LOGISTICS IN VALUE CHAIN

ABVM 332 (5 ECTS)

JULY 2012

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LT1: LOGISTICS IN VALUE CHAIN (5ECTS)

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1. General Information

1.1. Introduction

This educational unit is designed to equip students with the concepts and principles of management of Logistics comprising: the combination of information flow, transportation, warehousing, keeping inventory, packaging and the handling of materials.

After successfully completing this educational unit, the students will have the competence to manage, control and transport goods, information, and services starting from the very beginning of the supply chain right through to the very end in order to serve consumers' demand and accomplish the core task of 'Managing logistics in the value chain'.

Women largely participate in the process of value chain at different levels. They play an important role in product handling and quality management and benefit from an improved logistics services in the value chain. The educational unit emphasizes on equipping students with knowledge of well functioning logistics for sustainable value chain development.

1.2. Relation with the curriculum

The learning task enables students to utilize the acquired knowledge and understanding about logistic management, demonstrating management capacity of warehouses, controlling inventories, managing transportation and the role of ICT in logistic management. It helps students acquire the required competencies/ handling, coordination, managerial, and problem solving/. Moreover, it enables students to provide to concerned stakeholders informed profession ideas and advices how to align manage logistics along the value chain.

2. Objectives

At the end of this learning task, learners will be able to:
• Explain the concepts of logistics and logistics management in value chain
• Apply principles of efficient provision of logistics at reduced costs,
• Demonstrate skills in product labeling, packaging, improving inventory, etc.
• Develop positive attitudes towards teamwork, quality product, and consumer demands

3. Learning Task: Logistics in value chain

3.1. Section I: Introduction to Logistics

Definition and concepts of logistics

Pre-test

Please try to define what logistics is?

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_____

_____

What do you think logistics do with the value chain?

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Introduction

Every organization has to move materials. Manufacturers have factories that collect raw materials from suppliers and deliver finished goods to customers; retail shops have deliveries from wholesalers; a television news service collects reports from around the world and delivers them to viewers. When individuals order books from a website, a courier delivers them to their door. These examples indicate that, every time you buy, rent, lease, hire or borrow anything at all, someone has to collect it and deliver it to your door.

Definitions of logistics

There are many different but related definitions given for logistics. Some of them are given below:

Logistics is defined as part of the supply chain process that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements.

Logistics is that part of supply chain management that plans, creates and monitors the efficient, cost-effective flow and storage of goods, semi-finished items and manufactured products as well as related information between the point of origin and the point of consumption in order to meet customers' requirements.

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Logistics refers to the function responsible for all aspects of the storage and movement of materials on their journey from original suppliers through to final customers. Besides, Logistics manages the flow of inputs from suppliers, the movement of materials through different operations within the organization, and the flow of materials out to customers. It is worthwhile to indicate different types of logistics based on the direction of movement of materials for clear understanding. Accordingly, Moving materials into the organization from suppliers is called inbound or inward logistics. While, moving materials out to customers is called outbound or outward logistics. Along with inbound and outbound logistics, moving materials within the organization (i.e. collecting from internal suppliers and delivering to internal customers) is materials management. In other words, materials management controls the movement of materials within an organization. Physical distribution refers to the movement of goods outward from the end of the assembly line to the customer.

Logistics refers to all the move-store activities from the point of raw materials acquisition to the point of final consumption. Its core elements include customer service, order processing, inventory management and transportation.

Logistics is defined as those activities that relate to receiving the right product or service in the right quantity, in the right quality, in the right place, at the right time, delivering to the right customer, and doing this at the right cost (The seven R's).

Logistics is also defined as the planning, organization, and control of all activities in the material flow, from raw material until final consumption and reverse flows of the manufactured product, with the aim of satisfying the customer's and other interest party's needs and wishes i.e., to provide a good customer service, low cost, low tied-up capital and small environmental consequences.

The dictionary definition indicates that logistics refers to the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements.

Logistics consider the wide set of activities dedicated to the transformation and circulation of goods, such as the material supply of production, the core distribution and transport function, wholesale and retail and also the provision of households with consumer goods as well as the related information flows. Activities composing logistics perform two major functions of physical distribution (the derived transport segment) and materials management (the induced transport segment). For the sake of clarity, the two functions of logistics activities are summarized as follows.

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Physical distribution (PD): Refers to the collective term for the range of activities involved in the movement of goods from points of production to final points of sale and consumption. One important requirement of physical distribution is that it must insure that the mobility requirements of supply chains are entirely met. Physical distribution comprises all the functions of movement and handling of goods, particularly transportation services (e.g. trucking, freight rail, air freight, inland waterways, marine shipping, and pipelines), transshipment and warehousing services (e.g. consignment, storage, inventory management), trade, wholesale and, in principle, retail. Conventionally, all these activities are assumed to be derived from materials management demands.

Materials management (MM): Considers all the activities related to the manufacturing of commodities in all their stages of production along a supply chain. Materials management includes production and marketing activities such as production planning; demand forecasting; purchasing and inventory management. One major aspect of materials management to be considered is that it must insure that the requirements of supply chains are met by dealing with a wide array of parts for assembly and raw materials, including packaging (for transport and retailing) and, ultimately, recycling discarded commodities. All these activities are assumed to be inducing physical distribution demands.

Role and importance of logistics

The value (role) of logistics can possibly be explained by:

Creation of time and place utility: Customer services relates to the quality with which the flow of goods and services are managed. Logistics create time and place utility through their ability to deliver the right product to the right customer at the right place, in the right condition and right quantity at the right time, at the right (lowest possible) costs, are one major role of logistics.

Order processing: Logistics are the means by which firms in the logistics processes exchange order information. Order processing involves all the activities in the order cycle, including collecting, checking, entering and transmitting order information. The information collected will provide useful data for market analysis, financial planning, production scheduling and logistics operations.

Inventory management: In this aspect, logistics facilitates proper management of inventory levels that are helpful to serve the demand in a supply chain.

Transportation: Another role of logistics is transportation that is concerned with the ways in which physical items, for example, materials, components and finished products, are

transferred between different parties, for example, raw materials suppliers, distributors, retailers and end customers, in a supply chain.

Above listed roles imply that effective and efficient logistics management is a key to the success of business firms. Otherwise, poor logistics management can result in higher logistics costs. Logistics plays a key role in the economy, and the market volume of logistics has already reached a substantial level in many economies as a result. Companies that are successful worldwide have long recognized the critical role logistics plays in creating added value. In addition, a close focus on the customer is a critical factor for companies working together in a supply chain.

The significance of logistics, in a global comparison, depends largely on the overall economic power of a country. For instance, logistics has been far advanced in the United States, Japan and Europe for a long time. In other words, logistics significance and capabilities depend largely on the economic power and developmental stage of a country. One critical factor, for instance, is the availability of an intact infrastructure. The range of logistics service providers extends from pure transport functions to modern, complex logistics systems, depending on the conditions of a particular country.

Basics of Logistics Integration

As industrial activities extend globally, logistics will involve more material and information flows throughout a supply chain from sources to customers, which extends beyond national borders. In restructuring supply chains, logistics need to be managed as an integrated process that seeks to optimize these flows. If all firms involved in a particular supply chain optimize their logistics systems independently of other firms in that chain, the management of flows across the whole chain is likely to be sub-optimal. To overcome this problem, integrated logistics is advised.

The main role of integrated logistics is to extend functional management to include customers, suppliers and manufacturers. This is because companies can no longer afford to focus on supply-side efficiency alone. Rather, they need to use business strategies to integrate their demand and supply sides for achieving a competitive advantage. This involves the complete set of activities and organizations relevant to production and distribution, as well as their connecting supply links. Decisions made in each area impact others so that it becomes a single, interdependent system.

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Levels of logistics integration

It is worthwhile to indicate the different levels of logistics integration. The two main integrations of industrial logistics are indicated as follows:

The functional logistics integration: This method, mostly, will be used in case of fragmented supply chain with many stakeholders involved. The main roles of functional logistics integration, among others, include helpful for integration of different divisions within the same company responsible for sales and distribution activities; helps companies to gain functional excellence and cost advantages in their global supply chain operations of sourcing, conversion, distribution and after sales service; removes companies' internal barriers and lead them to focus on tactical solutions (e.g. rationalization of non-value-added activities, working capital, inventories, customer services, etc). Furthermore; the functional logistics integration may develop into internal integration where different companies under the same corporate structure combine facilities, equipment, systems and personnel in more flexible modes of deployment.

The market channel or external integration: This is called the most extensive integration among industries. This level of integration requires that enterprises extend their internal supply chain process both upstream with suppliers of raw materials and downstream to final consumers. In this way, all companies in the supply chain are integrating their activities with those of other companies to achieve economies of joint operation. The market channel now becomes a virtual enterprise with common goals, systems, organizations, facilities and shared management. Firms at this level are working in project organization with suppliers and customers, and investments are made jointly. Companies achieving this level of integration have the potential to realize superior levels of performance.

Besides above two methods, some companies have adopted logistics techniques and tools, and incorporated advanced ICT, the emphasis for most is on achieving optimal flows between two consecutive companies in a chain. Many companies are still grappling with the problems of internal integration, with respect to both physical activities and information systems.

Effects of integrated logistics on business practices

The progressive integration of logistics across supply chains has profound effects on business practices. These include the following trends:

- Higher interdependency between firms interlinked within the business network, which has become the new reality of industry. Performance by an individual firm

affects the performance of all, and determines the ultimate performance of the network as a whole.

- A more globalised economy links the sourcing of material and product components with production and markets across national boundaries, invoking problems of time, distance, cultures and diverse market preferences. It intensifies competition and increases the complexity of supply by expanding product variety, searching for higher efficiency while responding to diverse and rapidly changing markets.

- Changing the concept of corporate enterprise. Organizations have shed peripheral activities to concentrate on core competencies that offer the promise of unique value. Greater external dependence therefore forces attention to inter-organizational relationships for coordinating activities and processes. In some cases, the shift towards core business has led to the creation of "virtual" organizations, where the majority of business operations have been outsourced to external parties, including third and fourth party logistics.

- Transformation of organizational structure of the corporation from a hierarchy, in which the manager dispenses knowledge and workers perform, to the point where knowledge is widely diffused throughout the organization and workers manage their own activities. This places collaborative decisions closer to the point of action. In a logistics framework, it places a premium on inter-organizational relationships through formal and informal contact, as well as on data and information systems across organizational boundaries.

- Changing the government environment, creating both problems and opportunities. Much of the economic regulation of transport and telecommunications has been liberated, leading to new market-based combinations of service providers who offer transport combined with warehousing, telecommunications, product assembly and related services. Other forms of regulations to cover consumer protection, environment and safety are replacing the former economic restraints.

Learning activity

Field visit: Please assess a certain farm product market and identify what logistics services it had and requires.

Continuous assessment

Quiz, presentation

Summary

Logistics refers to the function responsible for all aspects of the storage and movement of materials on their journey from original suppliers through to final customers. Physical distribution and materials management are the two major functions of logistics activities. Furthermore; the value (role) of logistics can possible is explained by creation of time and place utility; order processing; inventory management and transportation.

3.2 Section II: Warehouse and Inventory

Pre-test

Dear learner, what is the difference between warehouse and warehousing?

_____
_____
_____

Can you list some Functions of warehouse?

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_____
_____

3.2.1 Introduction to warehouse and warehousing

People need different types of goods in their day-to-day life. They may buy some of these items in bulk and store them in their house. Similarly, businessmen also need a variety of goods for their use. Some of them may not be available all the time. But, they need those items throughout the year without any break. Let's consider one example, case of sugar factory. This factory needs sugarcane as raw material for production of sugar. As it is known, sugarcane is produced during a particular period of the year. Since sugar production takes place throughout the year, there is a need to supply sugarcane continuously. But how is it possible? Here storage of sugarcane in sufficient quantity is required. Again, after production of sugar it requires some time for sale or distribution. Thus, the need for storage arises both for raw material as well as finished products. Storage involves proper arrangement for preserving goods from the time of their production or purchase till their actual use. When this storage is done on a large scale and in a specified manner it is called 'warehousing'. The

place where goods are kept is called 'warehouse'. The person in-charge of warehouse is called warehouse-keeper.

Warehousing refers to the activities involving storage of goods on a large-scale in a systematic and orderly manner and making them available conveniently when needed. In other words, warehousing means holding or preserving goods in huge quantities from the time of their purchase or production till their actual use or sale. Warehousing is considered as one of the important auxiliaries to trade. This is mainly because it creates time utility by bridging the time gap between production and consumption of goods.

Despite above indicated roles, warehousing is costly in terms of human resources and the facilities and equipments required. This implies that developing a proper warehousing is not a simple task. For instance, inadequate design or managing of warehouse systems will jeopardize the achievement of required customer service levels and the maintenance of stock integrity, and result in unnecessarily high costs. Furthermore, warehousing performance will directly affect the overall supply chain performance. Because, warehousing is an important element of activity in the distribution of goods from raw materials, and work in progress through, to finished products across the supply chain.

Warehousing is also an integral part to the supply chain network within which it operates and as such its roles and objectives should synchronize with the objectives of the supply chain. It is not a 'Stand-alone' element of activity and it must not be a weak link in the whole supply chain network. Along with this, the pressure on supply chain due to increasing customers service levels; inventory optimization need; time compression and cost minimization have inevitably changed the structure of supply chains as well as the location and working warehouses within the supply chain network.

A simple definition of a warehouse indicates that it is a planned space for the storage and handling of goods and materials. In general, warehouses are focal points for product and information flow between sources of supply and beneficiaries. In other words, warehouse indicates performance of administrative and physical functions associated with storage of goods and materials. It is also a commercial building for storage of goods.

As far as the objective of warehouses is concerned, maximum utilization of storage space; higher labor productivity; maximum asset utilization**;** reduction in material handling**;** reduction in operating cost; increased inventory turnover and reduced order filling time are the main one.

Warehousing alternatives: There are three types of warehousing ownership. These are called private warehouses, public warehouses and contract warehouses. These warehouse alternatives, with their characteristic features, are illustrated in following paragraphs.

The private warehouses: Refers to those owned or leased by the product owner. The main features include that ownership is not the criterion; control is fully on the hand of the product owner; the product owner exercises overall control on warehouse management. Furthermore; changes can be made to integrate the warehouse with rest of the logistical system. The private warehouses also provide market presence to the product owner and are considered to be cheaper as there is no profit to be added to the cost.

The public warehouses: This type of warehouses is that available to companies on hire. Public warehouses are characterized by overhead costs distributed over large customer base (i.e. makes the usage cheaper); offer expertise in management since warehousing is their core business; flexibility of location (i.e. if the product owner needs to change the location of warehouse, it is only a question of terminating the contract and starting a new one); significant economies of scale; several users and resultant volume and benefits in transportation costs. Moreover; public warehouses are classified into five categories of general merchandise, Refrigerated, Special commodity, Bonded and Household goods and furniture.

Contract warehouses: In this case, contract warehouse operators take over logistics responsibility from manufacturing company. The contract warehouses have features of warehouse owner offers long term relationship and customized service; product owner gets the benefit of management expertise of the warehouse owner; and as the warehouse owner centrally controls several warehouses, product owners get the benefit of shared resources with several clients. This brings down the cost.

Warehouse operation and management

The main warehousing operations comprises of receiving goods and accepting responsibility; identifying goods using place, label, color code and etc; sorting out the received goods for appropriate storage area; dispatching goods to storage for ease of accessibility; holding goods for security against pilferage and deterioration; selecting, retrieving, packing and grouping items according to customers order for dispatch; marshaling goods(i.e. check whether the items of a single order are complete and order records are updated); dispatching goods using the proper transport and preparing records and advices- of stocks and replenishment requirements.

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Warehouse management deals with receipt, storage and movement of goods, normally finished goods, to intermediate storage locations or to final customer. In the multi-echelon model for distribution, there are levels of warehouses, starting with the central warehouse(s), regional warehouses services by the central warehouses and retail warehouses at the third level services by the regional warehouses and so on. The objective of warehouse management is to help in optimal cost of timely order fulfillment by managing the resources economically. Warehouse management is equivalent to management of storage of products and services rendered on the products within the four wall of a warehouse.

Warehouse management is also helpful to manage goods and space more effectively, to reduce costs and waste, and to gain control over warehouse operations. Moreover, with access to real-time and accurate inventory data, warehouse professionals can possibly save time in locating items or performing physical inventories. Similarly, sales representatives can keep tabs on stock availability, and buyers can maintain optimum stock levels while minimizing carrying costs. In other words, tracing items by lot or serial numbers helps to quickly identify from where the items were purchased, how they were used in the production processes, and where they were sold.

A key part of supply chain that primarily aims to control the movement and storage of materials within a warehouse and the associated transactions, including shipping, receiving, put away and picking, is called warehouse management system. The warehouse management system is also helpful to direct and to optimize stock put away based on real time information about the status of bin utilization. To efficiently monitor flow of products, the warehouse management systems often utilize Auto ID Data Capture (AIDC) technology, such as barcode scanners, mobile computers, wireless LANs and potentially Radio-frequency identification (RFID).Once the data has been collected, there is either batch synchronization with, or a real-time wireless transmission to a central database. The database can then provide useful reports about the status of goods in the warehouse.

To provide a set of computerized procedures to handle the receipt of stock and returns into a warehouse facility; to model and manage the logical representation of the physical storage facilities (e.g. racking etc); to manage the stock within the facility and to enable a seamless link to order processing and logistics management in order to pick, pack and ship product out of the facility are among the major objectives of a warehouse management system.

Economic benefits of warehouses: There are five main economic benefits of warehouses. These are movement consolidation, break-bulk, cross-dock, processing (postponement) and stock pilling. To clearly understand these economic benefits, it is important to define them.

The movement consolidation benefit indicates that warehouses reduce transportation cost by consolidating movement. This will be realized through the mechanism that several plants supply their products for the same customer to a warehouse and from this warehouse the products are sent in bulk shipment to the customer. The process of movement consolidation can possibly be shown in Figure 1.

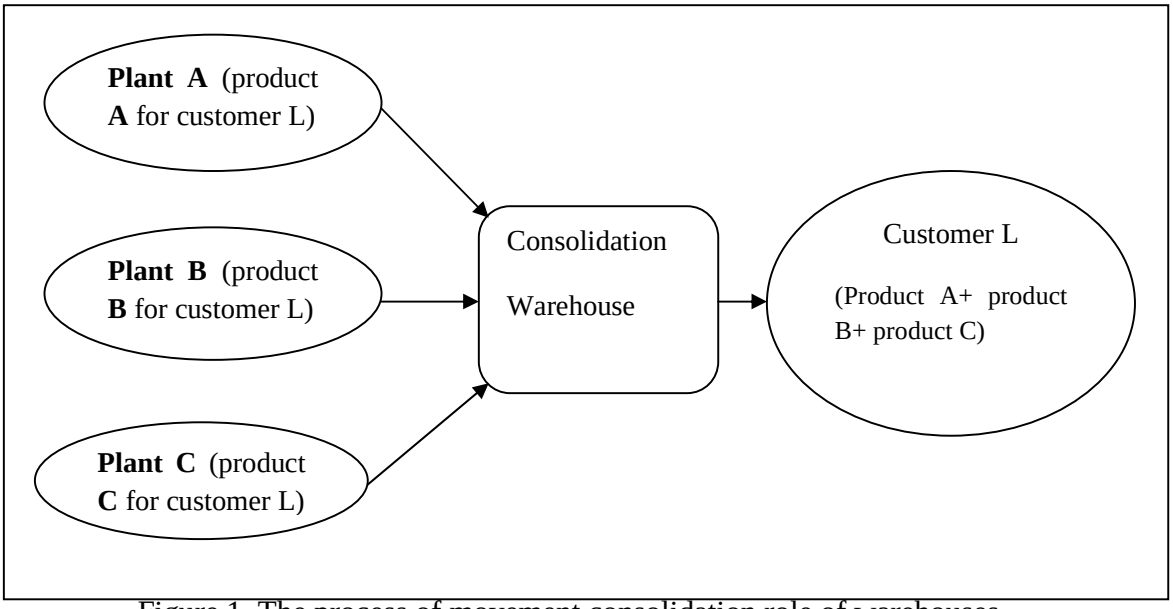

Figure 1. The process of movement consolidation role of warehouses

The break-bulk benefit of warehouses implies that goods from a plant for various customers are shipped to a warehouse obtaining the benefit of bulk shipment and then sent to the customers. This is shown in Figure 2.

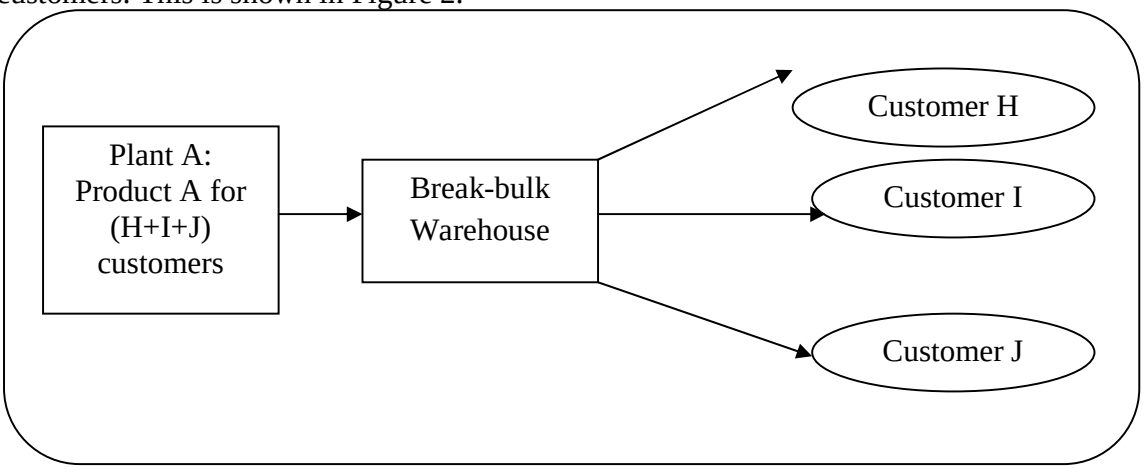

Figure 2. The break-bulk warehouse mechanism

The cross-dock benefit of warehouses indicates that several plants send their goods to the warehouse and from the warehouse the goods are moved across the dock to various customers as per order. A chain of retailers would like items as per movement of their stocks. The cross-dock warehouses benefit is shown in Figure 3.

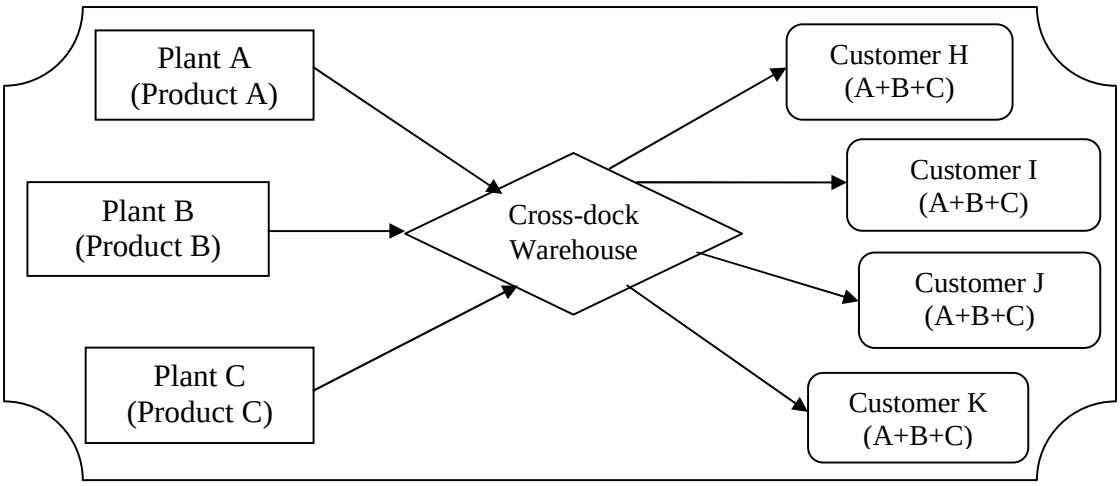

Figure 3. The cross-dock warehouse mechanism

The processing/postponement benefit of warehouses implies that products uncommitted to a customer are sent to the warehouse and as per their order labels, they are attached to the products. Process of committing the product is postponed until just in-time.

The stock piling benefit of warehouses indicates that, agricultural products which are produced during harvest are sold round the year and hence they need stocking. For example, woolen garments are sold during winter but produced earlier.

Service benefits of warehouses: Like economic benefits, warehouses mainly have five service benefits. These are spot stocking, assortment, mixing, and production support and market presence. Each of them is shortly defined below.

The spot stocking refers to a process of stocking products in strategically located warehouses during demand sensitive period. For instance, agricultural implements are spot stocked during the growing season. This is one service benefit of warehouses.
The assortment service benefit of warehouses implies that a wholesaler would like to stock assortment of items from different manufacturers so that his/her customers and/or retailers can choose what they want. The wholesalers can stock assortments based on customer's requirement.

The mixing service benefit of warehouses indicates that, in the warehouse, products from various plants are received and combinations are prepared as per the order and sent to customers. For ease of understanding, the mixing role of warehouses is shown in Figure 4.

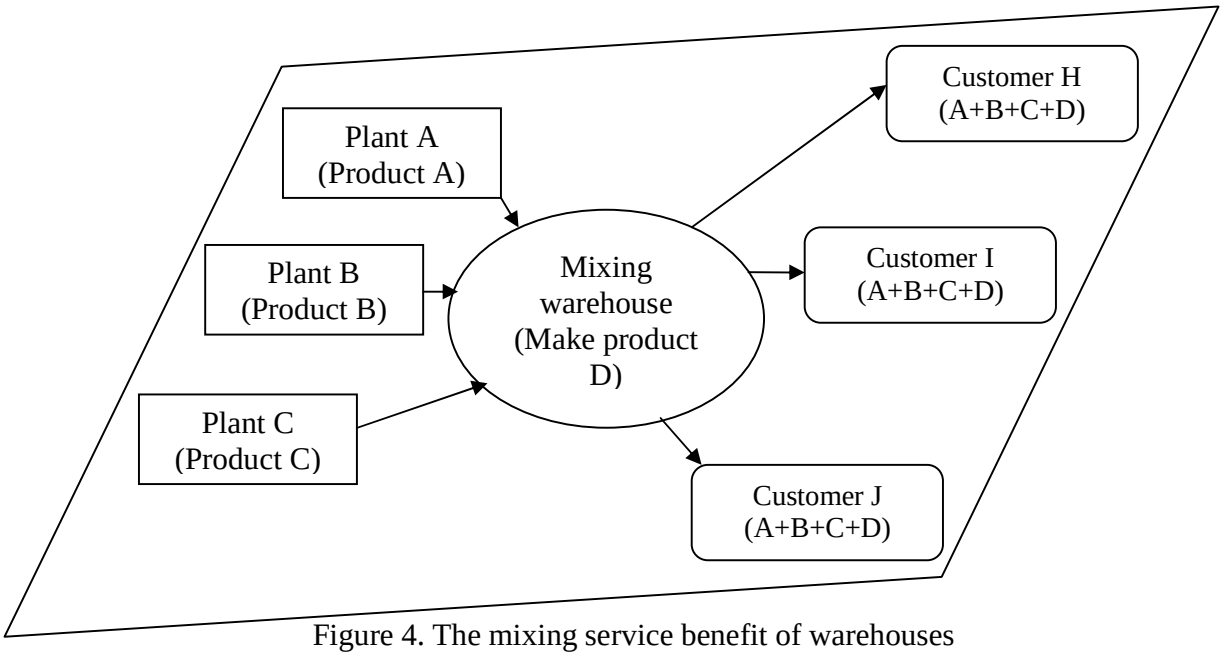

Figure 4. The mixing service benefit of warehouses

The production support service benefit of warehouses implies that components and subassemblies required by several assembly lines are stocked economically in a common warehouse and supplied to lines. This process is indicated in Figure 5.

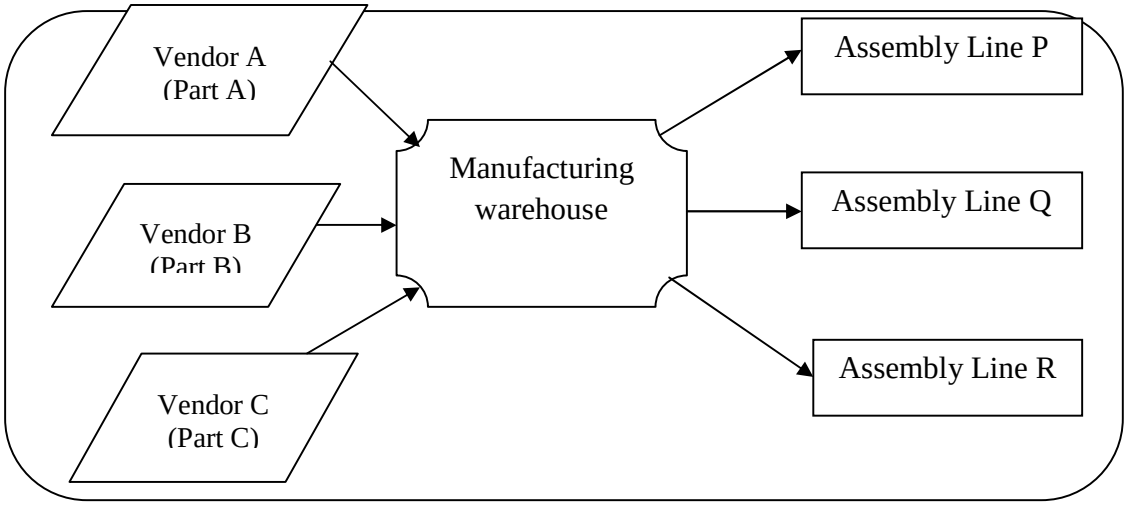

Figure 5. The production support function of warehouses

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The Market presence service benefit of warehouses implies that warehouses offer quick response to customer demand.

Inventory management and control

Before going into detail of inventory management and control, it is important to know what inventory means. Accordingly, inventory is a stock or store of goods. It also includes raw materials or stock incoming suppliers. As far as the questions of what to inventory are concerned, raw materials and purchased parts; partially completed goods; finished goods inventories or merchandise; replacement parts, tools and suppliers and goods in transit to warehouses or goods in progress can be considered.

There are two types of demand for inventory items. These are dependent demand and independent demand. The dependent demand refers to those items that are typically subassemblies or component parts that will be used in the production of a final or finished product. Subassemblies and component a part is derived from the number of finished units that will be produced. Example: Demand for wheels for new cars. While the independent demand refers to inventory items that are the finished goods or other end items. These items are sold or at least shipped out rather than used in making another product.

Another important point to be considered in this section is that of functions of inventory. This is helpful to answer the question ‘why inventory is needed? Among other, the following are assumed to be the main functions of inventories:

- **To meet anticipated customers demand:** These inventories are referred to as anticipation stocks because they are held to satisfy planned or expected demand.

- **To smooth production requirements:** Firms that experience seasonal patterns in demand often build up inventories during off-season to meet overly high requirements during certain seasonal periods. Companies that process fresh fruits and vegetable deal with seasonal inventories.

- **To decouple operations**: The buffers permit other operations to continue temporarily while the problem is resolved. Firms have used buffers of raw materials to insulate production from disruptions in deliveries from suppliers, and finished goods inventory to buffer sales operations from manufacturing disruptions.

- **To protect against stock-outs**: Delayed deliveries and unexpected increases in demand increase the risk of shortages. The risk of shortages can be reduced by holding safety stocks, which are stocks in excess of anticipated demand.
- **To take advantage of order cycles:** Inventory storage enables a firm to buy and produce in economic lot sizes without having to try to match purchases or production with demand requirements in short run.

- **To hedge against price increase:** The ability to store extra goods also allows a firm to take advantage of price discounts for large orders. And,

- **To permit operations:** Production operations take a certain amount of time means that there will generally be some work-in-process inventory.

The functions of inventory imply that, inadequate control of inventories can possibly result two main adverse effects. First, under stocking results in missed deliveries, lost sales, dissatisfied customers and production bottlenecks. Second, overstocking unnecessarily ties up funds that might be more productive. These highlights a need for due attention to inventory management and control by the business owners or managers. The major aspects of inventory management and control are discussed in below.

There are, principally, two main concerns in inventory management. These are level of customer's service (i.e. to have the right goods, in sufficient quantities, in the right place and at the right time) and cost of ordering and carrying inventories. These two issues are considered to be main focus areas due to their higher link with the objectives of inventory management. To achieve satisfactory levels of customer service while keeping inventory costs within reasonable bounds are the two essential objectives of inventory management. To realize these objectives, specifically, decision makers try to achieve a balance in stocking and fundamental decision must be made related to the timing and size of orders.

The success of effectively managing inventories depends on several requirements on the sides of management bodies of business enterprises. These mainly incorporate: A system to keep track of the inventory on the hand on order (inventory counting system); a reliable forecast of demand that includes an indication of possible forecast error; knowledge of lead times and lead time variability; reasonable estimates of inventory holding costs, ordering costs, and shortage costs; and a classification system for inventory items. These pre-conditions are shortly explained as follows.

Inventory counting systems: There are four major types of inventory counting systems for effective inventory management and control. These are the periodic system, the perpetual (continual) system, the two-bin system and the tracking (Universal Product Code) system.

The periodic inventory counting system: Refers to the physical count of inventory items made at periodic intervals (e.g. weekly, monthly, quarterly etc) in order to decide how much to order for each item. Major users of this counting system are supermarkets, discounts stores and department stores. This inventory counting system has its own advantage and disadvantages. Accordingly, making orders for many items at the same time results in economies of scale in processing and shipping orders. This is considered as the advantage of periodic inventory counting system. In contrast, lack of control between reviews; the need to protect against shortages between review periods by carrying extra stock and the need to make a decision on order quantities at each review are among the disadvantages of this system.

The perpetual (continual) inventory counting system: This system keeps track of removals from inventory on a continuous basis to provide information on the current level of inventory for each item. The main advantages of this inventory counting system constitute the control provided by the continuous monitoring of inventory withdrawals and the fixed-order quantity, helpful to identify an economic order size by the management. Whereas, the added cost of record keeping continuously is indicated as main drawback of this system.

The two-bin method inventory counting system: This system of inventory counting works with principle of assuming two containers of inventory, reorder when the first container is empty. The advantage of this system is that there is no need to record each withdrawal from inventory. While, the disadvantage is that the reorder card may not be turned in for a variety of reasons.

The tracking (Universal Product Code) system: The Universal Product Code printed on a label that has information about the item to which it is attached. This bar coding system represents an important development for other sectors of business besides retailing. For instance, in manufacturing, bar codes attached to parts, subassemblies, and finished goods greatly facilitate counting and monitoring activities.

Demands forecast and lead time information: As far as the demand forecast and lead time information pre-conditions for effective inventory management is concerned, managers need to know the extent to which demand and lead time might vary. The greater the potential variability, the greater the need for additional stock to reduce the risk of a shortage between deliveries. Lead time refers to the time interval between ordering and receiving the order.

Estimates and types of inventory costs: There are three major types of inventory costs. These are holding (carrying) cost, ordering cost and storage cost.

Holding (carrying) cost: Represents the cost incurred to carry an item in inventory for a length of time, usually a year. This cost includes interest, insurance, taxes, depreciation, obsolescence, deterioration, spoilage, pilferage, breakage, etc.

Ordering cost: This is a cost incurred for ordering and receiving inventory. These include determining how much is needed, preparing invoices, inspecting goods upon arrival for quality and quantity, and moving the goods to temporary storage.

Storage cost: This is a cost incurred when demand exceeds the supply of inventory on hand. These costs can include the opportunity cost of not making a sale, loss of customer goodwill, late charges, and similar costs.

Classification system for inventory items: An important aspect of inventory management is that items held in inventory are not of equal importance in terms of money invested, profit potential, sales or usage volume, or stock-out penalties. Hence, it would be unrealistic to devote equal attention to each of these items. For this, there are two approaches used by inventory managers. These are called the A-B-C approach and the Economic Order Quantity (EOQ) model.

The A-B-C approach: This approach classifies inventory items according to some measure of importance, usually annual money usage, and then allocates control efforts accordingly. Hence, A-represents very important inventory items; B-represents moderately important inventory items while C-represents least important inventory items.

The Economic Order Quantity (EOQ) model: This model identifies the optimal order quantity size in terms of minimizing the sum of certain annual costs that vary with order size. In other words, EOQ model is targeted at order size that minimizes total cost. The EOQ model works taking into account the following assumption. The first one is that only one product is involved; second annual demand requirements are known; third demand is spread evenly throughout the year so that the demand rate is reasonably constant; fourth lead time does not vary; fifth each order is received in a single delivery and finally there are quantity discounts. Furthermore; the optimal quantity, that minimizes the sum of annual total cost (carrying plus ordering cost), will be obtained by applying the following formula.

$$EOQ = \sqrt{\frac{2DS}{H}}$$

Where EOQ-represents the optimal quantity
D-Annual demand
S- Ordering cost
H- Holding (carrying) cost per unit

IT in warehousing and distribution

Information technology really began to explode. This gave organizations the ability to better monitor transaction intensive activities such as the ordering, movement, and storage of goods and materials. Combined with the availability of computerized quantitative models, this information increased the ability to manage flows and to optimize inventory levels and movements. Systems such as materials requirements planning, distribution resource planning, and just-in-time (JIT) allow organizations to link many materials management activities, from order processing to inventory management, ordering from the supplier, forecasting and productions scheduling. Other factors contributing to the growing interest in logistics include advances in information systems technology, an increased emphasis on customer service, growing recognition of the systems approach and total cost concept, the profit leverage from logistics, and the realization that logistics can be used as a strategic weapon in competing in the marketplace.

Outsourcing and tender process

It is worthwhile to define what outsourcing and tender mean before going into detail of outsourcing and tender process. Accordingly, outsourcing is a process of utilizing a third-party provider to perform services previously performed in-house. Examples include manufacturing of products and call center/customer support. Whereas, tender refers to the document which describes a business transaction to be performed.

Outsourcing: There are many reasons why enterprises choose to outsource business functions. These include permitting concentration on core business activity; to reduce overhead costs; to utilize leading-edge technology and/or specialist skills.

Outsourcing involves some processes starting from getting an advice on tendering and the tender process; preparation of tender documentation; reviewing and advising on tender documentation, prime contractors or sub-contractors; Negotiation, preparation and completion of contractual documentation including service level agreements; liability and insurance; changing control processes; advice on staff transfers and other employment considerations; and exit management.

Logistics in value chain

Tender process: are sought for the supply of legal services. The primary objective of tender process is to establish a panel of legal practitioners to provide legal advice and representation to persons. Such advice and representation, in most cases, will be provided in conjunction with lawyers employed by the legal representation office. The legal practitioners are to provide legal services of a high quality in an efficient and cost effective manner. Besides, the tender document is expected to include the following elements:

The cover sheet: This section provides details of the tender name and number, name of the company and reference number.

Covering letter: In this section, detail of the submission of specific tender (name and number), thanking the company for being given the opportunity to tender for the project or work are expected to be indicated clearly.

Scope of offer or executive summary: This section of the tender document includes the summary of the proposal to be submitted addressing the key points from the call for tender document. Besides, it is important to highlight the key issues in the executive summary.

Tender returns: This section refers to the specific documents which went out with the call for tender from the company and must be acknowledged by the bidder. Up on completion, these documents must be returned to the company along with the rest of the bid.

Commercial terms and conditions: Generally this is the financial elements of the bid. Besides, in this section, there is a need to present the financial statements and guarantees along with the commit to complying with the company's requirement. The commercial terms and conditions mainly incorporate history of tenderer, the structure of the company, statement of compliance, details of the parties involved, timing, testing and defects, payment, penalty clauses, liabilities, termination and options clause.

Technical requirements: While the previous elements of the tender document deals with the commercial aspects of the project or bid, the technical requirements pertain more to the actual operation or system i.e. the physical doing part of the bid. Main components under the technical requirements include statement of compliance with the generic or equipment specifications, description of products, support policy, testing, training, module repair, delivery, evaluation and product brochures.

Learning activity

- Learners are expected to identify the main functions and management of warehouses along with the role of IT in warehouse and distribution of products.

Continuous assessment

Quiz, case study, assignments and presentation

Summary

Warehousing refers to the activities involving storage of goods on a large-scale in a systematic and orderly manner and making them available conveniently when needed. Warehouse is defined as a planned space for the storage and handling of goods and materials. Maximum utilization of storage space; higher labor productivity; maximum asset utilization**;** reduction in material handling**;** reduction in operating cost; increased inventory turnover and reduced order filling time are among objectives of warehouses. The three types of warehouse ownership are private warehouse, public warehouses and contract warehouses. There are two types of demand for inventory items. These are dependent demand and independent demand. The dependent demand refers to those items that are typically subassemblies or component parts that will be used in the production of a final or finished product. While the independent demand refers to inventory items that are the finished goods or other end items.

3.3 Section III: Transportation Management

3.3.1 Introduction

The third section is concerned with the different modes of transport, role of transportation on logistics management, transport and network management as well as the impact of gender on transport. In the Ethiopian situation the human-powered and animal-powered transport is still in existence for carrying goods and people to and from the market, farming or other areas. But, today's agriculture produced items demands other effective modes of transport in the value chain systems. This section however, will enable students to acquire knowledge about efficient and low cost transportation and manage the transportation network in the value chain system.

Pre-test

Logistics in value chain

Dear learner, what do you think is transportation and its basic components in agribusiness? (Please take 5 minutes to define transport/transportation in the following space.)

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Transport or **transportation**

Transportation is the movement of people, animals and goods from one location to another. In this context then, transportation is one of key elements in the logistic value chains as it moves agricultural products from producers to consumers. It is one of the most important factors in improving agricultural productivity as it creates market and facilitates interactions among economic and geographically diverse regions of the country as well as with the outside world. There are different modes of transport which includes: air, rail, road, water, cable, pipeline, and space. Infrastructure has also a great role to play in transportation systems.

Infrastructure

Infrastructure is the fixed installations that allow vehicles (E.g., automobiles motorcycles, aircrafts etc) to become fully operational. It consists of both terminal and facilities for parking and maintenance. For the road, rail, pipeline, and cable transport, the entire way the vehicle travels must be built up. Air and water craft, which are the 'airway' and 'seaway' do not need to be built up but they require fixed infrastructure at terminals.

The financing of infrastructure can either be public or private. Transport is often a natural monopoly and a necessity for the public roads, and in some countries railways and airports are funded through taxation. New infrastructure projects can involve large spending, and are often financed through debt. Many infrastructure owners therefore impose usage fees, such as landing fees at airports, or toll plazas on roads. Independent of this, authorities may impose taxes on the purchase or use of vehicles.

Transportation Modes: An Overview

Dear learner, what do you know about types of transportation modes? (Please take 5 minutes to give your answer on the space given below):

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Transport modes are the means by which people and freight achieve mobility. They fall into one of three basic types depending on over what surface they travel such as: land (road, rail and pipelines), water (shipping), and air (aircraft). Each mode is characterized by a set of technical, operational and commercial characteristics. These modes have their own advantages and disadvantages, chosen for mobility on the basis of cost, capability, route, safety, comfort and speed. The modes of transport in agribusiness include:

Road:-

Dear learner, as you can imagine, a road is an important route, or path between two or more places. The common users of road include: buses, trucks, motorcycles, bicycles and pedestrians. Road transport systems have high maintenance costs, both for the vehicles and infrastructures. They are mainly linked to light industries where rapid movements of freight in small batches are the norm. Yet, with containerization, road transportation has become a crucial link in freight distribution. Generally, road transports offer high flexibility and with low capacity, but are deemed with high energy and area use. Road investment usually reduces transport costs of agricultural products, but sometimes costs cannot be based only on transport costs.

Air:- A **fixed-wing aircraft**, the airplane mostly operational for long distances, notably for financial income from passengers, tourism, and transporting agricultural products especially perishable items to markets or end users. More recently, air transportation has been accommodating growing quantities of high value freight and is playing a growing role in global agribusiness logistics.

Rail: - this mode of transport is where a **train** runs along a set of two parallel **steel rails**, known as a railway or railroad. Railed vehicles move with much less friction than rubber tires on paved roads, making trains more **energy efficient**, though not as efficient as ships. Heavy industries especially in the developed nations are linked with rail transport systems, although containerization has improved the flexibility of rail transportation by linking it with road and maritime modes. Rail is by far the land transportation mode offering the highest capacity.

Water:- Water transport is the process of transport watercraft, such as a **barge**, **boat**, **ship** or **sailboat**, makes over a body of water, such as a **sea**, **ocean**, **lake**, **canal** or **river**. Because of the physical properties of water conferring buoyancy and limited friction, maritime transportation is the most effective mode to move large quantities of cargo over long distances. However, due to the location of economic activities **maritime circulation** takes

place on specific parts of the maritime space. Maritime transportation has high terminal costs, since port infrastructures are among the most expensive to build, maintain and improve. High inventory costs also characterize maritime transportation. More than any other mode, maritime transportation is linked to heavy industries, such as steel and petrochemical facilities adjacent to port sites. Although slow, modern sea transport is a highly efficient method of transporting large quantities of goods especially for non-perishable agricultural products. Transport by water is significantly less costly than air transport for transcontinental shipping.

Other modes:- Pipeline transport sends goods through a pipe, most commonly liquid and gases are sent, but pneumatic tubes can also send solid capsules using compressed air. For liquid/gases, any chemically stable liquid or gas can be sent through a pipeline. Short-distance systems exist for sewage, slurry, water and beer, while long-distance networks are used for petroleum and natural gas. Cable transport is a broad mode where vehicles are pulled by cables instead of an internal power source. Spaceflight is a transport out of earth's atmosphere into outer space by means of a spacecraft. Electronic Data Interchange (EDI) is an evolving technology that is helping companies and government agencies (customs documentation) cope with an increasingly complex global transport system.

Containerization

The container permits easy handling in the transport mode systems. A container is a large standard size metal box into which cargo is packed for shipment abroad, especially configured transport modes. It is designed to be moved with common handling equipment enabling high-speed intermodal transfers in economically large units between ships, railcars, truck chassis, and barges using a minimum of labor. The container, therefore, serves as the load unit rather than the cargo contained therein, making it the foremost expression of intermodal transportation. The usage of containers shows the complementarities between freight transportation modes by offering a higher fluidity to movements and a standardization of loads. Thus, the relevance of containers is not what they are - simple boxes - but what they perform, intermodalism. The reference size is the 20 foot box, 20 feet long, 8'6" feet high and 8 feet wide, or 1 Twenty-foot Equivalent Unit (TEU). Since the great majority of containers are now forty foot long, the term Forty-foot Equivalent Unit (FEU) is also used, but less commonly.

Intermodalism originated in maritime transportation, with the development of the container in the late 1960's and has since spread to integrate other modes. It is not surprising that the maritime sector should have been the first mode to pursue containerization. It was the mode most constrained by the time taken to load and unload the vessels. A conventional break bulk cargo ship could spend as much time in a port as it did at sea. Containerization permits the

mechanized handling of cargoes of diverse types and dimensions that are placed into boxes of standard sizes. In this way goods that might have taken days to be loaded or unloaded from a ship can now be handled in a matter of minutes.

Development of intermodal transportation and containerization are mutually inclusive, self strengthening and rely of a set of driving forces linked with technology, infrastructures and management. One of the initial issues concerned the different sizes and dimensions of containers used by shipping lines, were a source of much confusion in compiling container shipping statistics. The diffusion and adaptation of transport modes to containerization is an ongoing process which will eventually reach a level of saturation. Containers have thus become the most important component for rail and maritime intermodal transportation. The challenge remains about the choice of modes in an intermodal transport chain as well as minimizing the costs and delays related to moving containers between modes.

Advantages and Challenges

Among the numerous advantages related to the success of containers in international and hinterland transport, it is possible to note the following:

Standard transport product. A container can be manipulated anywhere in the world as its dimensions are an ISO standard. Indeed, transfer infrastructures allow all elements (vehicles) of a transport chain to handle it with relative ease. Standardization is a prevalent benefit of containerization as it conveys a ubiquity to access the distribution system and reduces the risks of capital investment in modes and terminals. It necessitated the construction of specialized ships and of lifting equipment, but in several instances existing transport modes can be converted to container transportation.

Flexibility of usage. It can transport a wide variety of goods ranging from raw materials (coal, wheat), manufactured goods, and cars to frozen products. There are specialized containers for transporting liquids (oil and chemical products) and perishable food items in refrigerated containers (called "reefers" which now account for 50% of all refrigerated cargo being transported). In some developing countries, discarded containers are often used as storage, housing, office and retail structures.

Management. The container, as an indivisible unit, carries a unique identification number and a size type code enabling transport management not in terms of loads, but in terms of unit. This identification number is also used to insure that it is carried by an authorized agent of the cargo owner and is verified at terminal gates. Computerized management enables to reduce waiting times considerably and to know the location of containers (or batches of containers) at any time. It enables to assign containers according to the priority, the destination and the available transport capacities. Transport companies book slots in

maritime or railway convoys that they use to distribute containers under their responsibility. As such, the container has become a production, transport and distribution unit.

Economies of scale. Relatively to bulk, container transportation reduces transport costs considerably, about 20 times less. While before containerization maritime transport costs could account between 5 and 10% of the retail price, this share has been reduced to about 1.5%, depending on the goods being transported. The main factors behind costs reductions reside in the speed and flexibility incurred by containerization. Similar to other transportation modes, container shipping is benefiting from economies of scale with the usage of larger containerships.

Speed. Transshipment operations are minimal and rapid, which increase the utilization level of the modal assets. A modern containership has a monthly capacity of 3 to 6 times more than a conventional cargo ship. This is notably attributable to gains in transshipment time as a crane can handle roughly 30 movements (loading or unloading) per hour. Port turnaround times have thus been reduced from 3 weeks to less than 24 hours since it is uncommon for a ship to be fully loaded or unloaded along pendulum routes. It takes on average between 10 and 20 hours to unload 1,000 TEUs compared to between 70 and 100 hours for a similar quantity of bulk freight.

Warehousing. The container limits damage risks for the goods it carries because it is resistant to shocks and weather conditions. The packaging of goods in contains is therefore simpler, less expensive and can occupy less volume. Besides, containers fit together permitting stacking on ships, trains (double stacking) and on the ground. It is possible to superimpose three loaded and six empty containers on the ground. The container is consequently its own warehouse.

Security. The contents of the container are anonymous to outsiders as it can only be opened at the origin, at customs and at the destination. Thefts, especially those of valuable commodities, are therefore considerably reduced. This was a serious issue at ports before containerization as longshoremen had ready access to cargo.

In spite of numerous advantages in the usage of containers, some challenges are also evident:
Site constraints. Containerization implies a large consumption of terminal space. A containership of 5,000 TEU requires a minimum of 12 hectares of unloading space, while unloading entirely its containers would require the equivalent of about 7 double-stack trains of 400 containers each. Conventional port areas are often not adequate for the location of container transshipment infrastructures, particularly because of draft issues as well as required space for terminal operations.

Infrastructure costs. Container handling infrastructures, such as gantry cranes, yard equipment, road and rail access, represent important investments for port authorities and load centers.

Stacking. The arrangement of containers, both on the ground and on modes (containerships and double-stack trains) is a complex problem. At the time of loading, it becomes imperative to make sure that containers that must be taken out first are not below the pile. Further, containerships must be loaded in a way to avoid any restacking along its numerous port calls where containers are loaded and unloaded.

- **Thefts and losses**. While many theft issues have been addressed because of the freight anonymity a container confers, it remains an issue for movements outside terminals where the contents of the container can be assessed based upon its final destination.

- **Empty travel**. Maritime shippers need containers to maintain their operations along the port networks they service. The same number of containers brought into a market must thus eventually be relocated, regardless if they are full or empty.

- **Illicit trade**. By its confidential character, the container is a common instrument used in the illicit trade of drug and weapons, as well as for illegal immigrants. Concerns have also been raised about containers being used for terrorism. These fears have given rise to an increasing number of regulations aimed at counteracting illegal use of containers.

Yet, the advantages of containerization have far outweighed its drawbacks, transforming the global freight transport system.

ii) **Intermodal Transport Costs**

There is a relationship between transport costs, distance and modal choice that has for long been observed. It enables to understand why road transport is usually used for short distances (from 500 to 750 km), railway transport for average distances and maritime transport for long distances (about 750 km). Variations of modal choice according to the geographical setting are observed but these figures tend to show a growth of the range of trucking. However, intermodalism offers the opportunity to combine modes and find a less costly alternative than a uni-modal solution. It is also linked with a higher average value of the cargo being carried since intermodal transportation is linked with more complex and sophisticated commodity chains. As a result, the efficiency of contemporary transport systems rests as much on their **capacity to route freight** than on their **capacity to transship it**, but each of these functions have a cost that must be reduced. The intermodal transportation cost implies the consideration of several types of

transportation costs for the routing of freight from its origin to its destination, which involves a variety of shipment, transshipment and warehousing activities. It considers a **logistic** according to which are organized transport chains where production and consumption systems are linked to transport systems. Numerous technical improvements, such as river / sea shipping and better rail/road integration, have been established to reduce interchange costs, but containerization remains the most significant achievement so far.

The concept of economies of scale applies particularly well to container shipping. However, container shipping is also affected by diseconomies involving maritime and inland transport systems as well as transshipment. While maritime container shipping companies have been pressing for larger ships, transshipment and inland distribution systems have tried to cope with increased quantities of containers. Thus, in spite of a significant reduction in maritime transport costs, land transport costs remain significant.

Public policy is also playing a role through concerns over the dominant position of road transport in modal competition and the resultant concerns over congestion, safety and environmental degradation. In the developed world, policies have been introduced to induce a shift of freight and passengers from the roads to modes that are environmentally more efficient.

Example

> Intermodal transport is seen as a solution that could work in certain situations. In Switzerland, for example, laws stipulate that all freight crossing through the country must be placed on the railways in order to try to reduce air pollution in alpine valleys. The European Union is trying to promote intermodal alternatives by subsidizing rail, and shipping infrastructure and increasing road user costs. Since intermodal transportation is mostly the outcome of private initiatives seeking to capture market opportunities it remains to be seen to what extent public strategies can be reconciled with a global intermodal transport system which is flexible and footloose.

3.3.2 The Role of Transportation in Logistics Management

Dear learner, what do you expect is the role of transportation in logistic management? (Please take 10 minutes to respond to the questions in the space left below).

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Logistics in value chain

Dear learner, as you discussed in the introductory part, transporting goods from the point of production to the final destination is what good logistics management is all about. Transportation is one of the most important functions for any human activity or manufacturing enterprise that deals in the delivery of tangible products. The products meant for sale may need to be transferred to local areas or overseas locations depending on where the customers are located geographically. The process of sending the ordered products to far off locations requires careful supervision and monitoring to ensure that the sent items are delivered correctly and in a timely manner. Apart from this, it is also important to ensure that the costs incurred for such transportations are minimal and help in maintaining good profits. Transportation logistics software can be highly useful in ensuring a smooth and effective transportation process.

Even if a company has the best management team, best advertizing and pricing strategies but cannot deliver the goods as and when needed to the customer, it is a failure. Effective transportation facilitates the flow of goods from the seller to the buyer. It is extremely important for a company to efficiently operate its logistics.

The supply chain for inbound and outbound logistics is largely dependent on effective transportation. In fact, it may be possible to say that industrialized countries cannot exist without transportation. In every sphere of our lives, transportation has an important role to play in the mobility of people and goods. Everything from the clothes we wear to most of the food items we eat have moved from some place of origin to the stores we purchase them from. Raw materials are moved to factories from where they are converted into finished goods. The finished goods are then transported to distributors and retailers in order to reach the final consumer.

The present scenario of business is very different from what it was a couple of years back, and supply chains are becoming longer. Internet buying and selling has facilitated trading between buyers and sellers who are thousands of miles apart. This gap has increased the transportation costs and time to deliver the products. The immediate effect of this is high inventory and storage cost. A good logistics system works at making the right choice of transportation to save on these costs. An example could be switching from rail to air transport to move goods from the factory to the consumer. This can greatly cut down on the inventory and storage costs but increase the transportation costs. An effective logistics system is about making the right transportation decision based on a total cost approach.

The Role of Transportation in Service Quality

The role that transportation plays in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By

means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also it builds a bridge between producers and consumers. Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing in logistics activities brings benefits not only to service quality but also to company competitiveness.

Interrelationship between Transportation and Logistics

Dear learner, you have already discussed that without well-developed transportation systems, logistics could not bring its advantages into full play. A good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality. The improvement of transportation systems needs the effort from both public and private sectors. A well-operated logistics system could increase both the competitiveness of the government and enterprises.

Logistics and transportation are generally deemed to be equally important when it come to maintaining a regular supply of goods that are able to reach consumers in a timely manner. Many companies may be confronted with the question of whether to include logistics in their daily operations or to concentrate on transportation. Some organizations may also go in for a combination of both to achieve the highest amount of efficiency and effectiveness in goods distributions.

Although sometimes used interchangeably, there is a certain amount of difference between the two terms of logistics and transportation. Transportation is mostly concerned with physical movement of products or services that may be tangible or intangible through railways, roadways, airways, sea, etc. The other ancillary services without which transport may not be possible like packaging of products, maintaining coordination and contact with the receivers, handling of the goods, etc. forms a part of logistics. So, for efficient transportation, logistics also needs to be present in equal measure.

The management of the process of supplying the goods and maintaining communication between the sender and the receiver of goods is known as logistics. Through logistics, it is ensured that the required item is transported to the correct place at the appropriate time. A certain amount of human factor is necessary for carrying out this activity. Courier services are a great example of successful logistics. These companies may sometimes choose to employ their own vehicles for transportation of goods while at other times they may have contracts with air or railway carriers for the supply of goods. Everything including the decision regarding the method of transport to be used, the price to be paid, the time within which the delivery needs to take place, etc. is decided by the courier company itself.

Logistics in value chain

When logistics is used to transport goods for business purposes, it is known as business logistics. Most companies who wish to supply goods may need to choose whether they wish to go in for transport services or simply employ logistics to deliver their products to different geographical locations. These days, logistics and transportation have come to be viewed as two sides of the same coin and are generally used together for best results.

3.3.3 Transport Costs and Goods Characters in Logistics

Transport system is the most important economic activity among the components of business logistics systems. Around one third to two thirds of the expenses of enterprises' logistics costs are spent on transportation.

The transportation cost here includes the means of transportation, corridors, containers, pallets, terminals, labors, and time. This signifies the cost structure of logistics systems and the importance order in improvement processing. The improvement of the item of higher operation costs can get better effects. Hence, logistics managers must comprehend transport system operation thoroughly.

Transport system makes goods and products movable and provides timely and regional efficacy to promote value-added under the least cost principle. Transport affects the results of logistics activities and, of course, it influences production and sale. In the logistics system, transportation cost could be regarded as a restriction of the objective market. Value of transportation varies with different industries. For those products with small volume, low weight and high value, transportation cost simply occupies a very small part of sale and is less regarded; for those big, heavy and low-valued products, transportation occupies a very big part of sale and affects profits more, and therefore it is more regarded.

Distribution Management System

Pre-test

Dear learner, what is your idea about distribution management? Please discuss its benefits. (Please take 10 minutes to respond to the questions in the space left below.)

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A distribution management system helps to achieve maximum results in managing the supply chain of your business using innovative technologies. Having a proper system in place for managing the distribution of your products in the market can allow you to move way ahead

of your competitors who may be engaged in the same line of business. The amount of profits that you are able to earn depends majorly on the way your operations are managed. If you are correctly able to assess the demands for your products along with the amount of production required for each category of products, you can gain a lot of success in optimizing your company's sales process. A distribution management system can help address all the problems that may turn up in regulating and controlling your supply.

A distribution management system can be customized to suit the needs of all kinds of businesses in today's dynamic business environment. It can be used to manage the inventory levels of businesses dealing in varied and diverse product lines such as food, beverages, consumer durables, electronics, grocery items, vehicles, etc. By employing a management system, you will be able to examine the whole process beginning from the time when the product leaves the factory to the time that it reaches the retail space from where it is to be sold to the ultimate consumer. This helps to establish a great degree of effective control over the distribution process. A good distribution system can enhance your credibility and regular availability of stocks all year round will also help make your company more popular among buyers.

There are several other benefits that can be derived from distribution management systems such as an increase in the degree of automation of your business. There will be a reduced need for employees as manual work to control and regulate the distribution process will not have to be undertaken. An efficient system will be able to tackle most distribution related problems and report them to the management in a timely manner so that corrections can be made. Another significant advantage that companies having such systems in place can enjoy is that of managing online orders in an effective way without any hassles. This aspect is vital in today's times of conducting electronic business where marketplaces are established on the internet.

3.3.3. The Transportation Terminals

Dear learner, in this part you learn about the nature and types of transport terminals, cost and other determinants of performance of terminals. Before you go through the contents, think for a few minute about terminals in general, and then ask yourself the following questions: and give answer on the given spaces:

- What are transportation terminals?
- What are the features of the transportation terminals?
- What are factors affecting performance of transportation terminals?

Dear learner, all spatial flows, with the exception of personal vehicular and pedestrian trips, involves movements between terminals. With these two exceptions, all the transport modes require assembly and distribution of their traffic, both passenger and freight. Terminals are, therefore, essential links in transportation chains.

i)The Nature of Transport Terminals

A terminal may be defined as any facility where passengers and freight are **assembled or dispersed**. Both cannot travel individually, but in **batches**. Passengers have to go to bus terminals and airports first, where they are "assembled" in busloads or planeloads to reach their final destinations where they are dispersed. Freight has to be consolidated at a port or a rail yard before onward shipment. Terminals may also be points of interchange involving the same mode of transport.

Terminal

Any location where freight and passengers either originates, terminates, or is handled in the transportation process. Terminals are central and intermediate locations in the movements of passengers and freight. They often require specific facilities and equipment to accommodate the traffic they handle.

Terminals are points of interchange within the same modal system and which insure a continuity of the flows. This is particularly the case for modern air and port operations. Terminals, however, are also very important points of transfer between modes. Buses and cars deliver people to airports, trucks haul freight to rail terminals, and rail brings freight to docks for loading on ships. One of the main attributes of transport terminals, international and regional alike is their convergence function. They are indeed obligatory points of passage having invested on their geographical location which is generally intermediate to commercial flows. Thus, transport terminals are either created by the centrality or the intermediacy of their respective locations. In some cases, large transport terminals, particularly ports, confer the status of gateway or hub to their location since they become obligatory points of transit between different segments of the transport system. Three major attributes are linked with the importance and the performance of transport terminals:

- **Location**. The major location factor of a transport terminal is obviously to serve a large concentration of population and/or industrial activities, representing a terminal's market

area. Specific terminals have specific location constraints, such as port and airport sites. New transport terminals tend to be located outside central areas to avoid high land costs and congestion.

- **Accessibility**. Accessibility to other terminals (at the local, regional and global scale) as well as how well the terminal is linked to the regional transport system is of importance. For instance, a maritime terminal has little relevance if it is efficiently handling maritime traffic but is poorly connected to its market areas through an inland transport system (rail, road or barge).
- **Infrastructure**. The main function of a terminal is to handle and transship freight or passengers since modes and passengers or cargo are physically separated. They have a nominal capacity which is related to the amount of land they occupy and their level of technological, labor and managerial intensity. Infrastructure considerations are consequently important as they must accommodate current traffic and anticipate future trends and also technological and logistical changes. Modern terminal infrastructures consequently require massive investments and are among the largest structures ever built. A utilization rate of 75 to 80% is considered to be the optimal since above this level, congestion starts to arise, undermining the reliability of the terminal facility.

ii) Types of transportation terminals

Dear learner, although the term "terminal" implies an end, (a final **destination)**, because they are transfer points terminals in fact are typically **intermediate** locations in the global flows of passengers and freight. In order to carry out the transfer and bundling of freight and passengers' specific equipment and infrastructures are required. Differences in the nature, composition and timing of transfer activities give rise to significant differentiations in the form and function between terminals. A basic distinction is between passenger and freight transfers, because in order to carry out the transfer and bundling of each type, specific equipment and infrastructures are required. Passenger and freight terminals are consequently referring to substantially different entities and often have different location attributes.

Passenger Terminals

Passenger terminals require relatively little specific equipment. This is because individual mobility is the means by which passengers access busses, ferries or trains. Certainly, services such as information, shelter, food and security are required, but the layouts and activities taking place in passenger terminals tend to be simple and require relatively little equipment. They may appear congested at certain times of the day, but the flows of people can be managed successfully with good design of platforms and access points, and with appropriate scheduling of arrivals and departures. The amount of time passengers spend in such terminals tends to be brief. As a result bus termini and railway stations tend to be made up of simple

components, from ticket offices and waiting areas to limited amounts of retailing. Airports are of a complete different order. They are among the most complex of terminals functionally.

Freight terminals

Freight handling requires specific loading and unloading equipment. In addition to the facilities required to accommodate ships, trucks and trains (berths, loading bays and freight yards respectively) a very wide range of handling gear is required that is determined by the kinds of cargoes handled. Freight transport terminals have a set of characteristics linked with core and ancillary activities. The result is that terminals are **differentiated functionally** both by the mode involved and the commodities transferred. A basic distinction is that between bulk, general cargo and containers:

- **Bulk** refers to goods that are handled in large quantities that are unpackaged and are available in uniform dimensions. Liquid bulk goods include crude oil and refined products that can be handled using pumps to move the product along hoses and pipes. Relatively limited handling equipment is needed, but significant storage facilities may be required. Dry bulk includes a wide range of products, such as ores, coal and cereals. More equipment for dry bulk handling is required, because the material may have to utilize specialized grabs and cranes and conveyer-belt systems.
- **General cargo** refers to goods that are of many shapes, dimensions and weights such as machinery, processed materials and parts. Because the goods are so uneven and irregular, handling is difficult to mechanize. General cargo handling usually requires a lot of labor.
- **Containers** are standard units that have been designed for simplicity and functionality. Container terminals have minimal labor requirements and perform a wide variety of intermodal functions. They however require a significant amount of storage space which are simple paved areas where containers can be stacked and retrieved with intermodal equipment (cranes, straddlers and holsters). Depending on the intermodal function of the container terminal, specialized cranes are required, such as portainers (container cranes). Intermodal terminals and their related activities are increasingly seen as agents of added value within supply chains.

A feature of most freight activity is the **need for storage**. Assembling the individual bundles of goods may be time-consuming and thus some storage may be required. This produces the need for terminals to be equipped with specialized infrastructures such as grain silos, storage tanks, and refrigerated warehouses, or simply space to stockpile, such as for containers. Containerization, because of its large volumes, has forced a significant modal and temporal separation at terminals. In addition, a variety of transloading activities can take place in the vicinity of terminals, particularly if long distance inland transportation is involved.

Measurement of freight traffic through terminals is more complicated than for passengers. Because freight is so diverse, standard measures of weight and value are **difficult to compare and combine**. Because bulk cargoes are inevitably weighty, terminals specialized in such cargoes will inevitably record higher throughputs measured in tons than others more specialized in general cargoes.

iii) Terminal Costs

Dear learner, in this part you learn about the different types of terminal costs, could you please take 5 minutes to mention some? and their impacts on the given space below?

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Dear learner you have learned in the above part that terminals jointly perform **transfer** and **consolidation** functions, they are important economically because of the costs incurred in carrying out these activities. The traffic they handle is a source of employment and benefit regional economic activities, notably by providing accessibility to suppliers and customers. **Terminal costs** represent an important component of total transport costs. They are fixed costs that are incurred regardless of the length of the eventual trip, and vary significantly between the modes. They can be considered as:

- **Infrastructure costs**. Include construction and maintenance costs of structures such as piers, runways, cranes and facilities (warehouses, offices, etc.).
- **Transshipment costs**. The costs of loading and unloading passengers or freight.
- **Administration costs**. Many terminals are managed by institutions such as port or airport authorities or by private companies (e.g. terminal operators). In both cases administration costs are incurred.

Because ships have the largest carrying capacities, they incur the **largest terminal costs**, since it may take many days to load or unload a vessel. Conversely, a truck or a passenger bus can be loaded much more quickly, and hence the terminal costs for road transport are the lowest. Terminal costs play an important role in determining the competitive position between the modes. Because of their high freight terminal costs, ships and rail are unsuitable for short-haul trips. Competition between the modes is frequently measured by **cost comparisons**. Efforts to reduce transport costs of agriculture products can be achieved by using more fuel-efficient vehicles, increasing the size of ships, and reducing the labor employed on trains. However, unless terminal costs are reduced as well, the benefits would not be realized. For example, in water transportation, potential economies of scale realized by ever larger and more fuel-efficient vessels would be negated if it took longer to load and off-

load the jumbo ships. Over the last forty years, very significant steps to reduce terminal costs have been made. These have included introducing **information management systems** such as EDI (electronic data interchange) that have greatly speeded up the processing of information and removing delays typical of paper transactions. The most significant development has been the mechanization of loading and unloading activities. Mechanization has been facilitated by the use of units of standard dimensions such as the pallet and most importantly, the container.

Reduced terminal costs have had a major impact on transportation and international trade. Not only have they reduced over-all freight rates, and thereby re-shaping competition between the modes, but they have had a profound effect on transport systems. Ships spend far less time in port, enabling ships to make many more revenue-generating trips per year. Efficiency in the airports, rail facilities and ports greatly improves the effectiveness of transportation as a whole.

Activities in transport terminals represent not just exchanges of goods and people, but constitute an **important economic activity**. Employment of people in various terminal operations represents an advantage to the local economy. Dockers, baggage handlers and crane operators, air traffic controllers are example of jobs generated directly by terminals. In addition there are a wide range of activities that are linked to transportation activity at the terminals. These include the actual carriers (airlines, shipping lines etc.), intermediate agents (customs brokers, forwarders) required to carry out the It is no accident that centers that perform major airport, port and rail functions also important economic locales.

Impacts of transportation

Dear learner, in the previous parts you have learned about the different modes of transport and their particular importance and efficiency. In this part, you learn the economic, planning and environmental impacts of transportation.

Economic

Dear learner do you remember your study of International trade course about the importance of specialization? As you recall, transport is a key necessity for specialization—allowing production and consumption of agricultural products to occur at different locations. Transportation has throughout history been an important tool to expansion; better transport allows more trade and a greater mobility of people. Economic growth has always been dependent on increasing the capacity and rationality of transport. But the infrastructure and operation of transport has a great impact on the land and is the largest drainer of energy, making transport sustainability a major issue.

Logistics in value chain

Modern society dictates a physical distinction between home and work, forcing people to transport themselves to places of work or study, as well as to temporarily relocate for other daily activities. Passenger transport is also the essence of tourism, a major part of recreational transport. Commerce requires the transport of people to conduct business, either to allow face-to-face communication for important decisions or to move specialists from their regular place of work to sites where they are needed.

Planning

Dear learner, transport planning allows for high utilization and less impact regarding new infrastructure. Using models of transport forecasting, planners are able to predict future transport patterns. On the operative level, logistics allows owners of cargo to plan transport as part of the supply chain.

Because of the negative impacts made, transport often becomes the subject of controversy related to choice of mode, as well as increased capacity. Automotive transport can be seen as a tragedy of the commons, where the flexibility and comfort for the individual deteriorate the natural and urban environment for all. Density of development depends on mode of transport, with public transport allowing for better special utilization. Good land use keeps common activities close to people's homes and places higher-density development closer to transport lines and hubs; minimize the need for transport. There are economies of agglomeration. Beyond transportation some land uses are more efficient when clustered. Transportation facilities consume land, and in cities, pavement (devoted to streets and parking) can easily a considerable amount of the total land use. An efficient transport system can reduce land waste.

Too much infrastructure and too much smoothing for maximum vehicle throughput means that in many cities there is too much traffic and many—if not all—of the negative impacts that come with it. It is only in recent years that traditional practices have started to be questioned in many places, and as a result of new types of analysis which bring in a much broader range of skills than those traditionally relied on—spanning such areas as environmental impact analysis, public health, sociologists as well as economists who increasingly are questioning the viability of the old mobility solutions.

Environment

Dear learner, you know that these days the issue of climate change is at the top of world political economy. Human induced, socio-economic activities/production and energy usage/ are the highest rated reasons. Transport uses energy and burns most of the world's petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant

contributor to global warming through emission of carbon dioxide, for which transport is the fastest-growing emission sector.

By subsector, road transport is the largest contributor to global warming. Environmental regulations in developed countries have reduced individual vehicles' emissions; however, this has been offset by increases in the numbers of vehicles and in the use of each vehicle. Some pathways to reduce the carbon emissions of road vehicles considerably have been studied. Energy use and emissions vary largely between modes, causing environmentalists to call for a transition from air and road to rail and human-powered transport, as well as increased transport electrification and energy efficiency.

Other environmental impacts of transport systems include traffic congestion and automobile-oriented urban sprawl, which can consume natural habitat and agricultural lands. By reducing transportation emissions globally, it is predicted that there will be significant positive effects on Earth's air quality, acid rain, smog and climate change.

Gender and transportation

Dear learner, before you go through gender dimensions of transportation, please try to answer the following questions.

What are the gender differences in demand for transport?
Why are gender issues important in the transport sector?
(Please give your answer in the space left below)

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Dear learner, you can know women and men have different transport needs and priorities; they are frequently affected differently by transport interventions. For example, rural transport projects that build roads for motorized transport often do not benefit rural women, who mainly work and travel on foot in and around the village. Urban transport systems, which are designed to transport people to and from employment centers, may also respond inadequately to the needs of women, who must combine income generation with household activities, such as taking children to school and visiting the market. The failure of the transport sector in meeting women's needs and priorities affects women negatively in several ways. Because of lack of access to adequate transport, women enjoy less mobility than men; their access to markets and employment is circumscribed. Women's safety suffers when their needs are not taken into account in transport project design, for instance due to the absence of street lighting. Women's health is also negatively affected by the lack of adequate transport.

Logistics in value chain

Every minute a woman dies in child birth, but many of these deaths (and the disability caused by obstructed labor) could be avoided with timely access to transport. Furthermore, poor women, who balance productive, social, and reproductive roles, often have higher demands on their time than poor men. Gender-responsive infrastructure interventions can free up women's time by lowering their transaction costs. This, in turn, increases girls' school enrollment and facilitates women's participation in income-generation and decision-making activities.

Addressing transport-related gender inequalities is smart economics. It benefits society as a whole. Reducing women's time costs and increasing their mobility and safety increases women's productivity which makes society as a whole more productive. They help empower women, improve health, provide education opportunities and ultimately reduce poverty.

Learning activity

Please assess the transportation system used for agricultural products in your local area and identify the type of transport, and the cost of terminals. Then give presentation to the class.

Continuous assessment

Quiz/test, assignment and presentation

Summary

The role that transportation plays in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. All spatial flows, with the exception of personal vehicular and pedestrian trips, involve movements between terminals. Terminals are, therefore, essential links in transportation chains. Differences in the nature, composition and timing of transfer activities give rise to significant differentiations in the form and function between terminals. A basic distinction is between passenger and freight transfers, because in order to carry out the transfer and bundling of each type, specific equipment and infrastructures are required. Terminals jointly perform **transfer** and **consolidation** functions, they are important economically because of the costs incurred in carrying out these activities. By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also it builds a bridge between producers and consumers. Addressing transport-related gender inequalities is smart economics. It benefits society as a whole. Reducing women's time costs and increasing their mobility and safety increases women's productivity which makes society as a whole more productive.

3.4 Section IV: Labeling and packaging

3.4.1 Labeling and Standardizing Products

Pre -test

Dear student, before you start reading this section try to answer the next pre-test question that would make your reading simple. What is labeling? What are the elements to be included in the label of a product? (You can use the space left below to write your response)

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Labeling Products

A label is a piece of paper, polymer, cloth, metal, or other material affixed to a container or article, on which is printed a legend, information concerning the product, addresses, etc. A label may also be printed directly on the container or article. Labels have many uses: product identification, name tags, advertising, warnings, and other communication. Special types of labels called digital labels (printed through a digital printing) can also have special constructions such as RFID tags, security printing, and sandwich process labels.

The label gives information to customers about the type of product and how it is used, but it also gives an image of the product to the customer. A well designed label can give an impression of high quality or exciting taste, whereas a poor label can suggest low quality or a cheap product that is only eaten by people who cannot afford anything better. Producers may wish to have a 'logo' to help customers identify their products from those of competitors when on display in shops. However, the package and particularly the label must compare favorably with the others before customers will choose it. In general, a simple image on the label is better than a complex design. The brand name or the name of the company should stand out clearly. If pictures are used, they should accurately show the product or its main raw material.

Product labeling is a complex area that requires professional advice from graphic designers who are experienced in label design. In some countries there are legal requirements on the design of the label and the information that is included, with the following being the minimum required in most countries:

- Name of the product
- List of ingredients in order of weight

- Name and address of the producer
- Net weight of food in the package
- A ‘use-by’, ‘best-before’ or ‘sell-by’ date

The producer may also include:

- Any special instructions for preparing the product
- Storage information or instructions of storage after opening
- Examples of recipes in which the product can be used
- A bar code for sales to a larger supermarkets

Standardization of Products

Dear learner, do you have any exposure to the term standardization? What does it mean? (You can use the space left below to write your response)

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Standardization is the process of developing and implementing technical standards. The goals of standardization can be to help with independence of single suppliers (commoditization), compatibility, interoperability, safety, repeatability, or quality. A standard is a document which provides, inter alia, requirements, rules, and guidelines, for a process, product or service. These requirements are sometimes complemented by a description of the process, products or services. Standards are the result of a consensus and are approved by a recognized body. Standards aim at achieving the optimum degree of order in a given context. The process of formulating, issuing and implementing standards is called standardization.

Aims of Standardization:

Following are the primary aims of standardization:

Fitness for Purpose:

Fitness for purpose is the ability of the process, product or service to fulfill a defined purpose under specific conditions. Any product, process or service is intended to meet the needs of the user. Sometimes the expectations of the users may be at variance with the actual purpose. In addition, it is difficult for the users to always spell out the desirable quality of the process, product or service. Standards help by identifying the optimum parameters for the performance of a process, product or service (e.g. product standards) and the method for

evaluating product conformity (such as test method standards and quality control standards). Standards also lay down conditions for using the process, product or service, as otherwise any failure of the process, product or service due to improper use may be attributed by the users to a deficiency or lack of quality of the process, product or service.

Interchangeability:

The suitability for a process, product or service to be used in place of another to fulfill a relevant requirement is called interchangeability. Through a deliberate standardization process, it is possible to make processes, products or services interchangeable, even if they are created in different countries.

Variety Reduction:

It is popularly believed that variety is the spice of life. While a large number of varieties for a particular process, product or service may be helpful to consumers and enable them to select the most appropriate; this large number of varieties requires large inventories, resulting in high costs to manufacturers. Variety reduction is one of the aims of standardization for the selection, inter alia, of the optimum number of sizes, ratings, grades, compositions and practices to meet prevailing needs. Balancing between too many and too few varieties is in the best interest of both manufacturers and consumers.

Compatibility:

Parallel developments of processes, products or services, which are required to be used in combination, pose problems if they are not compatible. One of the aims of standardization is compatibility, namely, suitability of processes, products or services to be used together under specific conditions to fulfill the relevant requirements, without causing unnecessary interaction.

Guarding against factors that affect the health and safety of consumers:

Safety of the process, product or service is of great importance if, under certain conditions, the use of the process, product or service may pose a threat to human life or property. Therefore, identification of processes, products or services and their safety parameters, not only under normal use but under possible misuse, is one of the important requirements of standardization. For example, items for human consumption should be free from poisonous substances: if food colors are used in candy or sweets, they should be free from poisonous substances like lead or arsenic. Safety standards also broadly cover the requirements to

ensure the safety of equipment (e.g. a dustproof enclosure for equipment) and that of people and the environment (e.g. flameproof enclosures for equipment used in mines).

Environmental Protection:

Environmental protection is an important aim of standardization: the focus here is on preserving nature from damage that may be caused during the manufacture of a product or during its use or disposal after use. For example, the domestic use of a washing machine should generate only a minimum of pollutants.

Better Utilization of Resources:

Achievement of maximum overall economy through better utilization of resources such as capital, human effort and materials is an important aim of standardization. In manufacturing organizations, it is this aspect of standardization of materials, components and production methods that makes it possible to reduce waste and to carry out mass production in an economic way.

Better Communication and Understanding:

Whenever the transfer of goods and services is involved, standards spell out what means of communication are to be used between different parties. Since standards contain information that is recorded in a precise and documented form, they contribute towards better communication and understanding in a large variety of settings. In public places such as airports, railway stations and highways for instance, standardized signs play an important role.

Transfer of Technology:

Standards act as a good vehicle for technology transfer. Since standards incorporate the results of advances in science, technology and experience, they reflect the state of the art in technical development. As standardization is a dynamic process, standards are updated as new technologies are developed.

Removal of Trade Barriers:

Restrictions on the export of processes, products or services by the introduction of some technical barriers to trade, such as arbitrary product requirements, are being viewed with great concern. Standards prevent such non-tariff barriers to trade by harmonizing

requirements in a manner that promotes fair competition. Purchasers can be convinced about the quality level of a product that has been manufactured according to a recognized standard.

Benefits of Standardization:

By its very definition, standardization is aimed at achieving maximum overall economy. Standards provide benefits to different sectors of society. Some of the benefits of standardization are as follows:

For manufacturers, standards:

- Rationalize the manufacturing process.
- Eliminate or reduce wasteful material or labor.
- Reduce inventories of both raw material and finished products.
- Reduce the cost of manufacture.

For customers, standards:

- Assure the quality of goods purchased and services received.
- Provide better value for money.
- Are convenient for settling disputes, if any, with suppliers.

For traders, standards:

- Provide a workable basis for acceptance or rejection of goods or consequential disputes, if any.
- Minimize delays, correspondence, etc., resulting from inaccurate or incomplete specification of materials or products.

Attributes of a Standard

A standard generally has three attributes:

- Level: such as at the company, national or international level.
- Subject: such as engineering, food, textile or management.
- Aspect: such as specification, testing and analysis, packaging and labeling (more than one aspect may be covered in a single standard: a standard may include specification of items such as the product, its sampling and inspection, related tests and analysis, packaging and labeling).

ii. Packaging and Quality Control

Dear learner, are you familiar with the terms package and packaging? Try to define these terms based on your previous understanding? (You can use the space left below to write your response)

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Definition, levels and functions of Packaging:

Packaging has been defined as a socio scientific discipline which operates in society to ensure delivery of goods to the ultimate consumer of those goods in the best condition intended for their use.

The Packaging Institute International (PII) defines packaging as the enclosure of products, items or packages in a wrapped pouch, bag, box, cup, tray, can, tube, bottle or other container form to perform one or more of the following functions: containment, protection, preservation, communication, utility and performance. If the device or container performs one or more of these functions, it is considered a package.

Other definitions of packaging include a coordinated system of preparing goods for transport, distribution, storage, retailing and end-use, a means of ensuring safe delivery to the ultimate consumer in sound condition at optimum cost, and a techno-commercial function aimed at optimizing the costs of delivery while maximizing sales.

Package, Packaging, Packing:

It is important to distinguish between the words "package," "packaging" and "packing." The package is the physical entity that contains the product. Packaging was defined above and in addition, is also a discipline. The verb "packing" can be defined as the enclosing of an individual item (or several items) in a package or container.

Levels of Packaging:

A primary package is the one which is in direct contact with the contained product. It provides the initial, and usually the major protective barrier. Example: Metal cans, paperboard cartons, glass bottles and plastic pouches, aerosol spray can, Beverage can, cushioning envelopes, plastic bottles, skin pack.

A secondary package contains a number of primary packages. It is outside the primary packaging perhaps used to group primary packages together. It is the physical distribution carrier and is sometimes designed so that it can be used in retail outlets for the display of primary packages. Ex. Corrugated case, Boxes
A tertiary package is made up of a number of secondary packages. It is used for bulk handling. Example being a stretch-wrapped pallet of corrugated cases.

A quaternary package is frequently used to facilitate the handling of tertiary packages. This is generally a metal container up to 40 m in length which can be transferred to or from ships, trains, and flatbed trucks by giant cranes. Certain containers are also able to have their temperature, humidity and gas atmosphere controlled. This is necessary in particular situations such as the transportation of frozen foods, chilled meats and fresh fruits and vegetables.

Functions of Packaging:

What do you think about the reason behind to package products? (You can use the space left below to write your response)

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Packaging has four primary functions: containment, protection, convenience and communication.

Containment:

The containment function of packaging makes a huge contribution to protecting the environment from the myriad of products which are moved from one place to another. Faulty packaging (or under packaging) could result in major pollution of the environment.

Protection:

This is often regarded as the primary function of the package: to protect its contents from outside environmental effects, such as water, moisture vapour, gases, odours, micro-organisms, dust, shocks, vibrations and compressive forces, and to protect the environment from the product.

The products designed around principles of convenience include foods which are pre-prepared and can be cooked or reheated in a very short time, preferably without removing them from their primary package.

Communication:

A package functions as a "silent salesman". The modem methods of consumer marketing would fail were it not for the messages communicated by the package. The ability of consumers to instantly recognize products through distinctive branding and labeling enables supermarkets to function on a self-service basis. Without this communication function (i.e., if there were only plain packs and standard package sizes), the weekly shopping expedition to the supermarket would become a lengthy, frustrating nightmare as consumers attempted to make purchasing decisions without the numerous clues provided by the graphics and the distinctive shapes of packaging.

Packaging of Agricultural Products

Dear leaner in the previous topics you learned about packaging and its functions. In this part you will learn about packaging of agricultural products. Do you know some of the packaging materials used to package agricultural products? Try to list them in your own words before reading the following notes. (You can use the space left below to write your response)

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Raw Vegetables and Fruits: Raw vegetables may be packed loose in bulk or packed in containers for trading and transport. In the latter case, the vegetables should be packed in new loosely woven gunny bags or wooden/plastic crates or in lined or unlined corrugated fiberboard boxes.

Onion and Garlic: These should be packed in sound, clean, new loosely woven gunny bags, net bags, bamboo baskets or palm leaf baskets or wooden crates or lined or unlined corrugated fiberboard boxes or in any other suitable manner so as to allow proper aeration of the bulbs.

Tomatoes: Tomatoes should be packed in baskets or wooden boxes or lined or unlined corrugated fiberboard boxes. While packing, it should be ensured that the tomatoes are not unduly pressed when he lid is closed. Chillies: Fresh chillies should be packed in gunny bags or in bamboo baskets, or in corrugated boxes, lined or unlined. The containers should be so constructed as to allow for proper aeration of the packed material.

Guava, Lime and Mandarin: They should be packed in wooden boxes or lined or unlined corrugated fiberboard boxes. The boxes should be made in such a manner as to allow for proper aeration of the fruits. Sufficient quantity of straw should be put in the container to prevent fruits from rubbing against each other. Super grade fruit should be wrapped

individually either in tissue paper or in any other suitable material before being packed into the container.

Juices, Jams, Jellies and Marmalades: They should be packed in glass bottles or open top cans. Tomato juice be packed in glass or tinplate containers and hermetically sealed. The containers may be either plain or lacquered; if lacquered, the lacquer should be of the acid resistant type.
Meat: Meat should be wrapped in polyethylene sheets or bags and delivered in clean, rust free and closed containers. If the time involved in packaging and transport is more than 2 hours, the meat should be covered with ice. If the meat has to be supplied to the distant market, meat should be wrapped in polyethylene sheets and packed in clean, rust free and closed containers which are sufficiently strong to withstand repeated handling. The containers should have an outlet for drinking of water resulting from melting of ice used to chill the meat.

Dressed Chicken: The drained and dressed birds should be packed into suitable sized polyethylene bags or other suitable packing material. Before final sealing, the packs should be immersed into vats containing water to expel the content of air between the carcass and the bag, taking care that no water is introduced in the pack. Alternatively, vacuum packing or shrink wrapping of the packs may be adopted. After the air inside is expelled, the bag should be sealed on a sealer or should be knotted using rubber bands.

Fish: The fresh product should be packed in polyethylene lined insulated containers, made of plywood, country wood or plastic. The thickness of insulation may vary from 15 to 30 mm depending upon the storage period and the mode of transport. Thermocole or fiberglass may be used as insulation material. Adequate drainage of melted ice may be provided. Cereal Grains: Cereal gains should be packed in new, clean jute bags or LDPE coated jute bags and raffia bags. The mouth of each bag should be machined stitched.

Cereal Flours: The cereal flours should be packed in 1, 2, 10, 20, 40, 65, 75, or 90 kg bags. For packages above 65 kg, the material for packaging should be either LDPE coated jute bag/LDPE coated raffia bags or single sound A-twill or B-twill jute bags. The bags used for smaller packs may be polyethylene bags or polyethylene lined jute bags. The mouth of the bag should be either machine stitched or hand stitched. If it is hand stitched, the mouth should be rolled over and then stitched. The stitches should be in tow rows with atleast 14 stitches in each row for jute bags of 65 kg and above.

Honey: The packing of honey should be in hygienically clean and wide mouthed glass containers or in acid resistant lacquered tinplate containers or in suitable polyethylene

containers. The screwed caps of glass containers should be of non-corrosive and non-reactive material and should be provided with cork washers to avoid spilling.

Eggs: although a fresh egg is highly perishable, it is protected by the egg shell, which prevents loss of moisture and contamination by bacteria, insects, etc. this preserves the egg for several days or weeks, depending on the climate and storage conditions. Packaging is required to prevent damage to the egg shells during transport to the markets. Traditionally, baskets lined with straw or dried grass were used. Ungraded packaging uses molded paper pulp or plastic egg trays that are contained with cardboard boxes. The trays separate individual eggs and hold them in position, while also providing cushioning to prevent damage caused by impacts. Smaller paper pulp or plastic cartons that contain 6 – 18 eggs are also used for both shipping containers and retail display packs. They are packed into cardboard or corrugated cardboard boxes to prevent damage from impacts or crushing during transport.

Choice of Packaging Materials

Producers should first find out which types are locally available and select the most cost-effective options, taking into account the following factors:

- Is the material suitable to be in contact with a particular agricultural product?
- Should it be resistant to fats or oils?
- Should it be a barrier to air or moisture? How much of a barrier is needed?
- Does the material melt at a low temperature, which would make it unsuitable?
- Are the color, clarity, and surface finish of the packaging suitable for the intended product?
- Can the material be printed locally?
- Are special filling or sealing machines required for the material?
- Is the material strong enough to prevent damage from impacts or crushing? Is a stronger shipping container needed to protect the packaging material and its contents?
- Can the containers be stacked when empty to reduce transport and storage costs?
- Can the material be re-used or disposed of with minimum environmental pollution?

Quality Control

What is quality? Explain using your own words. (You can use the space left below to write your response)

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What is Quality?

Different meaning could be attached to the word quality under different circumstances. The word quality does not mean the quality of the final product only. It may refer to the quality of the process (i.e., men, material, and machines) and even that of management. Crosby defined as "Quality is conformance to requirement or specifications".

Juran defined as "Quality is fitness for use". "The Quality of a product or service is the fitness of that product or service for meeting or exceeding its intended use as required by the customer." According to American Society for Quality "Quality is the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs."

The dimensions of Quality:

The dimensions of quality primarily for products a consumer looks for in a product include the following:

Performance: The basic operating characteristics of a product

Features: The "extra" items added to the basic features

Reliability: The probability that a product will operate properly within an expected time frame

Conformance: The degree to which a product meets pre established standards.

Durability: How long the product lasts; its life span before replacement.

Serviceability: The ease of getting repairs, the speed of repairs, and the courtesy and competence of the repair person.

Aesthetics: How a product looks, feels, sounds, smells, or tastes.

Safety: Assurance that the customer will not suffer injury or harm from a product; an especially important consideration for automobiles.

Other perceptions: Subjective perceptions based on brand name, advertising and etc.

These quality characteristics are weighed by the customer relative to the cost of the product. In general, consumers will pay for the level of quality they can afford. If they feel they are getting what they paid for, then they tend to be satisfied with the quality of the product.

Quality Control Techniques

Dear leaner in the previous topics you learned about quality, cost of quality and standardization for quality. How do you think agricultural business organizations apply quality control techniques on their products? (You can use the space left below to write your response)

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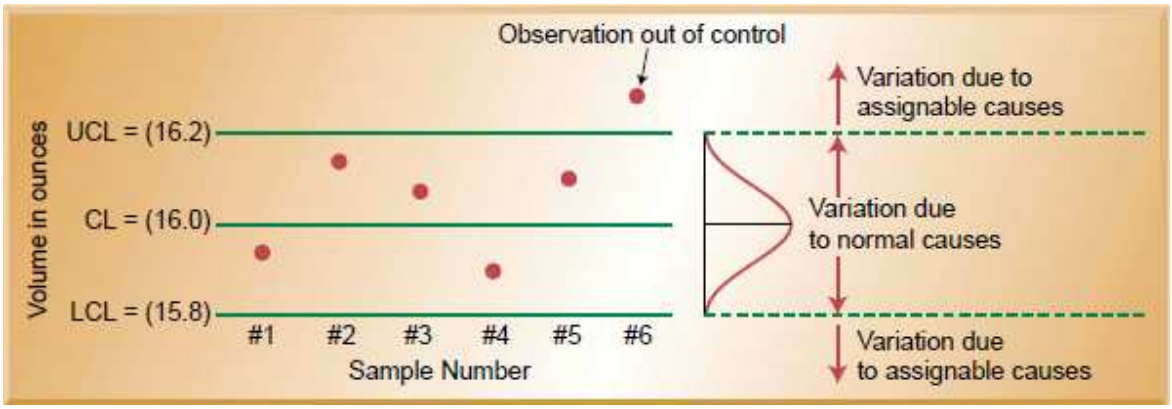
The best organizations emphasize designing quality into the process, thereby greatly reducing the need for inspection or control efforts. As you might expect, different organizations are in different stages of this evolutionary process: The least progressive rely heavily on inspection. Many occupy a middle ground that involves some inspection and a great deal of process control. The most progressive have achieved an inherent level of quality that is sufficiently high that they can avoid wholesale inspection activities and process control activities. Quality assurance that relies primarily on inspection after production is referred to as acceptance sampling. Quality control efforts that occur during production are referred to as statistical process control.

Process Control

Quality control is concerned with the quality of conformance of a process: Does the output of a process conform to the intent of design? Toward that end, managers use statistical process control to evaluate the output of a process to determine its acceptability. To do this, they take periodic samples from the process and compare them with a predetermined standard. If the samples results are not acceptable, they stop the process and take corrective action. If the samples results are acceptable, they allow the process to continue. There are two basic categories of variation in output: Common Causes and Assignable Causes. Common causes of variation are purely random, unpredictable sources of variation that are unavoidable with the current process. For example, a machine that fills cereal boxes will not put exactly the same amount of cereal in each box.

The second category of variation, assignable causes of variation, also known as special causes, includes any variation –causing factors that can be identified and eliminated. Assignable causes of variation include an employee needing training, or a machine needing repair.

Control charts are used to control in-process quality. Acceptance sampling plans are aimed to control the quality of incoming raw material, semi-finished products and finished products.



Acceptance Sampling

Acceptance sampling is a form of inspection that is applied to lots or batches of items either before or after a process instead of during the process. In the majority of cases, the lots represent incoming purchased items or final products awaiting shipment to warehouses or customers. The purpose of acceptance sampling is to decide whether a lot satisfies predetermined standards. Lots that satisfy these standards are passed or accepted; those that do not are rejected. Rejected lots may be subjected to 100 percent inspection, or purchased goods may be returned to the supplier for credit or replacement.

Sampling Plans

A key element of acceptance sampling is the sampling plan. Sampling plans specify the lot size, N; the sample size, n; the number of samples to be taken; and the acceptance/rejection criteria. A variety of sampling plans can be used. The following paragraphs briefly describe some of the different kinds of plans.

Single-Sampling Plan: In this plan, one random sample is drawn from each lot, and every item in the sample is examined and classified as either “good” or “defective.” If any sample contains more than a specified number of defectives, c, that lot is rejected.

Double-Sampling Plan: A double-sampling plan allows for the opportunity to take a second sample if the results of the initial sample are inconclusive. For example, if the quality of the initial sample is high, the lot can be accepted without need for a second sample. If the quality in the initial sample is poor, sampling can also be terminated and the lot rejected. A double-sampling plan specifies the lot size, the size of the initial sample, accept/reject criteria for the initial sample, the size of the second sample, and a single acceptance number.

With a double-sampling plan, two values are specified for the number of defective items, a lower level, C_1, and an upper level, C_2. If the number of defective items in the first sample is less than or equal to the lower values, the lot is judged to be good and sampling is terminated. Conversely, if the number of defectives exceeds the upper value, the lot is rejected. If the number of defectives falls somewhere in between, a second sample is taken and the number of defectives in both samples is compared to a third value, C_3.

Multiple-Sampling Plan: is similar to a double-sampling plan except that more than two samples may be required. If the cumulative number of defectives found exceeds the upper limit specified for that sample, sampling is terminated and the lot is rejected. If the cumulative number of defectives is less than or equal to the lower limit, sampling is terminated and the lot is passed. If the number is between the two limits, another sample is taken. The process continues until the lot is either accepted or rejected.

Learning Activity

Select one agro processing enterprise in your locality and assess the labeling, packaging and quality control methods used in that enterprise.

Continuous Assessment
Quiz, Case Study, Assignment and Presentation

Summary

A label is a piece of paper, polymer, cloth, metal, or other material affixed to a container or article, on which is printed a legend, information concerning the product, addresses, etc. Labels have many uses: product identification, name tags, advertising, warnings, and other communication. It also gives information to customers about the type of product and how it is used, but it also gives an image of the product to the customer. The information included in the label comprises: name of the product, list of ingredients in order of weight, name and address of the producer, net weight of food in the package and etc.

The process of formulating, issuing and implementing standards is called standardization. The primary aims of standardization are: fitness for purpose, interchangeability, variety reduction, compatibility, guarding against factors that affect the health and safety of consumers, environmental protection, better utilization of resources, better communication and understanding, transfer of technology and removal of trade barriers.

Packaging is the enclosure of products, items or packages in a wrapped pouch, bag, box, cup, tray, can, tube, bottle or other container form to perform one or more of the following

functions: containment, protection, preservation, communication, utility and performance. Packaging has four primary functions: containment, protection, convenience and communication.

There is various quality management approach techniques applied to control quality, Quality assurance that relies primarily on inspection after production is referred to as acceptance sampling. Quality control efforts that occur during production are referred to as statistical process control.

3.5. Section V: ICT and Logistics

3.5.1 Introduction

This learning task will equip the students with concepts of innovations in information and communication, standardization for quality, connectivity transparency and collaborative planning in general and agribusiness in particular. The students will also be introduced to the developments of technology such as barcodes and RFID, product identification and order picking and scanning. The students will be motivated to assess gender and sustainability issues in the process of ICT use to provide improved logistics services.

Developments in Information Technology: Barcodes and RFID

Pre-test

Dear learner before you go through the main developments in information technology that contributed for the logistic development, please take 10 minutes to respond to the following questions in the space left below. What are Barcodes and RFIDs? What do they contribute for logistic development?

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A mutual relationship exists between developments in information and communications technology and logistics. On one hand, logistics is one of the most important commercial areas of application. With its growing needs, it acts as a catalyst for advances in IT. On the other hand, new technological opportunities form the basis for new concepts in logistics. In this context, logistics advances include barcodes and RFID technology (Radio frequency identification). Thanks to this technology, real-time information can be stored and transmitted using the RFID tags on pallets, containers and parcels to efficiently manage flows of goods. In addition, logisticians envision scenarios in which intelligent logistics objects

find their own way through the material flow, managing and organizing the flow of goods by themselves in the process.

The integration of various applications into software systems offers logistics further opportunities to optimize the processes of global trade. For instance, internal warehouse management systems and IT systems such as track & trace systems often are components of modern logistics. Electronic platforms are also becoming increasingly important. More and more shipping agents, freight forwarders and service providers are turning to the Internet in order to gain an additional way to offer their services.

Barcode

A barcode is a series of parallel black and white bars, both of varying widths, whose sequence represents letters or numbers. This sequence is a code that scanners can translate into important information such as a shipment's origin, the product type, the place of manufacture, and the product's price. Bar code systems are simple to use, accurate, and quick; and they can store large amounts of information.

Bar code scanners fall into two main categories: automatic and handheld. Automatic scanners are in a fixed position and scan packages as they go by on a conveyer belt. In contrast, a worker can carry the portable handheld scanner or wand throughout the warehouse. To read bar codes, these optical scanners emit light beams and translate the reflections bouncing off the black and white bars into electric signals.

Bar coding had its initial logistics impact when companies used it on cartons and monitored or scanned the codes as the cartons flowed into a warehouse. Bar coding at the warehouse improves data collection accuracy, reduces receiving operations time and data collection labor, and helps to integrate data collection with other areas, leading to better database and inventory controls. Companies can assign more quickly into the warehouse, and warehouse personnel can select and prepare orders much more rapidly.

Radio Frequency Identification (RFID)

Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking. Some tags require no battery and are powered by the electromagnetic fields used to read them. Others use a local power source and emit radio waves (electromagnetic radiation at radio frequencies). The tag contains electronically stored information which can be read from up to several meters (yards) away.

Unlike a bar code, the tag does not need to be within line of sight of the reader and may be embedded in the tracked object.

RFID tags are used in many industries. An RFID tag attached to an automobile during production can be used to track its progress through the assembly line. Agricultural products can be tracked through warehouses. Livestock and pets may have tags injected, allowing positive identification of the animal. Since RFID tags can be attached to clothing, possessions, or even implanted within people, the possibility of reading personally-linked information without consent has raised privacy concerns.

RFID tags for animals represent one of the oldest uses of RFID technology. Originally meant for large ranches and rough terrain, since the outbreak of mad-cow disease, RFID has become crucial in animal identification management. An implantable RFID tag or transponder can also be used for animal identification. The transponders are more well-known as passive RFID technology, or "chips" on animals. Implantable RFID chips designed for animal tagging are now being used in humans. Privacy advocates have protested against implantable RFID chips, warning of potential abuse.

i) Innovative Technologies in Logistics

Dear learner, do you know the innovative technologies used in logistics? List some of them (You can take 5 minutes to write your responses on the spaces given below):

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New technologies are often the cornerstone for logistics innovations. In intra-logistics, for instance, a shift from central management of material flows to decentralization and modularization in conveyor technology is taking place. As part of this change, standardized mechanical elements that can be freely combined with one another draw on their own individual power supplies.

Containers

Dear learner you remember what you covered about the role of containers in managing logistics and transport systems in agribusiness. It is a tool which serves the transport system for decades all over the world, and it includes:

- **Reefer containers:** are used to control the temperature so the products maintain their quality. The use of relatively new 45’ foot reefer is growing. A refrigerated container or reefer is an intermodal container (shipping container) used in intermodal

freight transport that is refrigerated for the transportation of temperature sensitive cargo. While a reefer will have an integral refrigeration unit, they rely on external power, from electrical power points at a land based site, a shipper on quay. When being transported over the road on a trailer they can be powered from diesel powered generators ("gen sets") which attach to the container whilst on road journeys. Some reefers are equipped with a water cooling system, which can be used if the reefer is stored below deck on a vessel without adequate ventilation to remove the heat generated. Water cooling systems are expensive, so modern vessels rely more on ventilation to remove heat from cargo holds, and the use of water cooling systems is declining. The impact on society of reefer containers is vast, allowing consumers all over the world to enjoy fresh produce at any time of year and experience previously unavailable fresh produce from many other parts of the world.

- **MAERSK container:** offers a reefer container with a controlled atmosphere. This is technically difficult. Location and height of the pallets are critical. As a result, both temperature and composition and concentration of the gasses in the container can be controlled interactively during transport. As a result, customers can influence the ripeness of the products when they arrive. They use this to get a better price on the market.

- **Ventilated containers**: are also known as passive (naturally) ventilated or coffee containers. Ventilation is provided by ventilation openings in the top and bottom side rails. The openings do not let in spray, to prevent depreciation of the cargo by rain or spray. For example: If actively ventilated containers are required, i.e. containers with adjustable ventilation, "porthole" containers may be used, which simultaneously act as insulated or refrigerated containers.

Ships

We see in the overseas transport the use of fast ships. More than twice as fast as normal sea freight and less than half the costs of air transport. Currently the average transatlantic trip takes about seven to ten days door-to-door. So-called fast ships, mostly catamarans operated on shuttle services can bring this down to four days. A catamaran is a type of multihull boat or ship consisting of two hulls, or vakas, joined by some structure, the most basic being a frame, formed of akas. By applying roll on roll off facilities, unloading is reduced to six hours instead of the usual 28 to 48 hours. Ships are also using less fuel compared to normal ships, saving up to one third of what a normal ship is using.

Trucks

On the European roads a new phenomenon is the road train: trucks with a train length of 25m instead of 18m (the European definition. Two such road trains have the same loading capacity as three normal Lorries. Furthermore, costs for fuel and labour are reduced by at least 40%. Road trains are suitable for transporting high volumes of goods over longer distances, thus competing with train.

ii) Communication and Standardization for Quality

What are Electronic Data Interchange (EDI) and Order Picking Systems? What do they contribute for logistic development in agribusiness? (You can take 10 minutes to write your responses on the spaces given below)

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Electronic Data Interchange (EDI)

EDI has been defined as computer-to-computer exchange of structured data for automatic processing. EDI is used by supply chain partners to exchange essential information necessary for the effective running of their businesses. These structural links are usually set up between organizations that have a long-term trading relationship. For example, some multiple retailers will supply electronic point-of-sale (EPOS) data directly to suppliers, which in turn triggers replenishment of the item sold. As a consequence of this type of strong link, suppliers will be able to build a historical sales pattern that will aid their own demand forecasting activities. In this context, EDI has many benefits. It is providing timely information about its customers' sales, it is highly accurate and it is very efficient because it does not require staff to collate the information manually. EDI is used to send invoices, bills of lading, confirmation of dispatch, shipping details and any information that the linked organizations choose to exchange.

The main advantages of using EDI are:

- Information needs to be entered on to the computer system only once;
- Speed of transactions;
- Reduced cost and error rates.

Order Picking Systems

According to major researchers, order picking can be defined as the activity by which a small number of goods are extracted from a warehousing system, to satisfy a number of independent customer orders. In recent years picking activity has achieved more and more a crucial role in the context of the supply chain, both from the production system point of view of (i.e. the supply of assembly stations with assembly kits) and from the point of view of the distribution activities (i.e. preparation of the goods for the final customer). In fact this activity is characterized by high intensity of manual work, which deeply impacts both upon overall logistic costs and upon the level of the service provided to the customer. In many cases, as some researchers have highlighted, the costs related to the order picking activity impact for more than a half of the total costs of a warehouse.

Order Picking System Classification

Moving from the original classification proposed by Sharp (1992), we classify OPS solutions into four categories:

- picker-to-part system (also known as "man-to-materials")
- part-to-picker system (also known as "materials-to-man")
- sorting system
- pick to box system

The "**Picker-to-part" solution** represents one of the most common cases and can be considered as the basic solution for the picking activity. It generally consists of a storage area, a forward area (called also picking area) and a material handling system to connect them (basically reach trucks that refill picking locations).

The logical elements which compose the **"part-to-picker" solution** are: storage area, forward area, material handling system (i.e. conveyors or trucks) which connects them, called also "feeding system" of the forward area. The forward area is constituted only by picking bays. The unit loads required to fulfill a given number of orders are retrieved from the storage area and moved to the picking bays. An operator is present at each bay, picking up goods from the unit loads. When all the required items have been picked up from all the operators, the remaining ones (on unit load) go back to the storage area, waiting to be selected for a new retrieval operation.

The logical elements which compose the **"sorting" system** are: storage area, forward area, replenishment system of the forward area, sorter. Operators in the forward area retrieve the amount of each single item resulting from the batching of multiple orders and put it on a conveyor connecting the forward area with the sorting area. The conveyor crosses the isles of the forward area, so that each operator can work in a smaller part of the forward area. Most

of the time, the sorting is carried out by an automatic material handling system consisting in multiple conveyors and sorting devices.

The **"Pick-to-box" system** represents an alternative to the "sorting" system, and it's composed by similar logical elements: storage area, forward area, replenishment system of forward area, sorter. The forward area is separated in multiple picking zones, each of them being assigned to an operator. The picking zones are connected by a conveyor on which boxes filled up with picked items are placed, each of them corresponding (partially or completely) to a customer order ("order picking" policy). Therefore a line-end sorting per each order is not necessary any more, but box sorting on the basis of the destination (i.e. carrier) is sufficient, since the order has been already prepared.

iii) Collaborative Planning for Connectivity Transparency

Dear learner, have you ever heard about collaborate planning? How do we apply in logistics? (You can take about 5 minutes to minutes to write your responses on the space given below);

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Overtime, there have been numerous industry initiatives that have attempted to create efficiency and effectiveness through integration of supply chain activities and processes. They have been identified by names such as quick response, electronic data interchange (EDI), short cycle manufacturing, vendor managed inventory (VMI), continuous-replenishment planning (CRP), and efficient consumer response (ECR). One by one, each fell short of expectations, particularly in its ability to integrate supply chain activities among the many participants.

One of the most recent initiatives, aimed at achieving true supply chain integration, is collaborative planning, forecasting, and replenishment (CPFR). It has become recognized as a breakthrough business model for planning, forecasting, and replenishment. Using this approach, retailers, transport providers, distributors, and manufacturers can utilize available Internet-based technologies to collaborate from operational planning through execution. Whereas historically, for a single product, retailers and manufacturers may have had twenty or more types of forecast between them- each developed for a special purpose, each more or less accurate, and all trying to predict behavior of buyers in the market place – CPFR simplifies and streamlines overall demand planning.

CPFR seeks cooperative management of inventory through joint visibility and replenishment of products throughout the supply chain. Information shared between suppliers and retailers

aids in planning and satisfying customer demands through a supportive system of shared information. This allows for continuous updating of inventory and upcoming requirements, making the end-to-end supply chain process more efficient. Efficiency is created through the decrease expenditures for merchandising, inventory, logistics, and transportation across all trading partners.

The CPFR initiative begins with the sharing of marketing plans between trading partners. Once an agreement is reached on the timing and planned sales of specific products, and a commitment is made to follow that plan closely, the plan is then used to create a forecast, by stock keeping unit (SKU), by week, and by quantity. The planning can be for thirteen, twenty six, or fifty two weeks. A typical forecast is for seasonal or promotional items that represent approximately 15 percent of sales in each category. The regular turn items, or the remainder of products in the category, are forecast statistically. Then, the forecast is entered into a system that is accessible through the Internet by both supplier and buyer. Either party is empowered to change the forecast, within established parameters.

CPFR originally was presented by VICS in their VICS CPFR Guidelines in 1998 as a 9 step (or data flow) process, starting with the collaborating businesses developing the agreement for collaboration. The 9 steps were:

i) Develop Front End Agreement
ii) Create the Joint Business Plan
iii) Create the Sales Forecast
iv) Identify Exceptions for Sales Forecast
v) Resolve/Collaborate on Exception Items
vi) Create Order Forecast
vii) Identify Exceptions for Order Forecast
viii) Resolve/Collaborate on Exception Items
ix) Order Generation

The center of the CPFR model is represented as the consumer, followed by the middle ring of the retailer, and finally the outside ring being the manufacturer. Each ring of the model represents different functions within the CPFR model. The consumer drives demand for goods and services while the retailer is the provider of goods and services. The manufacturer supplies the retailer stores with product as demand for product is pulled through the supply chain by the end user, being the consumer.

Some of the main processes shown in the model can be found in the second ring that has arrows in a circular pattern. This is displayed with collaboration arrangement, joint business plan, sales forecasting, order fulfillment etc. This stage will be described in detail below:

Logistics in value chain

- Strategy & Planning, Collaboration Arrangement is the process of setting the business goals for the relationship, defining the scope of collaboration and assigning roles, responsibilities, checkpoints and escalation procedures. The Joint Business Plan then identifies the significant events that affect supply and demand in the planning period, such as promotions, inventory policy changes, store openings/closings, and product introductions.
- Demand & Supply Management is broken into Sales Forecasting, which projects consumer demand at the point of sale, and Order Planning/Forecasting, which determines future product ordering and delivery requirements based upon the sales forecast, inventory positions, transit lead times, and other factors. Execution consists of Order Generation, which transitions forecasts to firm demand, and Order Fulfillment, the process of producing, shipping, delivering, and stocking products for consumer purchase.
- Analysis tasks and Exception Management, the active monitoring of planning and operations for out-of-bounds conditions, and Performance Assessment, the calculation of key metrics to evaluate the achievement of business goals, uncover trends or develop alternative strategies.

Learning Activity:

Select one organization engaged in agro processing. Study and assess the information technologies applied in logistics.

Continuous Assessment:

Quiz/test and Presentation

Logistics in value chain

Summary

A barcode is a series of parallel black and white bars, both of varying widths, whose sequence represents letters or numbers. There are two types of scanners used to read barcodes: automatic and handheld.
Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.

There are new technologies currently used in logistics: reefer, maersk, catamaran and etc. A refrigerated container or reefer is an intermodal container (shipping container) used in intermodal freight transport that is refrigerated for the transportation of temperature sensitive cargo. Maersk offers a reefer container with a controlled atmosphere. A catamaran is a type of multihull boat or ship consisting of two hulls joined by some structure.

EDI is computer-to-computer exchange of structured data for automatic processing. EDI is used by supply chain partners to exchange essential information necessary for the effective running of their businesses. Order picking is the activity by which a small number of goods are extracted from a warehousing system, to satisfy a number of independent customer orders.

Collaborative planning is a breakthrough business model for planning, forecasting, and replenishment. Using this approach, retailers, transport providers, distributors, and manufacturers can utilize available Internet-based technologies to collaborate from operational planning through execution.

3.6. Proof of ability

Logistics in value chain

In this part, students will be assessed for overall competencies that cover the entire learning. The mode of assessment will include summative exams and task based interviews. it covers 40-50% of the overall assessment.

Product: the student has	**Criteria (Mode of assessment)**
Demonstrated management capacity of warehouses	Use of Steps in the application of theories and concepts of warehouse management (Written exam, Task based interview)
Handled products	Pursue quality and safety procedure(Criteria based interview)
Controlled inventories	Application of inventory control procedures (Written exam)
Managed transportation	Explanation of steps used to facilitate transportation, applied models (Written exam, task based interview)
Mobilized resource use	Shown ability to mobilize resources, and explained steps used in monitoring (Written exam)

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