotations. Quotations received after the time so indicated shall be returned unopened.

3. **ORDER ACCEPTANCE**: An order acceptance procedure, which includes an accept, review, reject process. There should be no doubt about which orders can be filled immediately and which should be reviewed.

4. **DISPATCH**: When businesses purchase goods from a company and the goods are shipped to them, the business receives them and that is receipt. Dispatch of goods is when that company ships out those goods purchased from them by the businesses. Dispatching is the part of production control that translates the paper work into actual production in accordance with the details worked out under routing and scheduling functions. Dispatching deals with setting the

production activities in motion through the release of orders and instructions in accordance with previously planned timings as embodied in production schedules.

5. **INVOICING**: Invoice is a statement which contains the under mentioned details compulsorily.

- ✓ Invoice Number
- ✓ Invoice date
- ✓ Name and address of the person making the invoice (Seller of goods and service)
- ✓ Name and address of the person to whom invoice is made. (Buyer of goods and service)

5. Description of goods / services involved

- ✓ Applicable rates and taxes with percentages
- ✓ Rate of the goods / services
- ✓ Quantity of the goods and services
- ✓ Quality or any other specifications
- ✓ Price / Value of the goods and services
- ✓ Invoice must be signed by the person making it
- ✓ Terms and conditions of making the payment

6. **VENDOR SELECTION (VENDOR ANALYSIS)** A supply chain is a network of four - departments, which is involved in various activities like product procurement to distribution of final product. The purchasing has gained importance in supply chain management due to the factors like globalization and technological changes. ORDER SHIPMENT : stock quantity delivery in convenient format with different transportation medium.

6 KEY STAGES OF ORDER PROCESSING

- ✓ Order **Preparation**
- ✓ Order Transmittal.
- ✓ Order Entry.
- ✓ Order filling.
- ✓ Order Delivery.
- ✓ Order Status Reporting.

STEPS IN ORDER FULFILMENT

Order fulfilment is all the steps a company takes between receiving a new order and placing that order into the customer's hands. The practice involves warehousing, picking and packing the product, shipping it and sending an automated email to the customer to let them know the order is in transit.

STEPS:

- ✓ Payment Clearance
- ✓ In-Stock Availability
- ✓ Packaging Shipment
- ✓ Insuring
- ✓ Production (Planning, Execution)
- ✓ Plant Services
- ✓ Purchasing Warehouse
- ✓ Customer Contract
- ✓ Reverse Logistics
- ✓ Demand Forecast
- ✓ Account Billing
- ✓ Returns

FUNCTIONS IN ORDER PROCESSING IN PHYSICAL DISTRIBUTION

1) Receiving order
2) Recording order
3) Filing order
4) Executing order or assembling of products for dispatch
5) Credit and collection.

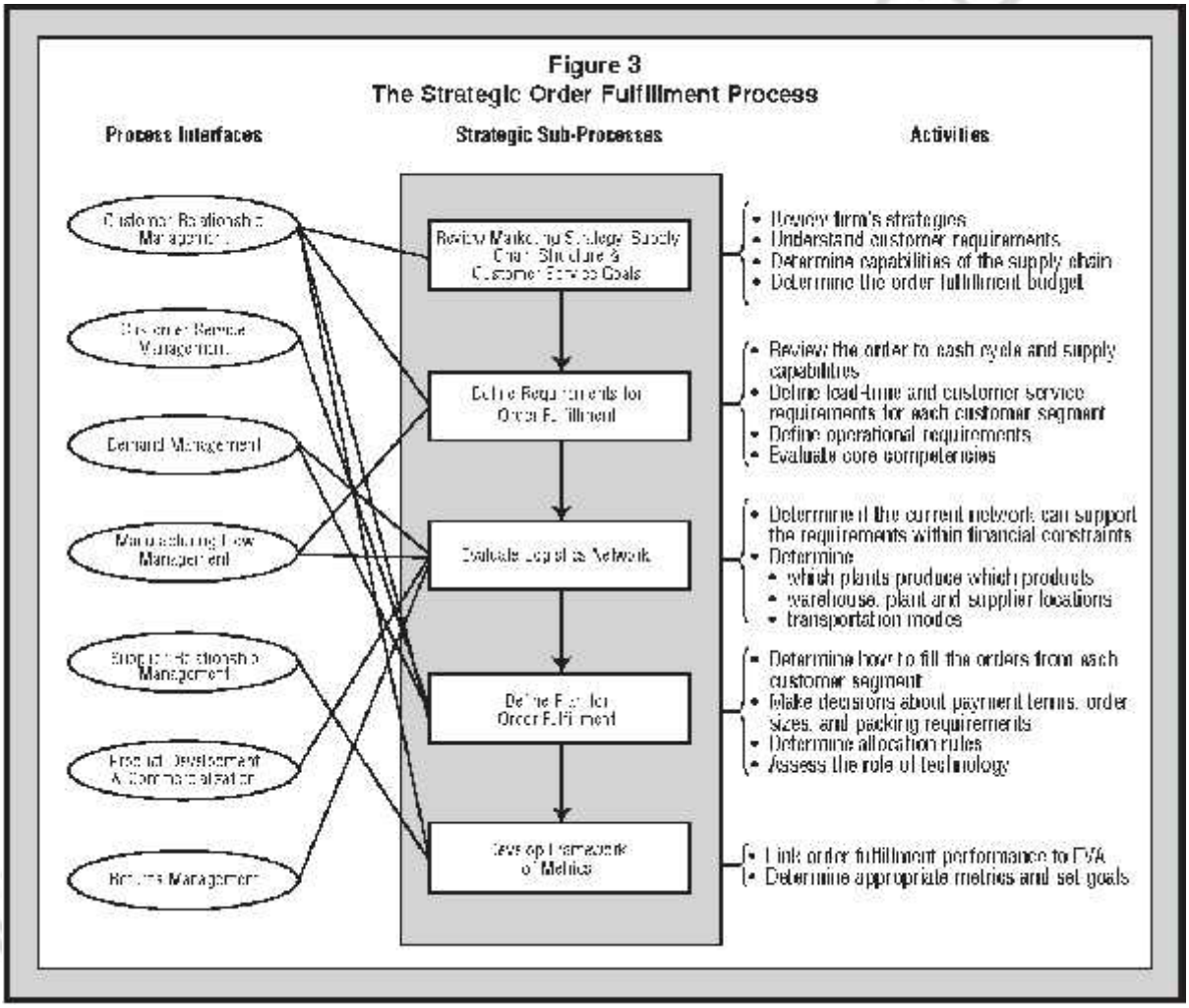
OBJECTIVES OF ORDER PROCESSING

1) To identify ineffective task.
2) To spot possible effectiveness in improving the task.
3) To understand where the value can be added.

ORDER PROCESSING SYSTEM

i. Order Entry
ii. Sales Configuration
iii. Planning for Shipment
iv. Shipping Execution
v. Invoicing
vi. CRM
vii. Routing and Scheduling
viii. Scheduling System

THE STRATEGIC ORDER FULFILLMENT PROCESS



TRANSPORTATION

CHARACTERISTICS OF TRANSPORTATION SERVICE

1. Freight Rates
2. Reliability
3. Transits Time
4. Loss, Damage, Claim, Processing and Tracing
5. Shippers Market condition
6. Carrier Consolidation

ROLES OF TRANSPORTATION

- Transportation refers to the movement of products from one location to another.
- It plays a major role in increasing GDP
- JAPAN use logistics to achieve its transportation goals.

FACTORS AFFECTING TRANSPORTATION DECISION

1. Shipper: A party that requires the movement of product between two points which include

- Transportation cost
- Inventory cost
- Facility cost

2. Carrier: Party that moves/ transports the product

- vehicle rate cost
- fixed operating cost
- trip related cost

IMPORTANCE OF EFFECTIVE TRANSPORTATION SYSTEM

1. **Transportation Cost**: are directly affected by location of the firms manufacturing facility, warehouse, suppliers, retailers, customers.

2. Tra**nsportation Mode**:is selected which has an impact on the packing required, and carrier classification rules determine package choice.

3. **Inventory requirements**: which are influenced by the mode of transport selected for use. When high speed, high priced transportation systems are used, the inventories required to be maintained in the logistics system would be smaller as compared to that when slow, less expensive transportation systems are used.

4. **Materials Handling Equipments:** of the firm is determined by the type of carrier used for transportation, for example, the handling equipments for loading and unloading the carrier and the design of the receiving and shipping docks depend on the type of carriers used.

5.**Order Management Methodology:** which encourage maximum consolidation of shipments between common points facilities larger shipments and advantages of volume discounts.

6. **Customer service goals**: which influence the type and quality of carrier source selected by the firm. An efficient and inexpensive transportation system contributes to greater competition in the market places, greater economies of scale in production and reduced prices for products sold.

TRANSPORTATION MODE

The **modes of transport** include various types of factors or methods to transfer the goods or product from one place to another place. The modes are:-

1. Roadways Transportation.
2. Railways Transportation.
3. Water Transportation.
4. Air Transportation.
5. Pipelines Transportation.
6. Inter Modal Transportation

1.Roadways Transportation:

A road is an identifiable route way or path between two or more places. This mode of transport helps to transfer the goods from one place to another place by road through various methods like auto, buses, trucks, cargos, and other suitable factors.

In road transport, the chances of an accident are very high and it is also very risky.

Advantages of Road Transport:

- It is very flexible in nature.
- It helps to facilitate the movement of goods even in remote areas.
- It provides alternatives in the form of car, rickshaw, auto, cars, bus, trucks, and so on.
- It is good for transporting perishable products.

- It requires low capital investments.
- It is very suitable for a short distance journey.

Disadvantages of Road Transport:

- It is not suited for long distance as it is not economical.
- Slow as compared to railways.
- Goods can be destroyed/damage due to specks of dust and pollutions.
- It is time-consuming.
- Accidents and Breakdowns.

2. Railways Transportation:

It is a means of transport in which the goods are transferred from one place to another place and as well as transfers the passenger from one place to another destination. It is preferred due to high speed. Invariance to road transport, where vehicles run on a flat road or surface, rail vehicles are directionally managed by the rail tracks on which they run.

Rail transport helps to provide administrative facilities to the government. The public servants and defense forces run their mobility from the railways.

Advantages of Railways Transportation:

- It is economical for long distances because it can easily cover all area of states and cities.
- This means of transport is very faster than roadways.
- Most suitable for carrying a bulky amount of goods and products.
- It provides proper protection from exposure to sun and dust pollutions.
- It is the most dependable means of transport.
- It is the very safest means of transport.
- Rail transport helps to provide employment opportunities to both skilled and unskilled individuals.

Disadvantages of Railways Transportation:

- Huge capital required for construction maintenance.
- It is not suitable for hilly areas.
- It is not flexible in nature.
- The cost and time of terminal operations are the major disadvantages of rail transport.
- Monopoly in nature.
- It consists much time for booking of goods through the comparison of road transport.

3. Water Transportation:

It involves the movement of goods through oceans and seas. There are more than 365 ports in India with Vishakapatnam contributing to maximum portion traffic. It can be categorized into three several categories:-

- Aqueducts, which includes tunnels and canals.
- Containers like tank car, tank ship, and tank truck.
- Towing, it is very useful to pull a large water bag or an iceberg.

In water transport, the weights of goods are very large in comparison to other means of transports. It plays a very crucial role in the development of exports and imports of goods in the different parts of the world.

Advantages of Water Transportation:

- It is the very cheapest or easiest means of transportation.
- Goods in bulk are transported.
- It promotes foreign or international trade.
- It can easily carry a huge quantity of goods such as timber and coal.
- In comparison to other transport, the risks capacity is very low.

Disadvantages of Water Transportation:

- One of the drawbacks is there is a delay in the movement of goods from one place to another.

- Performance is affected by seasonal variations.
- It can be used in a limited area of operations because it can only run on seas or oceans.
- Water transport is very unsuitable for small businesses because it carries a small number of goods.
-

4. Air Transportation:

The distinct advantage of air transport is speed and suitability. It is very useful for less working goods with a high value of the price. Air transport is also known as **aviation**.

The important characteristic of air transport is that does not need a particular surface track for its working operations. It is the fastest **means of transportation**. But the cost of operations is very high according to other modes.

Advantages of Air Transportation:

- Fastest means of transportation.
- Useful moving the goods in the amount of bulk.
- Each and every area of accessible.
- Vital for national security and defense.
- Very useful in earthquakes and other floods.
- It provides an efficient, regular, and quick service.
- It is very suitable for emergency services.

Disadvantages of Air Transportation:

- The large capital investment needed.
- Not suitable for working goods.
- May be affected by rains.
- Risks of accidents are highest.
- This mode of transport requires a specialized skill and a high degree of training for its working operations.

5. Pipelines Transportation:

Pipelines transportation is used for sending the liquids and gases from one place to another place. Through this means of transport, we can also send chemicals, biofuels, and natural gases.

Advantages of Pipelines Transportation:

- They are very flexible in transporting liquids and gases.
- It consumes low energy power.
- It needs a limited area of maintenance.
- Pipelines are very safe and accident-free transport

Disadvantages of Pipelines Transportation:

- It is not flexible in nature.
- It is restricted in a limited area of work.
- Difficult to make security arrangements for this transport.

6. Inter Modal Transportation

Intermodal transportation is the use of two or more modes, or carriers, to transport goods (freight) from shipper to consignee. Special standardized containers are used for intermodal transport of cargo on trucks, freight trains, and ships. These containers are large rectangular boxes, capable of being secured to special trailers. These durable, steel containers are built so they can be transferred between different modes of transportation easily. This eliminates the risks of directly handling shipments.

Advantages of Inter Modal Transportation

- Save from damage: - If you have packed and sealed your container properly then there are very less chances of its damage because we take proper care while transferring the goods.

- Saving of labor: - We are responsible for saving your time in packing and covering all the things properly and this will save labor because we handle the cargo from its origin point to destination.
- Flexibility regarding types of transportation: - It is our responsibility to transfer the goods in various kinds of transportation whichever your cargo requires like after ships to overland transport.
- Various containers: - Different kinds of goods require different type of container like liquids, frozen goods, compressed or liquefied gases, fast freight and even mini containers for smaller kind of cargo. So you can get various kinds of containers for various kinds of goods.

Dis advantages of Inter Modal Transportation

- Heavy load – reason of road damage: -While shifting goods by trucks can be a cause of damage of road because trucks are loaded fully and some roads can't bear so much heavy load and that can be damaged and maintenance cost also increases.
- Delay while delivering goods: - Sometimes workers ask for some demands and they do strike so in this way, the delivery of goods can be delayed.

Transport mode	Advantages	Disadvantages
Road	High velocity of delivery; Mobility (door-to-door service); Easy access to individual entities.	Low carrying capacity; High energy and area use; Noise and toxic emissions; Possible traffic delays.
Rail	High carrying capacity; Fast delivery; Low energy use;	Restricted timetables and routes; Low density of track's use; Expensive for short distances;
Inland water-ways	High carrying capacity; Economically and ecologically sustainable; Existence of natural routes already.	Limited geographical reach; Low speed; High dependence on environmental and weather conditions; Risks of accidents with dangerous environmental effects;
Sea	Very high carrying capacity; Economic for bulky and heavy goods; Existence of natural routes already.	Long delivery times; Dependence of weather conditions; Risks of accidents with dangerous environmental effects; Suitable only for coastal regions
Pipelines	Large volumes; Safety; Unaffected by weather; No driver.	Limited type of cargo; Easy target to vandalism or terrorist acts.
Air	Very high speed; No physical barrier; Existence of natural routes already.	Very costly; Dependence of weather conditions; Low carrying capacity; Heavy losses in case of

DEMAND FORECASTING

Meaning

Accurate demand forecasting is essential for a firm.

To enable it to produce the required quantities at the right time and arrange well in advance for the various factors of production.

Forecasting helps a firm to assist the probable demand for its products and plan its production accordingly.

It reduces the uncertainty and makes the organisation more confident of coping with the external environment.

Definition

According to Henry Fayol "the act of forecasting is of great benefit to all who take part in the process and is the best means of ensuring adaptability to changing circumstances. The collaboration of all concerned lead to a unified front, an understanding of the reasons for decisions and a broadened outlook".

Importance of Demand Forecasting:

1. Helpful in deciding the number of salesmen required to achieve the sales objective.
2. Determination of sales territories.
3. To determine how much production capacity to be built up.
4. Determining the pricing strategy.
5. Helpful in deciding the channels of distribution and physical distribution decision.
6. To decide to enter a new market or not.
7. To prepare standard against which to measure performance.
8. To assess the effect of a proposed marketing programme.
9. To decide the promotional mix.
10. Helpful in the product mix decisions relating to width and length of product line.

Demand Forecasting Periods

Demand forecasting is done for a definite period. The period can be one month, three month, one year, two years, five years, ten years etc. Generally, organisations are involved in forecasting the demand for one year and taking that demand forecast as a base, the demand for 6 months, 3 months and one month is derived.

So demand forecasting is of two types on the basis of periods:

1. Short run demand forecast.
2. Long run demand forecast.

1. Short Run Demand Forecast:

Its period ranges from one week to six months.

Following important decisions are taken under short run demand forecasting:

- Evolving suitable production policy so as to avoid the problem of over production and under production.
- Determining appropriate price policy so as to avoid an increase when the market conditions are expected to be weak and a reduction when the market is going to be quite strong.
- Forecasting short term financial requirements. Cash requirements depend on sales level and production operations. Sales forecasts enable arrangement of sufficient funds on reasonable terms well in advance.
- Setting sales targets and establishing controls and incentives. If targets are set too high, they will be discouraging sales man who fail to achieve them; if set too low, the targets will be achieved easily and hence incentives will prove meaningless.
- Helping the firm in reducing cost of purchasing raw materials and controlling inventory.

2. Long Run Demand Forecast:

The period of this type of forecasting ranges from one year to five years. This type of forecasting is generally done for a product line rather than for an individual product.

The purpose of long run demand forecasting includes:

- New unit planning or expansion of an existing unit. A long term demand forecasting helps to plan for the new units or at the same time existing units to expand their activities. A multi-product firm must determine total demand situation and the demand for different items.
- Planning for long term financial requirements. If the demand is more and it takes long term, then for such long term financial requirements could be planned and made available.
- Planning for manpower requirements under the long term demand, manpower is mostly required. For this purpose, persons have to be trained.

TYPES OF FORECASTING METHODS

1. Qualitative Method
2. Quantitative Method

Qualitative Method

- ✓ Executive opinions
- ✓ Salesforce Polling
- ✓ consumer survey
- ✓ outside opinion
- ✓ opinion of the manager
- ✓ Delphi method

1. Executive Opinions

The subjective views of executives or experts from sales, production, finance, purchasing, and administration are averaged to generate a forecast about future sales. Usually this method is used in conjunction with some quantitative method, such as trend extrapolation. The management team modifies the resulting forecast, based on their expectations.

2. Delphi Method

This is a group technique in which a panel of experts is questioned individually about their perceptions of future events. The experts do not meet as a group, in order to reduce the possibility that consensus is reached because of dominant personality factors. Instead, the forecasts and accompanying arguments are summarized by an outside party and returned to the experts along with further questions. This continues until a consensus is reached.

3**. Sales Force Polling**

Some companies use as a forecast source salespeople who have continual contacts with customers. They believe that the salespeople who are closest to the ultimate customers may have significant insights regarding the state of the future market. Forecasts based on sales force polling may be averaged to develop a future forecast. Or they may be used to modify other quantitative and/or qualitative forecasts that have been generated internally in the company.

4. **Consumer Surveys**

Some companies conduct their own market surveys regarding specific consumer purchases. Surveys may consist of telephone contacts, personal interviews, or questionnaires as a means of obtaining data. Extensive statistical analysis usually is applied to survey results in order to test hypotheses regarding consumer behaviour.

Quantitative methods

1. Time-series models

These models examine the past data patterns and forecast the future on the basis of underlying patterns that are obtained from those data. There are many types of time series models like Simple and weighted moving average, seasonal indexes, trend projections, simple mean and exponential smoothing.

2. Associative models

are also known as casual models. The model assumes that the variable that is being forecasted is associated with other variables The predictions are made based on these associations. The linear regression is one of the simplest forms of an associative model of forecasting. This regression line forecasts the dependent variable based on the selected value of the independent variable.

TECHNIQUE FOR AVERAGING

Time Series models are created when we have to predict values over a period of time i.e. forecasting values. There are multiple techniques to do it. In this blog, the most basic techniques known as Average Models will be explored. Such models are used when we don't have any major pattern in our data and the number of data points is not large enough.

There are multiple types of Average Models:

- ✓ Simple Average Models
- ✓ Moving Average Models
- ✓ Weighted Average Models

Unit – III

Transportation – participants in Transportation Decisions – Modes of Transportation – Factors influencing Transport economics – documents in Transport Decision Making .Warehousing / Distribution – Functions of Warehouse – benefits of Warehouse – Service – Warehousing Alternatives – Warehouse site selection – Factors while initiating Warehouse Operations – Warehouse Management Systems .Packing and Materials Handling – Functions of packaging – Communication – Packaging cost – Types of Packaging Material – Unitization – Containerization – Designing a package factors affecting choice of packaging materials.

TRANSPORTATION

PARTICIPANTS IN TRANSPORTATION DECISION

1. Shipper
2. Carrier
3. Receiver
4. Government
5. Public

1. Shipper perspective

- ✓ Transportation cost
- ✓ Facility cost
- ✓ Inventory cost
- ✓ Processing cost
- ✓ Customer Service cost

2. Carrier perspective

- Fixed cost- 1. terminal
  2. information system
  3. equipment
  4. vehicle

- Variable cost- 1. fuel cost
  2. personnel cost
  3. toll free charges

MODES OF TRANSPORTATION

1. Roadways Transportation.
2. Railways Transportation.
3. Water Transportation.
4. Air Transportation.
5. Pipelines Transportation.
6. Inter Modal Transportation

TRANSPORTATION DECISION IN NETWORK DESIGN

Network Design

1. Direct shipment network
2. Direct shipment decision without milk runs
3. Shipment managed from a centralised distribution centers
4. Shipments via distribution centers using milk run
5. Tailored network
6. Tailored transportation based on customer density and distance
7. Tailored transportation according to the size of the customer
8. Tailored transportation according to the product demand and value

TRADE OFFS IN TRANSPORTATION NETWORK DESIGN DECISION

1. Inventory cost
2. Choice of the transportation mode and inventory aggregation
3. Trade off between transportation cost and customer service decision

TRANSPORTATION ANALYSIS DECISION

1. Transportation analysis technique
2. Exact approach
3. Iterative approach
4. Heuristic approach

5. Combination approach

DIRECT SHIPMENT WITH MILK RUNS

- Milk run term is a delivery method in logistics which ensures that different deliveries from different vendors can be handled with maximum capacity utilization and minimal costs .
- The name Milk Run has been derived from the method used by the trucks to deliver the daily requirements of milk to the dairy co-operatives.
- A milk run ensures that that minimum distance is travelled and the maximum demand is carried into the truck or delivery vehicle so as to meet both the demand requirement and effective transportation with least cost.
- Most commonly used in FMCG goods

FACTORS INFLUENCING THE GROWTH AND DEVELOPMENT OF TRANSPORTATION SYSTEM

✓ "Transportation is a measure of the relations between areas and is, therefore, an essential aspect of geography".

✓ The economic relations between areas are reflected in the character of transportation facilities and in the flow of traffic.

✓ Wagner has stated, "the routes along which men, materials, and messages move bind a society together.

FACTORS:

(i) The Historical Factor:

This involves the location and patterns of systems, technological development, institutional development and settlement, and land-use patterns.

(ii) The Technological Factor:

The technological characteristics of each major transport mode are considered together with a discussion of the effects of technological advances.

(iii) The Physical Factor:

This includes physiographic controls upon route selection, and geological and climatic influences.

(iv) The Economic Factor:

The structure and nature of transport costs are examined, together with service quality and methods of pricing and charging.

(v) Political and Social Factors:

These include political motives for transport facilities; government involvement in capital, monopolies competition, safety, working conditions and coordination between modes, transport as an employer and social consequences of transport developments.

TOP 5 WAYS OF TRANSPORTATION IMPACT IN ECONOMIC DEVELOPMENT

1. Transportation investment
2. Measuring ROI for transportation
3. Supports clusters and increases productivity
4. Enhances job and labour market accessibility
5. opens new market for business and enhances supply chain efficiency

DOCUMENTS IN TRANSPORT DECISION MAKING

Bill of Lading

The bill of lading is the most important document that is used in transporting goods. The legal definition of a bill of lading is a contract for the carriage of goods and a document of title to them.

It provides any and all information that the carrier will need to transport the items. It contains the shipment origin and the contract terms for the transportation and is required by a carrier before the shipment is taken.

The bill of lading should include the name and address of the consignor and consignee, and often it will have the routing instructions for the carrier. It will contain a description of the goods to be transported, the quantity for each of the commodities, and the commodity class and rate.

The bill of lading will contain the terms of the contract for the movement of goods by a common carrier. This is the contract between the shipper and the carrier to transport the goods on the bill of lading to the consignee (i.e., the buyer). The bill of lading contract has nine terms:

Common Carrier Liability:

The carrier is liable for loss and damage of the goods being transported, except if the goods were improperly packed by the shipper or if the goods themselves would be liable to a normal loss like through evaporation. The carrier is not liable for acts of God, public enemy or public authority.

Delay in Transit:

The carrier cannot be held liable if the loss or damage is due to a delay in the transportation of the goods.

Freight Not Accepted:

If the goods are not accepted within the time allocated, the carrier can store the goods at a cost to the owner.

Extraordinary Value:

The carrier is not liable and does not have to carry items of extraordinary value that are not on the rated in the published classifications or tariffs unless a special agreement with the shipper has been negotiated.

Explosives:

The carrier has to be given full written disclosure when they are shipping dangerous material, otherwise, they are not liable for any losses.

Recourse:

The carrier cannot make additional charges to the shipper after making a delivery.

Substitute Bill of Lading:

If the bill of lading is a substitute or exchange for another bill of lading then the current bill of lading has to include all the clauses from previous documents.

Alterations:

The carrier must note any changes or additions to ensure that they can be enforceable.

Claims:

This clause specifies the details on how to file a claim against the shipper and the time period after delivery in which the claim will be accepted.

Freight Bill

The freight bill is the carrier's invoice to the shipper for all the charges that the carrier has incurred. The carrier’s freight bill will include the details of the shipment, the items being shipped, the consignee, the origin, and destination, as well as total weight and total charges.

Some carriers can ask for prepayment from the shipper if the value of the items being shipped is less than the total expected freight charges. If the charges are not prepaid then the carrier can present a freight bill on collect. This implies that the carrier will present the freight bill on the day of delivery.

FOB Terms of Sale

Free on Board (FOB) terms of sales documents which party will be liable for the transportation costs, which party is in control of the movement of the goods, and when the title passes to the buyer.

If the FOB terms of sale indicate that it is FOB Delivered then this implies that the shipper will be responsible for all of the carrier’s costs. If the terms of sale show FOB Origin, this means that the buyer will take the title of the goods when they are shipped and they will incur all the transportation costs.

WAREHOUSING

WAREHOUSE

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.

WAREHOUSING

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.

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:

Loans can be raised from the warehouse keeper against the goods stored by the owner. Goods act as security for the warehouse keeper. Similarly, banks and other financial institutions also advance loans against warehouse receipts. In this manner, warehousing acts as a source of finance for the businessmen for meeting business operations.

5. Grading and Packing:

Warehouses nowadays provide the facilities of packing, processing and grading of goods. Goods can be packed in convenient sizes as per the instructions of the owner.

BENEFITS FROM WAREHOUSES:

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.

FUNCTIONS OF WAREHOUSE

- ✓ Storage of Goods
- ✓ Protection of Goods
- ✓ Risk Bearing
- ✓ Identification of Goods
- ✓ Financing
- ✓ Processing

WAREHOUSE SERVICES

1. Central Location Storage Space

A warehouse provides a central location for receiving, storing and distributing products. When shipments have arrived at the final destination, it's a responsibility of warehouse service provider to handle the goods transfers. Once the shipments have been transferring to the warehouse, they will sort the products and dispatched to the temporary address. Once it's time to move items, each order is retrieved, grouped, packaged and checked for completeness before being dispatched to their new destination.

2. Increase Stock Visibility

Professional warehousing and transportation services actually utilize advance applications and strategies to manage their stock and provides you accurate insights of your inventory. By utilizing all these automatic inventory keeping application, they can track shipments and able to analyze historical performance data. This real-time data allows a company to see what's happening in its shipping operations.

3. Focus on Customer Satisfaction

The processes in between procurement and shipping can be long and complicated but with the help of the professional logistics and warehousing services, you can easily able to deliver the

cargo to the local address in a real time. The proper management of transportation and inventory can ensure high delivery performance and consistent customer satisfaction.

WAREHOUSE ALTERNATIVES

1. Private Warehouses
2. Public Warehouses
3. Government Warehouses
4. Distribution Centres Or Warehouses
5. Co-Operative Warehouses
6. Bonded Warehouses
7. Export and Import
8. Cold Storage
9. Climate –Controlled
10. Field Warehouses
11. Agricultural Warehouse

1. PRIVATE WAREHOUSES

- OPERATED by a company for shipping and storing its own products
- OWNED AND MANAGED- manufacturers or traders
- CONSTRUCTION- Farmers near their fields, Wholesalers and Retailers near their business centres and Manufacturers near their factories
- COMPANIES – Stable inventory levels and long run expectations
- SUITABILITY- Firms that require special handling and storage features and want to control design and operation of the warehouse
-

ADVANTAGES OF PRIVATE WAREHOUSES

- Better control over movement and storage
- Chances of errors and mistakes are less as products are handled by its own employees who have full knowledge
- Designing is done according to suitability of owner
- Greater flexibility with respect to storage and material handling needs

2. PUBLIC WAREHOUSES

- Provide storage and physical distribution services on rental basis
- Used by SMALL FIRMS and LARGE FIRMS
- Organizes to provide storage facilities to traders, manufacturers, agriculturists in return for a storage charge
- Licensed by Govt.
- In India OWNED and OPERATED – Central Warehousing Corporation and State Warehousing Corporation
- SUITABILTY – seasonal production or low volume storage needs, companies with inventories maintained in many locations, firms entering new markets
- OWNER –stands as an agent of goods

ADVANTAGES OF PUBLIC WAREHOUSING

- More efficient and less expensive
- Cost easily and exactly ascertained
- Fixed cost distributed among many users
- Strategically located and immediately available
- Flexible to meet space requirements of different users
- Companies have a wide choice of locations and warehouse types

3. GOVERNMENT WAREHOUSES

- OWNED, MANAGED AND CONTROLLED - Central or State Governments or public corporations or local authorities
- EXAMPLES- Central Warehousing Corporation of India, State Warehousing Corporation and Food Corporation of India
- If customer cannot pay rent within specified time authority can recover rent disposing of goods4. CO-OPERATIVE WAREHOUSES
- Owned, Managed and Controlled – Co-operative societies
- Facilities at most economical rates to members
- Located-Punjab, Karnataka, Maharashtra and Andhra

5. BONDED WAREHOUSES

- Licensed to accept imported goods for storage before payment of customs duty
- Imported merchandise is stored and released only after payment of appropriate taxes
- Cigarettes, Liquor, Other products are stored
- Owned and Operated – PORT TRUSTS
- Acts in two capacities viz LANDLORD and BAILEE OF GOODS
- As landlord provides storage facilities on rent
- As bailee of goods take reasonable care to handle and store goods as it has lien on goods under care for charges of its services
- Owner can sell goods wholly or in part by endorsing a warrant
- Facilitate enterpot trade- importer need not pay the import duty

6. DISTRIBUTION CENTERS / WAREHOUSES

- Designed to move goods
- Large and highly automated
- Receive goods from various plants and suppliers, take orders, fill them efficiently deliver to customers quickly
- Located near the market owned or leased by manufacturers
- Access to transport networks

7. COLD STORAGE

- Preserve perishability of goods against payment of a storage charge
- Temperature variation is controlled to degree necessary for certain sensitive items

8. EXPORT AND IMPORT WAREHOUSES

- LOCATION –near ports where international trade is undertaken
- Storage facilities for goods awaiting onward movements
- Facilities- packaging , inspection, marking etc

9. CLIMATE-CONTROLLED WAREHOUSE

- Handle storage of many products including need special handling conditions
- Freezers for frozen products, humidity controlled environment for delicate products, produce or flowers, etc

10. FIELD WAREHOUSES

- MANAGED- Public Warehousing Agency in the premises of a factory or company which needs facility for borrowing from a bank against certification of goods in storage or in process by an independent professional warehouse man.

11. AGRICULTURAL WAREHOUSES

- Store agricultural produce grown in a certain area
- Location – Assembling or regulated markets
- Receive agricultural commodities either directly from farmers or through their commission agents or from wholesalers
- Encourage speculative trading

WAREHOUSING STRATEGY

Depends on the Company's objectives in general and Logistics objectives in particular like :-

a) Availability of goods to consumers

b) Degree of customer service offered

c) Minimum total distribution cost

WAREHOUSE SITE SELECTION

Divided into 3 parts

1. Macro analysis
2. Micro analysis
3. Specific site analysis

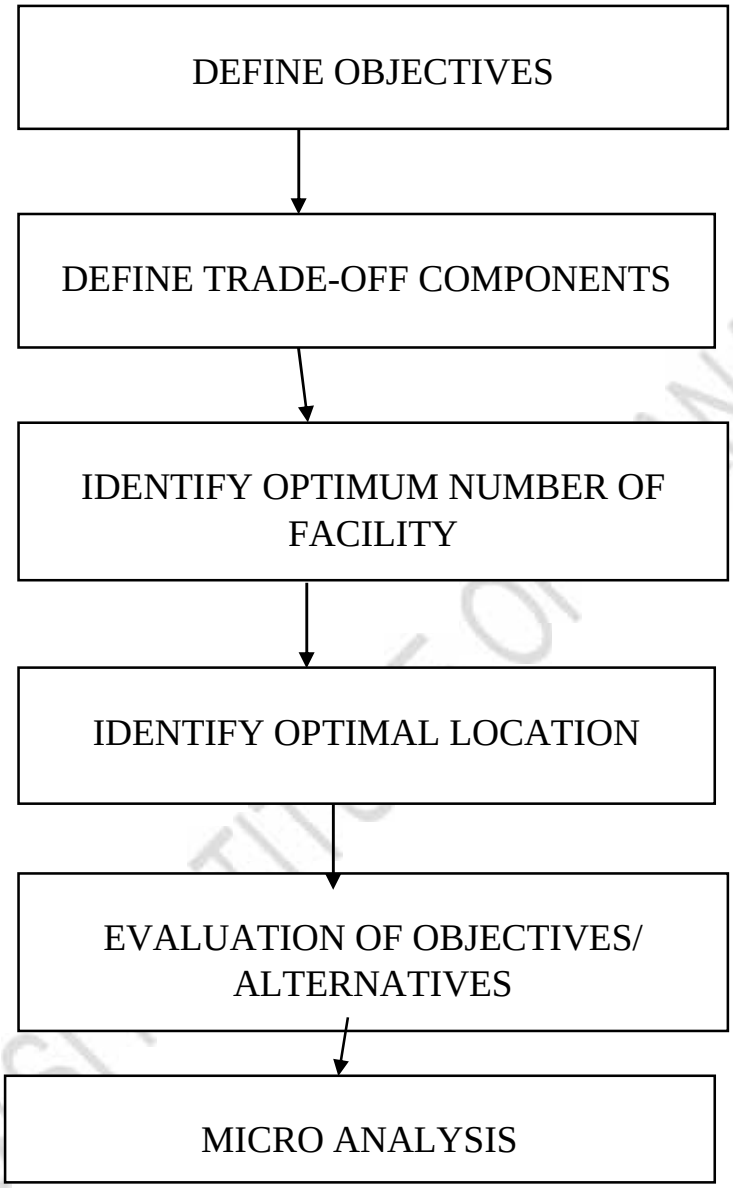
1. MACRO ANALYSIS

- Top level analysis
- How many locations to be chosen?
- Where the location should be?
- What is the best cost involved?

MACRO ANALYSIS ISSUES

- ✓ Service requirements
- ✓ Transportation
- ✓ Material handling
- ✓ Fixed cost
- ✓ Inventory cost
- ✓ Number and location of facilities

DRAW A FLOW CHART FOR MACRO ANALYSIS APPROACH



MACRO ANALYSIS MODELLING

3 types of modelling

- ✓ Computer Spreadsheet model
- ✓ Mathematical model
- ✓ Network Simulation model

1. Computer Spreadsheet model

Spreadsheet allows us to view the data and to identify the complications of the volume of the data. use various programs to get input of the data and can use the method to manipulate the data to get quick result.

2. Mathematical Model

Apply the mathematical formulae to find the situation.

3. Network Simulation Model

Solve various models automatically to provide a solution listing for various warehouse sites.

MACRO ANALYSIS RESULT

Result of the modelling gives the macro analysis result.

2. MICRO ANALYSIS

Focus Points:

1. Availability of existing site location
2. Population – Labour availability
3. Taxes and subsidies
4. Climate
5. Supplier availability
6. Local utilities
7. Distribution hubs and its potentials
8. Access to highway
9. Business activities
10. Quality of life considerations
11. Weather threats

12. Proximities to the airport and sea port

TOOLS OF MICRO ANALYSIS (GRID ANALYSIS)

1. Centre of gravity
2. Weighted Centre of gravity

1.CENTER OF GRAVITY

- Patterns are set on a map
- Grid: Horizontal axis refers to the miles in the east. Vertical axis refers to the miles in the west.
- Points are assigned to different locations
- Average distance between east and west is X displacement and average distance between north and south is Y displacement.
- Average is divided by the number of existing facilities
- The best location is one with which coordinates with the above averages.

2**. WEIGHTED CENTRE OF GRAVITY**

- Take the account of volume in a particular site receives.
- The location is multiplied by monthly volume received
- The average is calculated.
- The weighted centre of gravity is determined for that location

ADVANTAGES AND DISADVANTAGES OF WAREHOUSE

Advantages:

- Track exact stock location within one storage location with FIFO.
- Provides put away functionality for palletizing. etc
- Provides better picking functionality .
- Allows for picking locations with replenishment when falls below a defined quantity.
- Allows segregation of stock types within a warehouse.

Disadvantages:

- Increased master data maintenance.

- Additional process step for receipt and picking.
- Requires expert knowledge to configure for maximum benefit.
- More complex to resolve problems caused by incorrect processing.

FACTORS WHILE INITIATING WAREHOUSE OPERATIONS

1. Location
2. Access
3. Client Profile
4. Storage Area
5. Association Memberships
6. Experience
7. Employees
8. Value-Added Services
9. Risk
10. Technology

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. Operations in a warehouse include inventory management, picking processes and auditing.

Types of Warehouse Management Systems

There are several types of Warehouse Management Systems, each with it's own pros and cons. Here are the most popular types:

- Standalone System
- ERP Modules
- Cloud Based

1.Standalone Warehouse Management System

A standalone warehouse management system is your typical on premises type system which is deployed on the native hardware and network of the business.

Most WMS systems are third-party, standalone packages that must be integrated with the rest of your business management software (such as ERP). While integration of external programs can work, the process is often fraught with challenges such as duplicate data entry, information delays and silos, interface issues and customization expenses.

These systems are often the lowest long term cost option, but lack the benefits of a more integrated WMS option.

2.Cloud Based Warehouse Management System

A cloud warehouse management system is a web-based software as a service (SaaS) model utilizing enterprise cloud technology.

The benefits of cloud based WMS software include better flexibility, disaster recovery, scalability, and security. Cloud computing also offers users the ability to receive automatic software updates without additional capital expenditures, providing better technology competitiveness.

3.ERP Modules

Some ERP vendors, such as IQMS, offer a warehouse management system that is built into their ERP solution. This type of solution provides embedded EDI, accounting, sales orders, MRP and shipping management with no messy non-real-time interfaces.

The benefits of a comprehensive warehouse management system include:

- Reduced fulfillment time
- Increased inventory accuracy
- Improved customer service
- Greater space utilization
- Increased warehouse productivity
- Reduced labor cost

How to Choose the Right Warehouse Management System (WMS)

- Software fit and functionality – above all else!
- Purchase agreement (perpetual or subscription licensing)

- Implementation and training
- Backup & redundancy
- Customization
- You philosophy on IT and internal IT footprint
- Software update control
- Data access and ownership
- Total cost of ownership

MORDERN TRENDS IN WAREHOUSING

1. Just in Time(JIT)
2. Internet based stores
3. Third Party Logistics (3PL)
4. Radio Frequency Identification (RFID)
5. Transport Management System (TMA)
6. Pick to Light Technology
7. Voice activated Receiving and Gift Pack

PACKAGING IN LOGISTICS

- Packaging is the technology of enclosing or protecting products for distribution, storage, sale and use.
- Packaging also refers to the process of design, evaluation and production of packages.
- Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale and end use. Packaging contains, protects, preserves, transports, informs, and sells. Packaging is done by private firms as well as government bodies too.
- It is described as a coordinated system of preparing the goods for
- Transportation
- Warehousing
- Logistics
- Sale
- Enduse

- Packaging contains preservation, protection, transportation, information, enhances the sales.

CHARACTERISTICS OF PACKAGING

1. Convenient

Good packaging should be convenient. Package should be made in a way that the product could be conveniently taken from one place to another and can be handled easily by middlemen or consumers. The size and shape of package also should be convenient for retailers to keep in shop or for consumers to keep at their home. The package design should be made re-use-able, if possible.

2. Attractive

Package should be very attractive and fascinating. Attractive package draws customers' attention. It stimulates their interest towards the product and makes them realize the want of product. Color, picture, design, size etc. of package can be dramatically influence customers' mind. Some customers demand due to attractive packaging.

3. Economical

The other feature of good packaging is to be economical. It should not be costly. If packaging is expensive, it increases the price of the product. As a result, it becomes difficult to sell the product. So, packaging should not be costly nor should be clumsy.

4. Protective

The purpose of packaging is to protect products from different risks. Products should be packaged in a way that the quality, quantity, color etc. of product does not decline or damaged from sun, rain, insects, dust etc. While carrying from one place to another, transporting or storing in, and products may get damaged, putrefied, spoiled, or rotten. So, proper arrangement should be made to save the product from every risk. Only the packaging, which can protect products from all risk, is a good packaging.

5. Communicative

Good packaging should also be communicative. it should give information to the customers about the brand utility and quality of the product, which can stimulate demand. Good packaging works as silent salesperson and an effective advertisement.

TYPES OF PACKAGING

1. **Primary**,
2. **Secondary**
3. **Tertiary**

1.Primary Packaging

- The packaging that most closely touches a product, often referred to as "retail packaging."
- Its main goals are to protect the product and inform or attract a customer.
- What's considered to be primary packaging depends on the product. For example, a pop can is primary packaging (because it's the primary way to carry around soda), while a corrugated box containing a camera and its accessories is also primary packaging (because it's the primary way to purchase it).

2. Secondary Packing

- The packaging used to ship products already in primary packaging.
- Its main goals are to protect products and provide branding during shipping.
- It's also used as display packaging in retail locations such as grocery stores.
- Examples of secondary packaging include 12-packs of soda cans, the corrugated box that a half-dozen camera boxes ship in, and the display stand for a newly-released Blu-Ray movie.
- As you can see, primary and secondary packaging sometimes overlap.
- Secondary packaging can overlap with tertiary packaging as well.
-

3. Tertiary Packaging

- The packaging used most often by warehouses to ship secondary packaging.
- Its mail goal is to properly protect shipments during their time in transit.
- Tertiary packaging is typically not seen by consumers.
- Examples include the pallets that bulk shipments are placed on, corrugated pads used to separate layers of boxes and stretch wrap used to secure stacks of cartons.

LIST OF A GOOD PACKAGING CHARACTERISTICS

1. Right Condition
2. Right Place
3. Right Position
4. Right Sequence
5. Right Cost
6. Right Method of Packaging

FUNCTIONS OF PACKAGING

Key functions of logistics

1. Order Processing
2. Inventory Control
3. Warehousing
4. Transportation
5. Material Handling
6. Packaging
7. Information

1. Order processing

- It is an important task in functions of logistics operations. The purchase order placed by a buyer to a supplier is an important legal document of the transactions between the two parties.

- This document incorporates the description or technical details of the product to supply, price, delivery period, payment terms, taxes, and other commercial terms as agreed.
- The processing of this document is important as it has a direct relationship with the order or the performance cycle time, which indicates the time when the order is received and when the materials are received by the customer. The order processing activity consists of the following steps:

1. Order checking for any deviations in agrees upon or negotiated terms
2. Prices, payment, and delivery terms.
3. Checking the availability of materials in stock.
4. Production and material scheduling for shortages.
5. Acknowledging the order indicating deviations if any.

2. Inventory control

- Inventory management is to keep enough inventories to meet customer requirements, and simultaneously its carrying cost should be lowest.
- It is basically an exercise of striking a balance between the customer service for not losing the market opportunity and the cost to meet the same.
- The inventory is the greatest culprit in the overall supply chain of a firm because of its huge carrying cost, which indirectly eats away the profits. It consists of the cost of financing the inventory, insurance, storage, losses, damages, and pilferage.
- The average cost of carrying inventory varies from 10 to 25 percent of the total inventory per year depending on the products.

3. Warehousing

- Warehousing is the storing of finished goods until they are sold. It plays a vital role in logistics operations of a firm. The effectiveness of an organization's marketing depends on the appropriate decision on warehousing.
- In today's context, warehousing is treated as switching facility rather than a storage of improper warehousing management. Warehousing is the key decision area in logistics.

The major decisions in warehousing are:

- Location of warehousing facilities
- Number of warehouses
- Size of the warehouse
- Warehouse layout
- Design of the building
- Ownership of the warehouse

4. Transportation

- For movement of goods from the supplier to the buyer, transportation is the most fundamental and important component of logistics.
- When an order is placed, the transaction is not completed till the goods are physically moved to the customer's place. The physical movement of goods is through various transportation modes.
- In logistics costs, its share varies from 65 to 70 percent in the case of mass-consumed, very low unit-priced products.
- Firms choose the mode of transportation depending on the infrastructure of transportation in the country or region. Cost is the most important consideration in the selection of a particular mode of transport.
- However, sometimes urgency of the good at the customer end overrides the cost consideration, and goods are sent through the fastest mode, which is an expensive alternative.

5. Material handling and storage system

- The speed of the inventory movement across the supply chain depends on the material handling methods. An improper method of material handling will add to the product damages and delays in deliveries and incidental overheads.
- Mechanization and automation in material handling enhance the logistics system productivity.

- Other considerations for selection of a material handling system are the volumes to be handled, the speed required for material movement and the level of service to be offered to the customer.
- The storage system is important for maximum space utilization (floor and cubic) in the given size of a warehouse.
- The material handling system should support the storage system for speedy movement (storage and retrieval) of goods in and out of the warehouse.

6. Packaging

- Logistical or industrial packaging is a critical element in the physical distribution of a product, which influences the efficiency of the logistical system. It differs from product packaging, which is based on marketing objectives.
- However, logistical packaging plays an important role in damage protection, case in material handling and storage space economy. The utilization of load has a major bearing on logistical packaging with regard to the packaging cost.

7.Information

- Logistics is basically an information-based activity of inventory movement across a supply chain. Hence, an information system plays a vital role in delivering a superior service to the customers.
- Use of IT tools for information identification, access, storage, analysis, retrieval and decision support which is vital among the functions of logistics is helping business firms to enhance their competitiveness.

RULES FOR SUCCESSFUL COMMUNICATION IN LOGISTICS

1. Successful Communication Logistics Runs On Permanent, Needs-Based Content

Diverse content, widely and constantly available, enables customers to easily find and compare products and services.Providers who fail to continually adapt their communications to reflect

the needs of their customers are in danger of having their content perceived as spam. This is particularly the case for the after-sales relationship.

Tasks:

- Detailed analysis of the purchase process and motive
- Comprehensive analytical CRM (data and profile analysis)

2. Neo-Ecology And New Local Are Integrative Components Of Communications Logistics

Existing customer intermediaries (retail, service providers - including CEP services) must reposition themselves because knowledge of customer needs and wishes means intermediaries can communicate needs-based content on an ongoing basis – both locally and nationally. This applies both to CEP products as well as to services and products offered by CEP service partners.

Tasks:

- Intermediaries must redefine and reposition themselves
- Trust & added value must be based on individual attributes and credentials
- Individual cross-selling capabilities must be designed to benefit the end-consumer

3. Successful Communications Logistics Requires A Consciously Controlled Omnipresence

For customers, the connection between online and offline worlds is already reality. Global networks are changing the daily behaviour of individuals. Anyone communicating with their customers via a range of channels, and offering them a variety of options, can leverage on valuable synergies – because the customer can be reached wherever they happen to be.

Tasks:

- Analyse sales channels
- Identify potential to link channels & place offers
- Become a trusted, butler-like help agent

4. Mobility Must Be The Driver Of Communications Logistics

Systems need to be networked so that companies can address their own customers via a series of touch points.

Tasks:

- Identify your customer touch points
- Consider how current touch points can become an instrument of collaboration with your customers

5. Only Those Who Offer Their Customers Communications Of Value Will Enjoy Success

Much potential hides behind the truism that it is cheaper to retain current customers than to win new ones.Customised communications logistics are increasingly important when it comes to selecting the right model for determining a customer's actual value, and understanding what influences customer loyalty.

Tasks:

- Consider how to get to know each and every customer better

6. Individuality & Big Data Are The Cornerstones Of Communications Logistics

The value of a customer must be precisely analysed. Each partner in a communication must be offered the product and service option which suits them best – and which is profitable for the provider.

Tasks:

- Engage with your customers to help them improve their own profiles (whether an authentic profile, or the profile they wish to have)

7. Loyal Customers Are Ambassadors Of Success

Customer relations are finite. Not only for biological reasons. Customers are dynamic beings and their degree of loyalty varies within their own lifetimes. Even where a customer ceases to be a customer, they can continue to make a valuable contribution to the economic success of a company through their loyalty – by recommending the company and/or product to new

customers. Anyone understanding customer 'opinion leader potential' can encourage customers to share their opinions. This the basis for a qualitative and quantitative growth in loyalty.

Tasks:

- Activate opinion leader potential
- Encourage and recognise/reward those willing to share their views

8. Connectivity & Real Time Communication

Successful communications logistics leverages on opinion leader strategies. Successful organisations provide customers with offerings extending over and above their core competence. This generates enthusiasm and encourages recommendations.

Task:

- Most customers are highly predictable. Become a part of their ‘micro-cosmos’

PACKAGING COST

Most produces need packaging as they serve three basic purposes such as convenience, handling and transporting. Cost would be certainly much higher if everything had to be carried and moved without any form of packaging. Packaging can be used to divide the produce into convenient units for retail sale and to make the produce more attractive to consider, thus increasing the price at which it can be sold. The more sophisticated is the packaging, the greater will be the cost. The item to be packed and repacked on its way between the producers to consumer is depending on the length of marketing chain like in the case of vegetables. Though packaging is the last operation in any manufacturing activity or transport of raw material, it plays a vital role in distribution. Packaging of a product is an absolute necessity to ensure that the product reaches the ultimate customer in sound condition. However, this objective should be attained at minimum overall cost

FACTORS AGAINST THE REDUCTION OF PACKAGING COST

It should be noted here that there are certain factors working against the attempt of reduction of packaging as listed here below.

(i) Increasing the number of individuals living alone who need to keep their goods in packed condition,
(ii) Increasing numbers living alone,
(iii) The cost of goods damaged in transit,
(iv) Increasing purchase of imported goods,
(v) Increasing demand from retailers for tamper evident and anti-theft packaging,
(vi) Changing shopping habits – like home delivery,
(vii) Decreasing time spent on shopping and increasing demand for convenience and
(viii) Increasing in travel leading to rising demand for convenience packaging

TYPES OF PACKAGING MATERIAL

1. Cardboard Boxes
2. Bubble Wraps
3. Plastic Carrier Bags
4. Corrugated Paper Rolls
5. Document Enclosed Wallets
6. Board Back Canvas
7. Foam Edge Guards
8. Jiffy Foam Rolls
9. Craft Paper Rolls
10. Removal Kits
11. Plastic
12. Glass

13. Steel And Aluminium Containers

UNITIZATION

It is the process of consolidation of several units into single unit. It is made of a number of items or a bulky material and is constrained to lifted and shifted because it is too bulky to be moved manually. Material handling cost decreases as the size of the unit increases.
Using a carton would be more economical than lifting items individually and combining several cartons into a unit load would be even more economical.

CONTAINERIZATION

Containerization is the international shipping practice of storing a number of pieces of freight within a large container and transporting them as a single unit. This technique offers benefits to shippers, including less cargo handling, greater cargo protection and reduced shipping costs. Standardized containers, typically in 20- or 40-foot lengths, can be transported over long distances and transferred between transportation modes more efficiently.
ADVANTAGES OF CONTAINERIZATION

- Less handling of cargo
- More protection against pilferage
- Less exposure to elements
- Lower shipping costs

DESIGNING A PACKAGE FACTORS AFFECTING CHOICE OF PACKAGING MATERIALS.

- **Protection:** Packaging of the product is done to protect it from damage during shipping and handling, and to lessen the decaying in case the product is exposed to foul air or other harmful factors by accident.

- **Design & Structure:**Good packaging design and proper structure can add value to a product. For instance, the benefits can be obtained from the structure of a package that enhances the function of the product while the design give the product an appealing look.
- **Appearance:** Package design should be attractive enough to capture customers' attention as they are shopping or just glancing through a catalogue or your website. This is particularly important for customers who are not very familiar with the product. Designs that are unique and stand out are more likely to stay in the mind of a shopper.
- **Acceptance:** Package designs are not just to attract the end user, they also have to be accepted and liked by distributors who are going to sell the product. For instance, a retailer may not be interested in your package if it does not conform to the requirements they have, for storing the products and displaying them on the shelves.
- **Cost:** Packaging of a particular product can be a significant portion of its selling price. In the cosmetics industry, it is estimated that the packaging cost of some products may be as high as 40% of its product's selling price. Make smart packaging decisions in order to reduce the product's selling price and possibly lead to higher profits due to increase in sales.
- **Re-designing:** Developing an entirely new package for your product can be expensive. But it is also important to be part of the trend, since your product should appeal to your consumers. If you feel that your product packaging requires an update, then consider re-designing the package.
- **Environmental & Legal Issues:** While deciding on the package structure and design, you should also include assessment of its environmental impact especially for product packages that are frequently discarded. Ensure that you create packages that do not infringe on intellectual property, such as trademarks, copyrights or patents, held by others companies. These are some of the key factors that influence a product's package design and branding. With constant innovation in design and printing, packaging has become a key influencer in the market and helps attract the right attention amongst a hoard of other products.

Unit – IV

Organisation for effective logistics performance – centralised and decentralised structures – stages of functional aggregation in organisation, financial issues in logistics performance – Measures – Steps in ABC costing – Financial Gap Analysis integrated Logistics – Need for Integration - Activity Centres in Integrated Logistics Role of 3PL and 4PL – Principles of LIS.

ORGANISATION FOR EFFECTIVE LOGISTICS PERFORMANCE

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. These situations can be related to:

➢ The products

- Unavailability of the transportation
- Any internal issue in the organization
- Research and pick the correct Freight class.

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. Analyze the metrics related to different operations. This includes:

- Cycle time metrics
- Cost metrics, and
- Service metrics

CENTRALISED AND DECENTRALISED STRUCTURES

A centralised structure keeps decision-making firmly at the top of the hierarchy (amongst the most senior management)

Advantages	Disadvantages
Easier to implement common policies and practices for the whole business	More bureaucratic – often extra layers in the hierarchy
Prevents other parts of the business from becoming too independent	Local or junior managers are likely to much closer to customer needs
Easier to co-ordinate and control from the centre – e.g. with budgets	Lack of authority down the hierarchy may reduce manager motivation
Quicker decision-making (usually) – easier to show strong leadership	Customer service does misses flexibility and speed of local decision-making

Decision-making in decentralisation is spread out to include more managers in the hierarchy, as well as individual business units or trading locations

Advantages	Disadvantages
Decisions made closer to the customer = better customer service?	Decision-making is not necessarily "strategic"
Better able to respond to local circumstances	Harder to ensure consistent practices and policies at each location
Should improve staff motivation	May be some diseconomies of scale – e.g. duplication of roles
Consistent with aiming for a flatter hierarchy	Who provides strong leadership when needed (e.g. in a crisis)?
Good way of training and developing junior management	Harder to achieve tight financial control – risk of cost-overruns

Basis of Comparison	Decentralization	Centralization
Definition	Decision-making capabilities delegated across multiple levels	Decision-making capability rests with the top management
Flow of Information	Open and free	Vertical
Ideal for	Decentralization is ideal for large-sized organizations	Centralization is ideal for small-sized organizations

Decision-making speed	Significantly faster	Comparatively slow
People Involved	In decentralization, a higher number of people from each level are involved in the decision-making process	In centralization, only a few handpicked people are involved in the decision-making process
Employee Motivation	Highly motivated employee	Demotivated employee
Conflict in Decision	Most likely to occur	Least likely to occur
Burden	The burden gets shared among many levels	Only one group is carrying the burden
Stability	Prone to instability due to multiple conflicting decisions	Relatively stable as decisions are made by a central authority sharing a common ideology

STAGES OF FUNCTIONAL AGGREGATION IN ORGANISATION

Aggregate planning is the process of developing, analyzing, and maintaining a preliminary, approximate schedule of the overall operations of an organization. The aggregate plan generally contains targeted sales forecasts, production levels, inventory levels, and customer backlogs. This schedule is intended to satisfy the demand forecast at a minimum cost. Properly done, aggregate planning should minimize the effects of shortsighted, day-to-day scheduling, in which small amounts of material may be ordered one week, with an accompanying layoff of workers, followed by ordering larger amounts and rehiring workers the next week. This longer-term perspective on resource use can help minimize short-term requirements changes with a resulting cost savings.

In simple terms, aggregate planning is an attempt to balance capacity and demand in such a way that costs are minimized. The term "aggregate" is used because planning at this level includes all resources "in the aggregate;" for example, as a product line or family. Aggregate resources could be total number of workers, hours of machine time, or tons of raw materials. Aggregate units of output could include gallons, feet, pounds of output, as well as aggregate units appearing in service industries such as hours of service delivered, number of patients seen, etc.

Aggregate planning does not distinguish among sizes, colors, features, and so forth. For example, with automobile manufacturing, aggregate planning would consider the total number of cars planned for not the individual models, colors, or options. When units of aggregation are difficult to determine (for example, when the variation in output is extreme) equivalent units are usually determined. These equivalent units could be based on value, cost, worker hours, or some similar measure.

Aggregate planning is considered to be intermediate-term (as opposed to long- or short-term) in nature. Hence, most aggregate plans cover a period of three to 18 months. Aggregate plans serve as a foundation for future short-range type planning, such as production scheduling, sequencing, and loading. The master production schedule (MPS) used in material requirements planning (MRP) has been described as the aggregate plan "disaggregated."

Steps taken to produce an aggregate plan begin with the determination of demand and the determination of current capacity. Capacity is expressed as total number of units per time period that can be produced (this requires that an average number of units be computed since the total may include a product mix utilizing distinctly different production times). Demand is expressed as total number of units needed. If the two are not in balance (equal), the firm must

decide whether to increase or decrease capacity to meet demand or increase or decrease demand to meet capacity. In order to accomplish this, a number of options are available.

Options for situations in which demand needs to be increased in order to match capacity include:

1. Pricing. Varying pricing to increase demand in periods when demand is less than peak. For example, matinee prices for movie theaters, off-season rates for hotels, weekend rates for telephone service, and pricing for items that experience seasonal demand.
2. Promotion. Advertising, direct marketing, and other forms of promotion are used to shift demand.
3. Back ordering. By postponing delivery on current orders demand is shifted to period when capacity is not fully utilized. This is really just a form of smoothing demand. Service industries are able to smooth demand by taking reservations or by making appointments in an attempt to avoid walk-in customers. Some refer to this as "partitioning" demand.
4. New demand creation. A new, but complementary demand is created for a product or service. When restaurant customers have to wait, they are frequently diverted into a complementary (but not complimentary) service, the bar. Other examples include the addition of video arcades within movie theaters, and the expansion of services at convenience stores.
5. Options which can be used to increase or decrease capacity to match current demand include:
6. Hire/lay off. By hiring additional workers as needed or by laying off workers not currently required to meet demand, firms can maintain a balance between capacity and demand.
7. Overtime. By asking or requiring workers to work extra hours a day or an extra day per week, firms can create a temporary increase in capacity without the added expense of hiring additional workers.

8. Part-time or casual labor. By utilizing temporary workers or casual labor (workers who are considered permanent but only work when needed, on an on-call basis, and typically without the benefits given to full-time workers).
9. Inventory. Finished-goods inventory can be built up in periods of slack demand and then used to fill demand during periods of high demand. In this way no new workers have to be hired, no temporary or casual labor is needed, and no overtime is incurred.
10. Subcontracting. Frequently firms choose to allow another manufacturer or service provider to provide the product or service to the subcontracting firm's customers. By subcontracting work to an alternative source, additional capacity is temporarily obtained.
11. Cross-training. Cross-trained employees may be able to perform tasks in several operations, creating some flexibility when scheduling capacity.
12. Other methods. While varying workforce size and utilization, inventory buildup/backlogging, and subcontracting are well-known alternatives, there are other, more novel ways that find use in industry. Among these options are sharing employees with counter-cyclical companies and attempting to find interesting and meaningful projects for employees to do during slack times.

AGGREGATE PLANNING STRATEGIES

There are two pure planning strategies available to the aggregate planner: a level strategy and a chase strategy. Firms may choose to utilize one of the pure strategies in isolation, or they may opt for a strategy that combines the two.

1. **LEVEL STRATEGY.**

   A level strategy seeks to produce an aggregate plan that maintains a steady production rate and/or a steady employment level. In order to satisfy changes in customer demand, the firm must raise or lower inventory levels in anticipation of increased or decreased levels of forecast demand. The firm maintains a level workforce and a steady rate of output when demand is somewhat low. This allows the firm to establish higher

inventory levels than are currently needed. As demand increases, the firm is able to continue a steady production rate/steady employment level, while allowing the inventory surplus to absorb the increased demand.

A second alternative would be to use a backlog or backorder. A backorder is simply a promise to deliver the product at a later date when it is more readily available, usually when capacity begins to catch up with diminishing demand. In essence, the backorder is a device for moving demand from one period to another, preferably one in which demand is lower, thereby smoothing demand requirements over time.

A level strategy allows a firm to maintain a constant level of output and still meet demand. This is desirable from an employee relations standpoint. Negative results of the level strategy would include the cost of excess inventory, subcontracting or overtime costs, and backorder costs, which typically are the cost of expediting orders and the loss of customer goodwill.

2. CHASE STRATEGY.

A chase strategy implies matching demand and capacity period by period. This could result in a considerable amount of hiring, firing or laying off of employees; insecure and unhappy employees; increased inventory carrying costs; problems with labor unions; and erratic utilization of plant and equipment. It also implies a great deal of flexibility on the firm's part. The major advantage of a chase strategy is that it allows inventory to be held to the lowest level possible, and for some firms this is a considerable savings. Most firms embracing the just-in-time production concept utilize a chase strategy approach to aggregate planning.

Most firms find it advantageous to utilize a combination of the level and chase strategy. A combination strategy (sometimes called a hybrid or mixed strategy) can be found to better meet organizational goals and policies and achieve lower costs than either of the pure strategies used independently.

TECHNIQUES FOR AGGREGATE PLANNING

Techniques for aggregate planning range from informal trial-and-error approaches, which usually utilize simple tables or graphs, to more formalized and advanced mathematical techniques. William Stevenson's textbook Production/Operations Management contains an informal but useful trial-and-error process for aggregate planning presented in outline form. This general procedure consists of the following steps:

3. Determine demand for each period.
4. Determine capacity for each period. This capacity should match demand, which means it may require the inclusion of overtime or subcontracting.
5. Identify company, departmental, or union policies that are pertinent. For example, maintaining a certain safety stock level, maintaining a reasonably stable workforce, backorder policies, overtime policies, inventory level policies, and other less explicit rules such as the nature of employment with the individual industry, the possibility of a bad image, and the loss of goodwill.
6. Determine unit costs for units produced. These costs typically include the basic production costs (fixed and variable costs as well as direct and indirect labor costs). Also included are the costs associated with making changes in capacity. Inventory holding costs must also be considered, as should storage, insurance, taxes, spoilage, and obsolescence costs. Finally, backorder costs must be computed. While difficult to measure, this generally includes expediting costs, loss of customer goodwill, and revenue loss from cancelled orders.

7. Develop alternative plans and compute the cost for each.
8. If satisfactory plans emerge, select the one that best satisfies objectives. Frequently, this is the plan with the least cost. Otherwise, return to step 5.

FINANCIAL ISSUES IN LOGISTICS PERFORMANCE

Under the council of Supply Chain Management Professionals (CSCMP)

1. Inbound Outbound Transportation Management
2. Fleet Management
3. Warehouse Management
4. Cost in Material Handling
5. Order Fulfilment
6. Logistics Network Design
7. Inventory Management
8. Supply or Demand Planning

Under the company's logistics cost and service database they state logistics cost end up approximately 9% of sales where in transportation makes 50% of cost. So better management of transportation activities have a high potential to deliver financial improvements.

TRANSPORTATION AND ITS IMPACTS ON REVENUE GROWTH

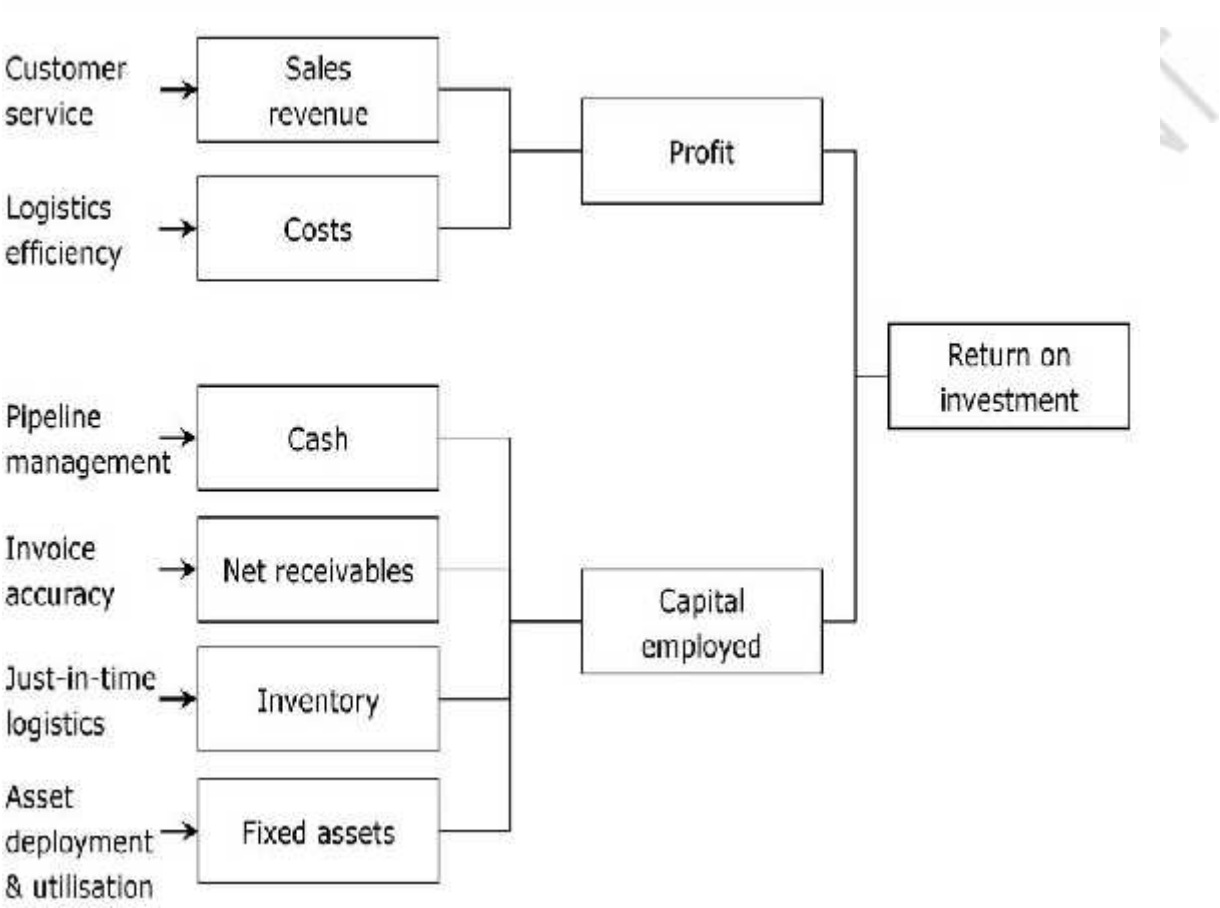
1. Goods with short life cycle and goods which are essential for production run rely on transportation capacity.
2. Transportation impacts the top line.
3. Transportation has a significant impact on company's operating expenses. It is easily identified by the cost of Goods sold calculations.
4. Technology and real time access to information are important driver for an efficient reliable transportation management system
5. When the cost of goods sold reduces the financial performances of the company increases.

The following criteria is to be considered in transportation to increase the financial performance of the company

- Better purchase order coordination
- shipment planning
- shipment execution
- financial settlement

6. Companies have to consolidate the transportation into large shipment sizes for transportation saving (Access the capacity of multiple carriers choose the best mode efficient routes for improved operational cost)
7. Automated manual process.
8. Better Scheduling of Staffs
9. Improve the visibility of purchase order information shipment in transit and delivery time, reduce the cost of labour at distribution centre.
10. Transportation also impact on capital utilization (i.e) The amount of revenue generated from each dollar invested in capital.

LOGISTICS IMPACT ON RETURN ON INVESTMENT



5 WAYS TO OPTIMIZE YOUR ROI

1. Accurate Data

Accurate data is an essential starting point for any effort to optimize your supply logistics. Comprehensive data points must be delivered in a timely manner so you can use up to date information to make the most informed supply chain decisions.

For many companies, implementing a supply chain management software that automates many of the tasks associated with business data, such as tracking order status or warehouse inventory

levels, can eliminate the risk of human error associated with manual data input. Using a system that automates basic tasks, while simultaneously notifying you with important information, will make it easier to make decisions that will help your company grow.

2. Account for Variables

While the data supplied through supply logistics software can be extremely beneficial as you go through the process of optimizing your operations, managers cannot overlook the many variables that might affect the supply chain process. Every aspect of supply logistics is subject to some degree of variability, whether it be differences in travel time for a particular trip or even variances in the number of orders received on a given day.

Supply logistics models run through a supply chain management software would account for these and other variables. By understanding the many potential variables that could affect your supply logistics, you can make more accurate decisions and further optimize your ROI.

3. Employee Training

At first glance, employee training may not seem like a crucial part of supply logistics optimization. But in reality, it can have a significant impact on your ability to leverage data-based insights and turn them into opportunities to boost your ROI. Everyone involved in supply logistics can impact your company's potential for growth, from your warehouse manager to your delivery personnel.

As such, employee training must be a key focus of your optimization efforts. By training employees on new techniques and skills that will allow them to perform at peak efficiency, you can accomplish far more than you would with data alone. Most importantly, well-trained employees will know how to react appropriately to divert disaster when unexpected challenges arise.

4. Maximizing Storage Capacity

Supply logistics optimization should always account for ways to make the most of your facility's storage capabilities. Naturally, this will be somewhat dependent on the type of products and materials you store; many perishable items, for example, will need to be kept in

moisture-free or refrigerated environments, which may require a specific pre-set storage arrangement.

No matter what type of products you store at your facility, you should implement a layout that maximizes your storage capacity while also making it easier for warehouse workers to gain access to desired items. Consider using vertical storage columns and active receiving areas that can handle an influx of seasonal in-demand items. Barcode scanning technology can also make it much easier for workers to locate items after a customer has placed an order.

5. Route Optimization

An additional way to improve your supply logistics is by finding ways to optimize routes for both your own orders and client deliveries. Using technology tools that find the safest and fastest routes can help you achieve rapid deliveries for your clients, which greatly increasing customer satisfaction. Alternatively, optimizing delivery schedules and routes from your own suppliers will help ensure that you always have the necessary items in your warehouse. Route optimization can make the entire supply chain process more cost efficient for your team.

LOGISTICS MEASURES

1. On-Time Shipping

A distribution center's primary objective is clear in its name: It must accurately and efficiently *distribute* goods that are coming in and out of the warehouse. In other words, the correct product must be placed on the correct transportation method at the appropriate time. In order to complete this task, you must monitor late shipping departures to the warehouse and early completion of freight loading time.

Although it may seem that finishing shipment loads ahead of schedule is a good idea, in reality it could affect the departure and duties of other shipments. So, your business can be sure to monitor these shipment details via a 3PL system. You should also take into account the varying loading and transportation times needed to shift freights before out-bounding product. (Because delaying shipping can be just as bad as receiving the birthday present you ordered for your mom days later, timing matters.)

2. Warehouse Capacity

While there are measures out there to monitor inventory, it is essential that you complete manual observation as well. A distribution center needs to be aware of its ability to increase or decrease its loading times, create more storage space, and accurately track inventory. Currently, many distribution centers incorporate RFID measures to check inventory. However, you should not underestimate the need for manual observation in order to successfully analyze the listed criteria.

3. Accurate Order Fulfillment

Another highly important metric is, of course, the accuracy of the order picking processes. When your employee goes to retrieve a pallet of a specific product, you want to be able to measure how quickly and accurately that task is completed. However, realistically, human error will sometimes occur, which makes the tracking of the picking and moving process vital. A distribution center does not want to be in a situation in which it is unaware of lost, damaged, or misplaced product.

4. Properly Storing Incoming Product

This metric relates to the previous one about order fulfillment, in that it requires a similar tracking process. Accurate inbound storage is essential for accurate outbound deliveries. Without a well-organized inventory in the receiving end, the outbound end will have trouble accurately and efficiently fulfilling orders.

Additionally, the incoming product needs to be recorded correctly, so that inventory capacity can consistently be updated. Furthermore, incoming product and procedures can vary depending on the type of warehouse and storage facility you are operating. For instance, Catch-Up Logistics focuses on food storage. Therefore, it is essential that the product is placed in the correct freezer, cooler, or ambient temperature zone. If this is not done properly, not only will we ruin the product, but we will also lose credibility in our ability to provide high-quality warehousing services.

5. Peaks in Warehouse Capacity

Changes in product demand can, of course, influence the amount of inventory you are willing to hold in your warehouse distribution center. For instance, the holiday season will result in a peak in inventory, as companies need to store more seasonal product. With Catch-Up Logistics,

Thanksgiving is a prime example, as our turkey inventory grows and distribution needs to be timely.

6. Total and Individual Cycle Times

In order to be sure that your warehouse is running efficiently, you should be tracking the cycle times. The total cycle time refers to the time needed to properly place the product in inventory from its time of arrival and then ship it from the distribution center. Individually, you can record the dock-to-load time, picking, packing, and preparing the freight for shipping times. This will enable you to see whether or not a certain process is underperforming and can be improved.

7. Damaged Products

You are bound to deal with damaged product at some point while either receiving inventory or moving it. Thus, it is important to record whether or not the product was already damaged upon arrival or if it was due to mishandling in the distribution center. Knowing this data and taking proper action to reduce such mishaps will help improve the efficiency of your warehouse.

8. Employee Turnover Rate

Because working in a distribution center can be exhausting, it is common for employees to search for other job opportunities. However, being able to minimize the turnover with incentives and an improved working environment can benefit the business. It is best to try and maintain employment, instead of consistently searching for new workers and spending the time and resources to train them, only to have them leave in a few months.

9. Accurate Tracking of Trailers

If your warehouse distribution center makes use of trailers for shipping product, it is essential that you are aware of their location at all times. (For instance, Catch-Up Logistics utilizes trailers for shipping.) A great method for tracking this information is through the use of a GPS tracking system.

10. Recording Temperatures

If you have a food storage warehouse facility, it is essential to install a temperature-monitoring system. At Catch-Up Logistics, we monitor the daily temperatures of all the freezers, coolers, and ambient temperature storage spaces to ensure the optimal temperature for proper food storage and health reasons. Additionally, such a system will notify you of any irregular changes

in temperature so that you can immediately solve an arising problem before the food product becomes unusable.

There are many aspects to maintaining a well-functioning warehouse distribution system, as demonstrated from the list of metrics above. Although these tracking suggestions may at first appear excessive and time-consuming, they will help you improve the efficiency of your warehouse.

STEPS IN ABC COSTING

Activity-based costing (**ABC**) is a **costing** method that identifies activities in an organization and assigns the cost of each activity to all products and services according to the actual consumption by each. This model assigns more indirect costs (overhead) into direct costs compared to conventional **costing**.

Activity-based costing provides a more accurate method of product/service costing, leading to more accurate pricing decisions. It increases understanding of overheads and cost drivers; and makes costly and non-value adding activities more visible, allowing managers to reduce or eliminate them. ABC enables effective challenge of operating costs to find better ways of allocating and eliminating overheads. It also enables improved product and customer profitability analysis. It supports performance management techniques such as continuous improvement and scorecards.

FEATURES OR CHARACTERISTICS OF ACTIVITY BASED COSTING

1. The total cost is divided into two types i.e. fixed cost and variable cost which is necessary to provide quality information to design a suitable cost system in a manufacturing concern.
2. The proper distinction is made between the cost behavior patterns.
3. The cost behavior patterns are volume related, diversity related, events related and time related.
4. The appropriate cost driver has to be identified for tracing the overhead to a product.
5. The cost drivers dictate the cost behavior pattern.

OBJECTIVES OF ACTIVITY BASED COSTING

1. To rectify the inaccurate cost information.
2. To allocate the overheads on activity basis.
3. To help the management in taking quality and timely decision.

DEVELOPMENT OF ACTIVITY BASED COSTING

1. The main functional areas of the organization have been identified. For example production, sales, distribution etc.
2. Each functional area has separate activities. Out of many activities, the main activities of each functional areas have been identified. For example: Purchase of raw materials, purchase of packing materials etc.
3. The support activities of main activities have been identified. For example: repairs and maintenance of machine, maintaining power supply, testing of quality etc.
4. The factors which are influencing the main activities and support activities identified i.e. cost drivers.
5. The data relating to direct labour, material and overhead costs have been collected accurately.
6. The cost driver rates have been fixed on the basis of the overheads incurred.
7. The cost of each activity is also find out in order to calculate the cost of each product separately.

Thus, ABC is the process of tracing costs first from resources to activities and then from activities to specific products.

IMPLEMENTATION OF ACTIVITY BASED COSTING

1. Identify the functional areas of organization.
2. Identify the main activities of each functional areas.
3. Allocate common indirect costs to each functional areas on suitable basis.
4. Identify the most suitable cost driver in each activity under functional areas.
5. Preparing the statement of expenditure on activity wise.
6. Compare this statement with the value addition activity wise.
7. Find the activities which are to be eliminated or improved for better performance of the organization.

STEPS IN IDENTIFY/ APPLYING ABC

Step #1: Activity Identification

First, activities must be identified and grouped together in activity pools. Activity pools are the supporting activities that tie in to a product line or service These pools or buckets may include fractionally assigned costs of supporting activities to individual products as appropriate during the second step.

Step #2: Activity Analysis

ABC continues with activity analysis, clearly identifying the processes which support a product and avoiding some of the systemic inaccuracies of traditional costing. ABC costing requires activity analysis, similar to the process mapping found in lean manufacturing.

This activity analysis identifies indirect cost relationships and allows assignment of some percentage of that activity to an end product directly.

Step #3: Assignment of Costs

Based on the findings of step #1 and #2, costs are assigned to an activity pool. For example, human resources costs would be assigned to indirect administrative or indirect management costs. These pools will each have some contribution to object cost.

Step #4: Calculate Activity Rates

Initial analysis may include direct labor hours, or indirect support labor. These activities must be assigned a value in real currency. All weightings must be added at this step. For instance, production labor hours should be in terms of a weighted labor rate including benefit costs.

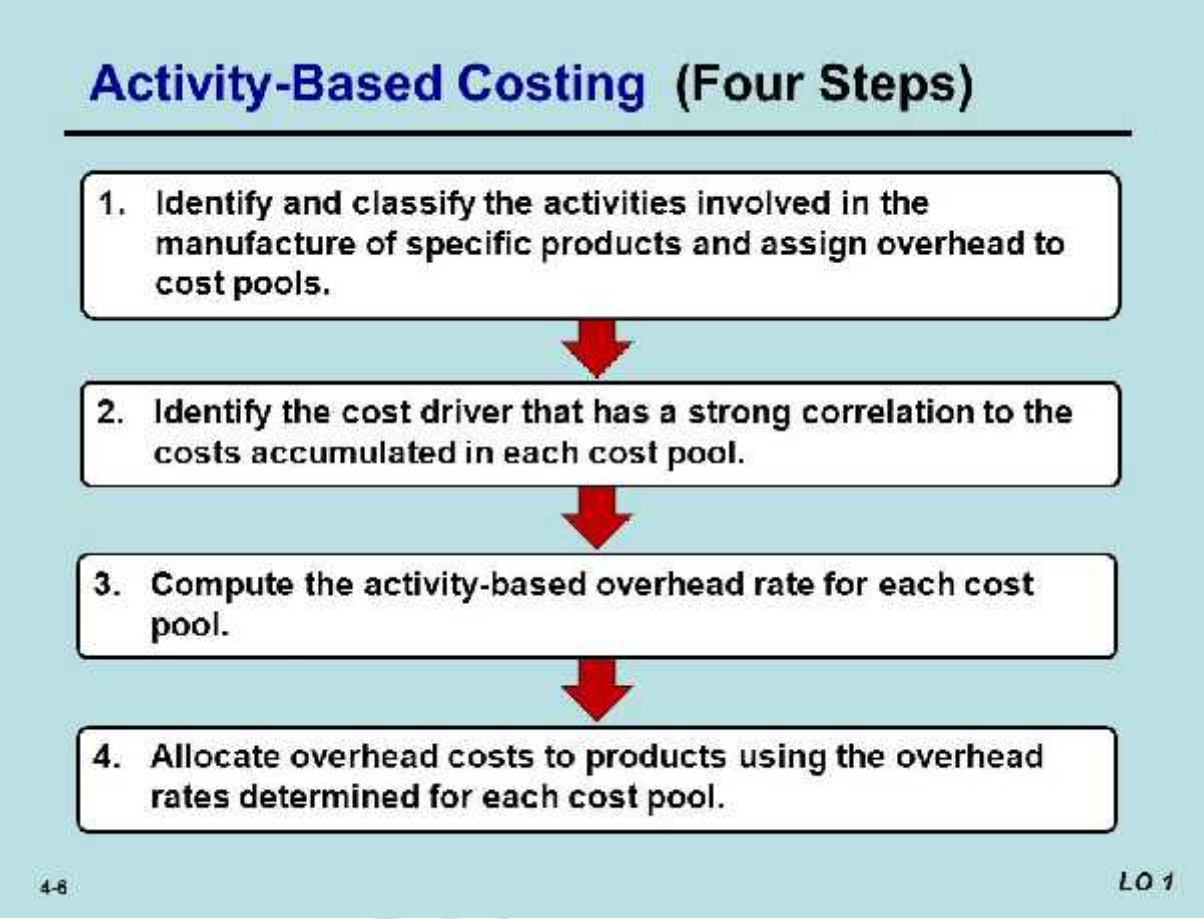
Step #5: Assign Costs to Cost Objects

Once activity costs, pools and rates are identified and clearly defined, the next step is to assign them to cost objects. Objects are generally defined as the results offered to a customer. In both manufacturing and non-manufacturing environments, this product should have some saleable value to compare to the assigned costs.

Step #6: Prepare and Distribute Management Reports

Once ABC costing analysis is complete, that cost data should be placed in a concise and coherent manner for cost object and process owners. This communication of the costing analysis is critical to justify the cost of the analysis, as often this is not an inconsequential cost.

FLOW CHART


Activity-Based Costing (Four Steps)
1. Identify and classify the activities involved in the manufacture of specific products and assign overhead to cost pools.
2. Identify the cost driver that has a strong correlation to the costs accumulated in each cost pool.
3. Compute the activity-based overhead rate for each cost pool.
4. Allocate overhead costs to products using the overhead rates determined for each cost pool.
4-6
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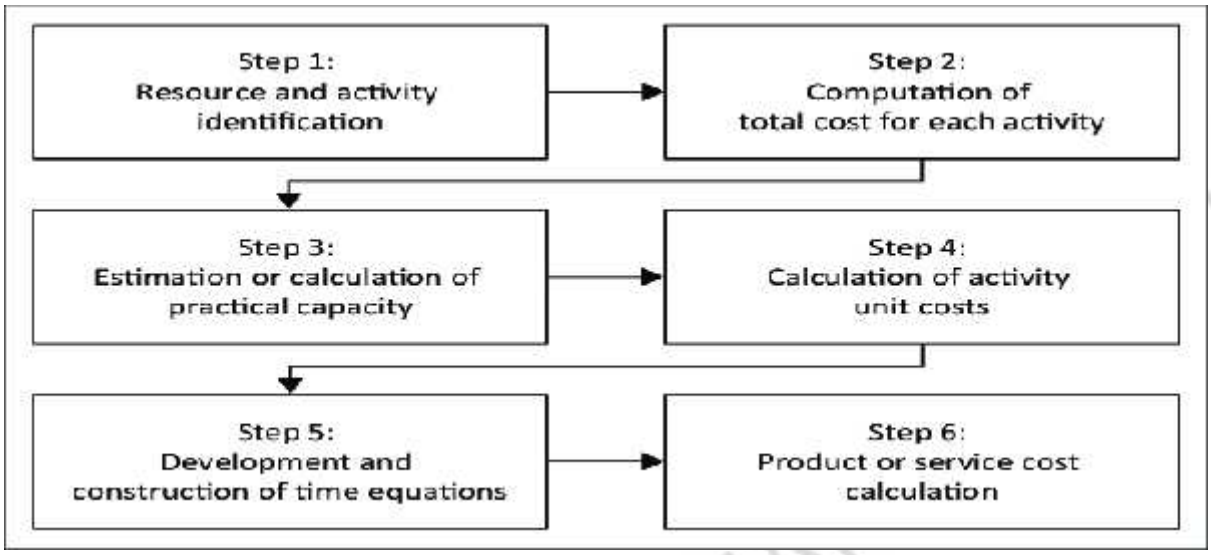
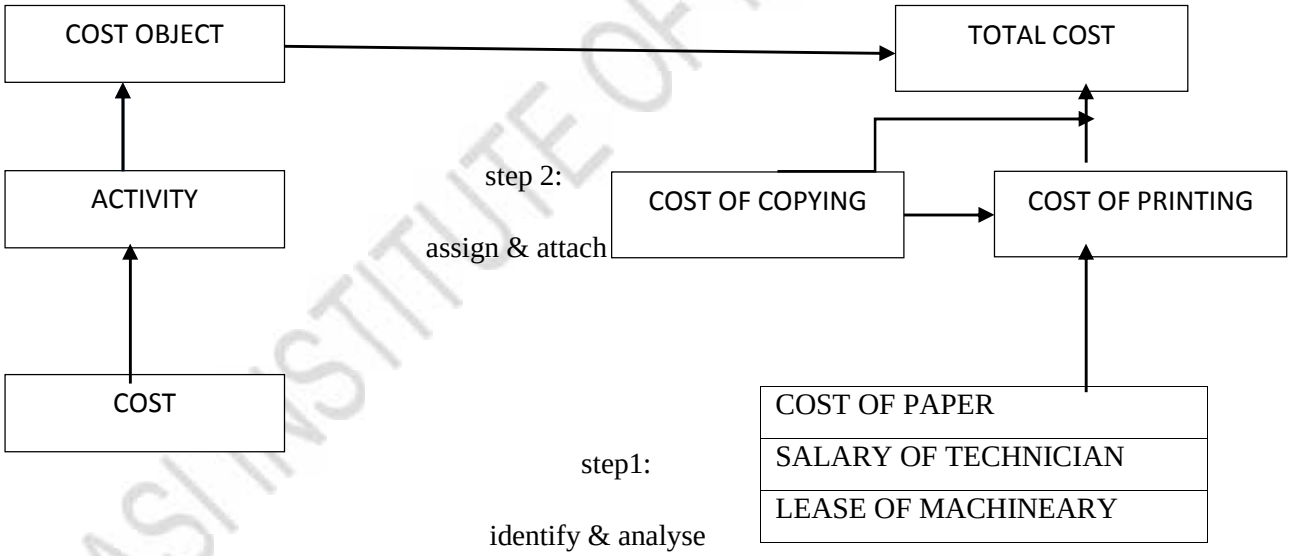
ABC MODEL



STEPS IN IDENTIFY/ APPLYING ABC



FINANCIAL GAP ANALYSIS INTEGRATED LOGISTICS

This refers to the evaluation of the cost of each system component with the objective of determining a combination of components providing a minimum total cost for a specified level of customer service. Trade-off takes place when management incurs cost in a particular activity center as part of the strategy to achieve benefits from another activity center. Intra– activity trade-off occurs when trade-offs occur within an individual activity of the logistics system. An example can be a decision to use one's own transportation instead of a public transportation. Inter-activity trade-off occurs between various activities of logistics system. Management prepares itself to bear the increased cost of one activity center so as to get the profits from another. For example, using airfreight can increase transportation cost but would result in are diced inventory and warehousing cost. Inter-functional trade-off occurs between the logistics system and other functional areas of the firm. A trade-off is made between various functions. For example, the packaging structure for a company was changed from conventional vacuum packs to a different shape to suit the structure of the product.

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

NEED FOR INTEGRATION

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

This is achieved through the following means:

1. **Rationalization of supply base**: Companies try to rationalize their supply base by reducing the number of suppliers. In fact, companies are looking at these suppliers to provide systems rather than components. Companies are basically trying to rationalize their supply base. For example: the automotive sector is trying to integrate tier 1, tier 2 and tier 3 suppliers.
2. **Centralized inventory**: The extended enterprise not only includes upstream suppliers but also the downstream flow of finished products through dealer networks. Traditionally, when dealers did not have the product demanded by customers, they used to swap this with another dealer who had that product variety in stock. Today, enterprises have centralized inventory and also take responsibility for its management. The dealers have only demonstration models; they have on-line access of the enterprise supply system and can give the customer an immediate confirmation about the availability of the product of their choice and when it can be delivered. For those products not available from stock, dealers enter order directly into the production schedule and the product required is made to order.
3. **Integrated Information Systems**: The benefits of a fully transparent information system are being considered with the use of Electronic Data Interchange (EDI) together with the growing acceptance of 'just-in-time' philosophy. Suppliers can now manage the flow of materials into the plant on the basis of advance notification of a company's production schedule. With integrated information systems, there are no manual orders, invoices or delivery notes. A single source of information provides the basis for a timely physical response, which automatically triggers payment to the supplier.
4. **Supplier Development Programmes**: Supplier development has replaced the traditional purchasing function. A cross functional team of specialists work closely with suppliers and seek improvements in supplier processes as well as in the interfaces with the enterprise's processes.
5. **Supplier involvement**: Innovations in industries are supplier originated. By bringing suppliers closer to the process of new development, it has been found that innovation

can be embodied in new products continually and simpler cost effective designs can be created.

ACTIVITY CENTRES IN INTEGRATED LOGISTICS

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

1. **Customer Service Standards:** The customer has become more and more demanding in overall performance terms. The manufacturer needs to create a competitive advantage on the basis of customer-service. Co-operating with marketing to determine customer needs and wants determine the customer response to service and set customer levels.
2. **Transportation:** This is one of the most expensive activity centers in logistics. It is concerned with movement of raw materials to the plant and semi-finished goods or finished goods to the market. Any problems in the transportation service can result in the company holding inventory for more days than planned for. An efficient transportation planning and management is a pre-requisite function of logistics.
3. **Inventory Management:** The operational aspects of logistical management are concerned with movement and storage of materials and finished goods. Logistics operations start with the initial shipment of material from a supplier and finalized when a manufactured or processed product is delivered to a final customer. As material gains value at every step of its conversion into finished inventory, work-in-progress inventory needs to be moved to support final assembly for supporting manufacturing. A meaningful value-addition is done only when the final ownership is transferred to customers wherever specified. For better understanding of the inventory it is divided into the following three areas:
    i. Physical Distribution
    ii. Manufacturing Support
    iii. Procurement

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

Support Activity Centers

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

1. **Warehousing**: Storing goods that are waiting for sale. This function is necessary as there is rarely a match between production and consumption. Organizations choose between warehouses and distribution centers. Distribution centers are larger, automated warehouses designed to receive goods from various plants and suppliers.
2. **Material Handling**: Efficient material handling methods in warehouses can improve customer satisfaction by decreasing the damage in handling, maintaining the quality of storage, facilitating order processing and moving the right goods at the right time to make them available to the right customers. Costs are also reduced through proper material handling techniques
3. **Information**: Information collection, storage and handling are necessary for achieving higher customer service. Information enables reducing the gap between actual and benchmark and also assists in strategy formulation – a key activity in logistics.
4. **Packaging:** Packaging protects the goods and acts as a source of information for customers. It is also used as a marketing tool to attract customers. The concept of packaging has paved way to 'Unitization', where various package are handled together as one unit. Example: Palletization.

ROLE OF 3PL AND 4PL

It involves a relationship between a company and logistics service provider which is compared with the basic logistic services, customer operation, a broad range of service activities characterised by a long term orientation which is strategic in nature.

WHY IS OUTSOURCING DONE

1. Avoid labour problems
2. Acquire talents
3. Lack of sales and scales
4. Improved service
5. Focus on core business
6. Increase flexibility
7. Cut cost
8. Avoid capital expenditure

THIRD PARTY LOGISTICS(3PL)

- Third party Logistics Provider (3PL) performs logistics services on behalf of another company. 3PLs provide the management skills along with the physical assets, labor, and systems technology to provide professional logistics services, relieving companies of the responsibility of performing these services themselves. 3PL's typically can provide transportation, warehousing, pool distribution, management consulting, logistics optimization, freight forwarding, transportation management, rate negotiations, cost evaluations, and contract management services.
- 3PL is the function by which the owner of goods outsource various elements of the supply chain to one 3PL company that can perform the management function of the clients inbound freight, customs, warehousing, order fulfillment, distribution, and outbound freight to theclients customers. 3PL is a service provider who gives service for one or more portfolios of services in stand alone or integrated manner with own or leased or contracted assets or services.A 3PL can also be described as a contract logistics service provider who manage inventory/material flow between companies and encompasses all processes and activities such as transportation, warehousing, documentation.

Common 3 PL functions are as follows:

1. Transportation Management

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

2. Warehouse management

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

3. Packaging

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

ADVANTAGES TO COMPANIES BY USING 3PL SERVICES

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

ESSENTIAL CHARACTERISTICS OF A 3 PL

1. Solutions Orientation
2. Logistics Know-how
3. IT Capability
4. Management and organizational Skill
5. Innovativeness
6. Independent and best of breed approach

FOURTH PARTY LOGISTICS

- Information technology plays a key role in logistics and supply chain management. In fact logistics integration, which is a complex exercise, is completely dependent on IT support. Third party logistic suppliers provide logistics solutions to clients on the basis of their domain knowledge they have acquired over the years. 4 PL companies provide

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

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

FEATURES OF A 4 PL

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

THE FOLLOWING ARE THE REQUIREMENTS OF A 4 PL:

1. 3PL cost advantage are one time achieved through the contract process
2. Performance and competency across the logistics network
3. Logistics planning and consulting
4. IT support
5. Operative and administrative logistics functions

6. Customer Relationship Management
7. Linking analytical capabilities with strong implementation and operational capabilities
8. Building a high level of customer confidence in outsourcing and its solutions
9. Offering transparent and flexible win-win contracts

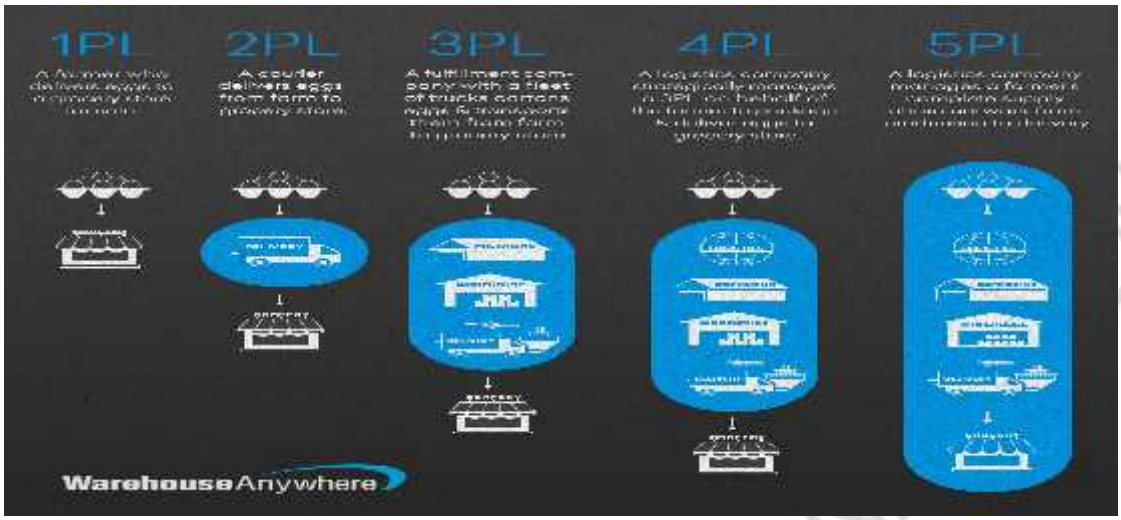
ADVANTAGES TO COMPANIES USING 4PL SERVICES

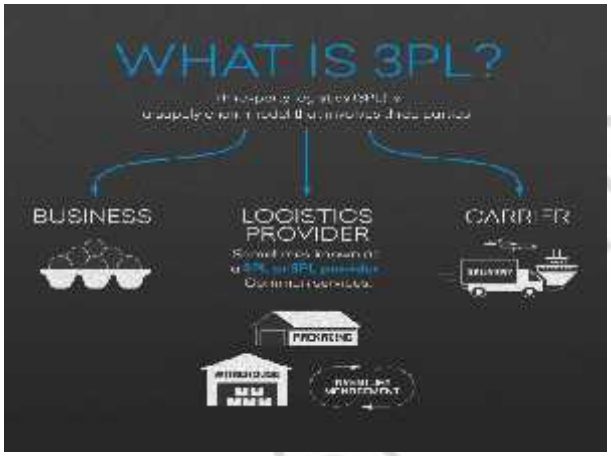
1. Reduced inventory and cycle time.
2. Improved delivery performance.
3. Lower supply chain cost.
4. Improved order fulfillment, capacity utilization.
5. Overall productivity.

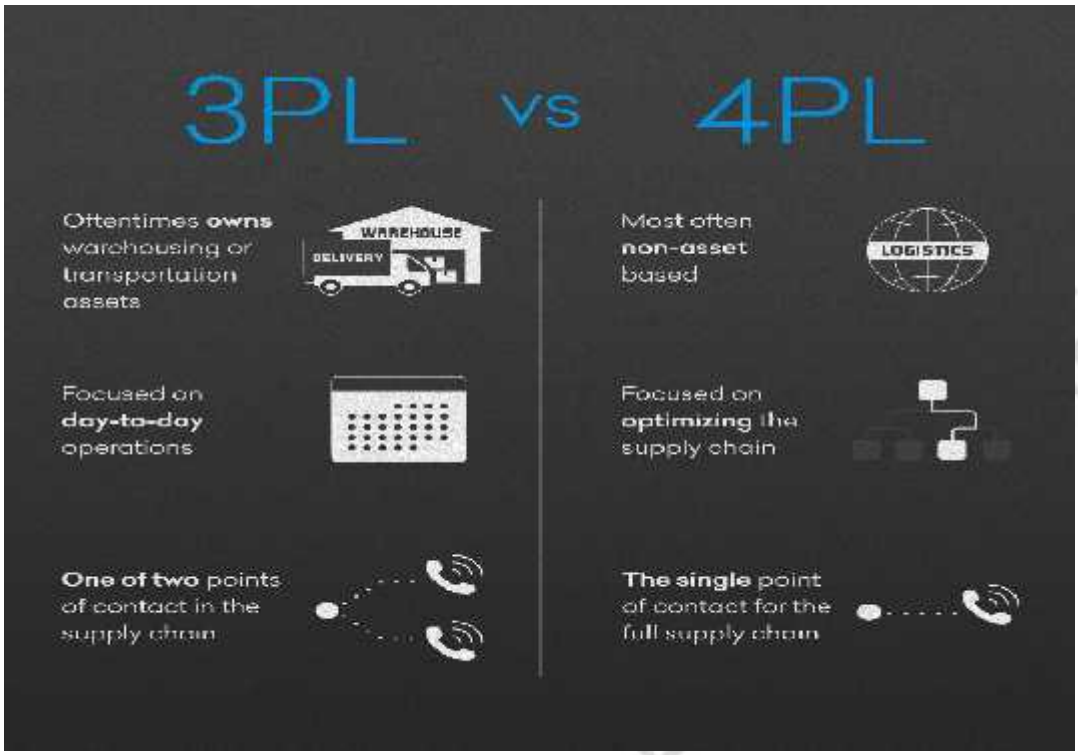
4 PL ATTEMPTS TO DO THE FOLLOWING TO CREATE VALUE BY

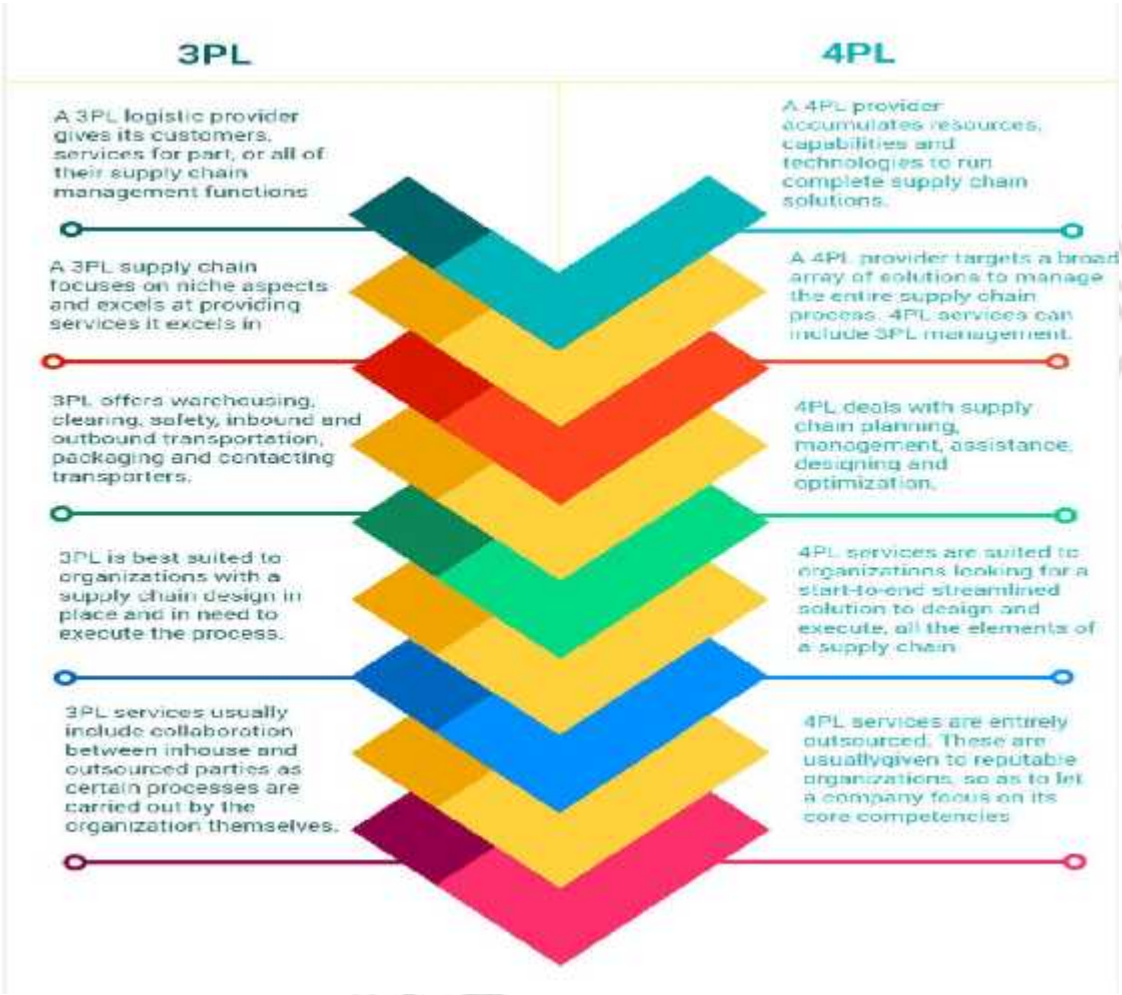
- Reduction of complexity/eliminate redundancy.
- Economics of scale
- Tailor made solutions
- Improved customer service at reduced cost.
- Access to new technology.

DISTINGUISH BETWEEN 3PL AND 4PL









LOGISTICS INFORMATION SYSTEM

Converting data to information, portraying it in a manner useful for decision making, and interfacing the information with decision-assisting methods are considered to be at the heart of an information system. Logistics information systems are a subset of the firm's total information system, and it is directed to the particular problems of logistics decision making. There are three distinct elements that make up this system:

1. the input
2. the database and its associated manipulations
3. the output

PRINCIPLES OF LIS

- **Availability** Logistics information must be readily and consistently available. Information may be regarding order status, inventory status, etc Rapid availability is very important to respond to decisions. Information availability can reduce customer requirements and improve management uncertainties in operations and planning

- **Accuracy** Logistics information must reflect the current status of all the activities like inventory levels, customer orders etc. E.g.: The actual level of inventories should match with the LIS reported inventory levels. However if there is a large difference between the actual inventories and those indicated by the information system inventory levels, buffer stock or safety stock would be required to cover up the uncertainty.

- **Timeliness** The logistics information must be timely to provide quick management feedback. Timeliness is measured in terms of delay that takes place between the commencement and occurrence of an activity and when the activity is actually visible in the logistical information system. E.g.: a company may receive a certain order which a customer desires to be executed urgently. However, the database information system of the company is not fed with the details regarding the urgency of the order for whatever reasons. This will cause delay in the actual execution of the order. This delay indicates ineffectiveness in the planning process. Similar delays can occur when the goods are moved from VVIP to finished goods. All this calls for timely management controls so that corrective actions can be taken to minimize loss. Hence timely information is very necessary to reduce uncertainty.

- **Logistics information system**

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2. the database and its associated manipulations
3. and the output

1.Logistics: The Inputs

The inputs are data items needed for planning and operating logistics system obtained from sources like customers, company records, and published data and company personnel.

2. Logistics: The Database and Its Associated Manipulations

Management of the database involves selection of the data to be stored and retrieved, choice of the methods of analysis and choice of the basic data-processing procedures.

3.Logistics: The Outputs

The outputs of a logistics information system include:

1. summary reports of cost or performance statistics,
2. status reports of inventories or order progress,
3. exception reports that compare desired performance with actual performance, and reports that initiate action.