LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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Reference:

Logistics and Supply Chain Management

- K.Shridhara Bhat

SUPPLY CHAIN

- Supply chain refers to the way that materials flow through different organizations, starting with raw-materials and ending with finished products delivered to the ultimate customer.
- A supply chain is a sequence of suppliers, transporters, warehouses, manufacturers, wholesalers or distributors, retail outlets and final customers. Different companies may have different supply chains due to the nature of their operations and whether they are primarily a manufacturing operation or a service operation.

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SUPPLY CHAIN MANAGEMENT

- Supply chain management is a collection of actions required to co-ordinate and manage all activities necessary to bring a product to market, including processing raw-materials, producing goods, transporting and distributing those goods and managing the selling process.

- Jules Abend

- Supply chain management is a ability to get closer to the customer.

- Marty Weil

- Supply chain management is the process of planning, implementing and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently as possible. Supply chain management spans all movement and storage of raw-materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption.

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IMPORTANCE OF SUPPLY CHAIN MANAGEMENT

1. The total time for materials to travels through the entire supply chain can be quiet long (say six months to one year or more). Since the materials spend so much time waiting in inventory at various stages in the supply chain, there is a great opportunity to reduce the total supply chain cycle time leading to a corresponding reduction in inventory, increased flexibility, reduced costs and better deliveries.

2. The goals of supply chain management are to reduce uncertainty and risks in the supply chain.

3. The design, planning and operation of a supply chain have a strong impact on overall profitability and success.

4. Supply-chain management has become a hot competitive advantage as companies struggle to get the right stuff to the right place at the right time.

5. Supply chain management includes transportation vendors, suppliers, distributors, banks, credit and cash transfers, bills payable and receivable, warehousing and inventory levels, order fulfillment and sharing customer, forecasting and production information.

6. Increase their competitiveness via product customization, high quality, cost reductions and speed-to-market.

7. Supply chain management builds a chain of suppliers that focus on both minimizing waste and maximizing value to the ultimate customer.

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OBJECTIVES OF A SUPPLY CHAIN

1. To maximize the overall value generated

2. To achieve maximum supply chain profitability. Supply chain profitability is the total profit to be shared across all supply chain stages.

3. To reduce the supply chain costs to the minimum possible level.

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DECISION PHASES IN A SUPPLY CHAIN

1. Supply chain strategy or design

2. Supply chain planning and

3. Supply chain operation.

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DECISION PHASES IN A SUPPLY CHAIN

1. Supply chain strategy or design:
   - The location and capacities of production and warehousing facilities
   - Products to be manufactured or stored at various locations
   - Modes of transportation to be made available along different shipping legs
   - Type of information system to be utilized

2. Supply chain planning: The planning phase starts with a forecast for the coming year of demand in different markets. Supply chain planning includes decision regarding the following:
   - Which market to be served from which locations
   - The subcontracting of manufacturing
   - Policies regarding back up locations in case of a stock out and
   - The timing and size of marketing promotions.

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DECISION PHASES IN A SUPPLY CHAIN

3. Supply chain operations: During this phase, companies make decisions for the time horizon (weekly or daily) regarding individual customer orders. The supply chain operation aims at implementing the operating policies in the best possible manner. Various activities involved in these phases are:

- allocating individual orders to inventory or production
- setting dates for fulfilling orders
- generating pick lists at a warehouse
- allocating an order to a particular shipping mode or shipment
- getting delivery schedules of trucks and
- placing replenishment orders.

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PROCESS VIEW OF A SUPPLY CHAIN

Two different way to view the process performed in a supply chain are:

1. Cycle view 2. The push-pull view

1. Cycle view: According to this view, the processes in a supply chain are divided into a series of cycles, each performed at the interface between two successive stages of a supply chain. All supply chain processes can be broken down into the following four process cycles.

- Customer order cycle
- Replenishment cycle
- Manufacturing cycle
- Procurement cycle

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PROCESS VIEW OF A SUPPLY CHAIN

a) Customer order cycle

- Customer arrival refers to the customers visiting the location (super market or retail store) where he or she has access to his or her choices and make a decision regarding what to buy, how much to buy and so on.
- Customer order entry refers to customers telling the retailer what products they want to buy and the retailer allocating those products to customers.
- Customer order fulfillment refers to process by which the customer order is filled and sent to the customer.
- Customer order receiving refers to the process by which customer receives what he has ordered and takes ownership of the products ordered.

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PROCESS VIEW OF A SUPPLY CHAIN

b) Replenishment cycle

- Retail order trigger: As and when the retailer fills customer order, inventory is depleted which must be replenished to meet future demand. The retailer devises a replenishment or ordering policy which triggers an order on the distributor so as to maximize profitability by balancing product availability and cost.
- Retail order entry: The retailer places the order with the distributor or manufacturer. The purpose of the retail order entry process is to ensure that an order is entered accurately and conveyed quickly to all supply chain processes affected by the order.
- Retail order fulfillment: This is a process by which retail order is filled by the distributor or manufacturer. The objective is to get the replenishment order to the retailer on time while minimizing costs.
- Retail order receiving: When the replenishment order arrives at a retailer, the retailer must receive it physically, update all inventory records and settle all product from distributor to the retailer as well as information and financial flows. This process helps to update inventories and displays quickly at the lowest possible cost.

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PROCESS VIEW OF A SUPPLY CHAIN

c) Manufacturing cycle: This occurs at the distributor or manufacturer interface and includes all processes involved in replenishing distributor (or retailer) inventory. The process involved in the manufacturing cycle include

- Order arrival from the distributor, retailer or customer
- Production scheduling
- Manufacturing and shipping and
- Receiving at the distributor, retailer or customer

d) Procurement cycle: This occurs at the manufacturer or supplier interface and includes all processes necessary to ensure that materials are available for carrying out manufacturing as per the schedule. The manufacturer orders components from suppliers to replenish inventories. Competent orders are based on the production schedule.

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PROCESS VIEW OF A SUPPLY CHAIN

2. Push / Pull view of supply chain process

All processes in the supply chain fall into one of two categories:

1) Push processes

2) Pull processes

In pull processes, execution is initiated in response to a customer order. In push processes, execution is in anticipation of customer order. At the time of execution of pull process demand is known with certainty, whereas at the time of execution of push process demand is not known but forecasted.

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PROCESS VIEW OF A SUPPLY CHAIN

A push or pull view of the supply chain is useful when considering strategic decisions relating to supply chain design. This view facilitates a more global consideration of supply chain processes as they relate to a customer order. Pull processes may be regarded as reactive processes because they react to customer demand. Push processes may be regarded as speculative process because they respond to forecast (speculative) demand rather than actual demand.

The push or pull boundary in a supply chain helps to separate, push processes from pull processes. For example: In a computer manufacturing company manufacturing personal computers the beginning of assembly process represents the push or pull boundary. All processes carried out prior to assembly are push processes and all processes carried out after and including assembly are pull processes because they are initiated in response to a customer order.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

1. Purchasing

2. Logistics

3. Warehousing and expediting

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

1. Purchasing: Purchasing is responsible for obtaining the materials, parts and supplies needed to produce a product or provide a service. The importance of purchasing is not only just the cost of goods purchased, but also the quality of goods and services and the timing of deliveries of goods and services.

- Purchasing interfaces: Purchasing is the link between the organisation and its suppliers. It exchanges information with suppliers and functional areas.
- Operating units constitute the main source of requests for purchased materials and close co-operation between these units and the purchasing department is vital if quality, quantity and delivery goals are to be met. The purchasing department may require the assistance of the legal department in contract negotiations and to help interpret legislation on pricing, product liability and contracts with suppliers.
- Accounting is responsible for handling payments to suppliers, data processing is handled by the accounts departments which keeps inventory records, checks invoices and monitors vendor performance.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

- Design and engineering usually prepare material specifications which must be communicated to purchasing. Also, design and purchasing people may work closely to determine whether changes in specifications, design or materials can reduce the cost of purchased items.
- Receiving checks incoming shipments of purchased items to determine whether quality, quantity and timing objectives have been met and moves the goods to temporary storage. Purchasing must be notified when shipments are delayed, accounting must be notified when shipments are received so that payments can be made.
- Suppliers or vendors work closely with purchasing to learn what materials will be purchased and what kinds of specifications will be required in terms of quality, quantity and deliveries

The purchasing cycle:

- Purchasing receives the requisition
- Purchasing selects a supplier
- Purchasing places the order with the vendor
- Monitoring orders and
- Receiving orders

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

Outsourcing: Outsourcing refers to buying goods or services from outside sources instead of making the goods or providing the services within the firm. The reasons for outsourcing are:

- Outside source can provide materials, parts or services better, cheaper or more efficiently
- A supplier may hold a patent on a necessary part/component
- To have the advantage of flexibility
- Improve company focus
- Share risks
- Make capital funds available
- Reduce and control operating costs

JIT Purchasing: Just-in-time manufacturing techniques requires just-in-time purchasing. The easy part of JIT purchasing include having to deal with fewer suppliers and forming long-term relationships with suppliers who emphasise co-operative spirit than low price. On-time delivery is usually the primary need of JIT manufacturers.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

Suppliers

Good suppliers are a vital link in the supply chain. Late deliveries of parts or materials or missing or defective items can disrupt production schedules, increase inventory costs and cause late deliveries of end products.

Choosing suppliers: When choosing suppliers, the key considerations are:

- Quality of the products or services and
- On-time delivery

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

Factors to be considered while choosing a supplier:

- Lead times and on-time delivery
  - What lead times can the supplier provide?
  - What procedure does the supplier have for assuring on-time deliveries?
  - What procedures does the supplier have for documenting and correcting delivery problems?
  - Are there procedures?
- Quality and Quality Assurance
  - What procedures does the supplier have for quality control and quality assurance?
  - Are problems and corrective actions for quality documented?
  - Are investigations conducted to determine and correct the causes of non-conforming materials?

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

- Flexibility
  - How flexible is the supplier in handling changes in quantity, delivery schedules and product or service changes?
- Location
  - Is the supplier located nearby?
- Price
  - Are prices reasonable given the entire package the supplier will provide?
  - Is the supplier willing to negotiate prices?
  - Is the supplier willing to engage in a joint effort to reduce costs (and prices)?
- Product or service changes
  - How much advance notifications does the supplier give when changes are made in products or services?
  - How financially stable is the supplier?
- Other accounts
  - Is the supplier heavily dependent on other buyer (s), causing the risk of giving priority to another buyer's needs over ours?

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

Evaluating Sources of Supply (Vendor Analysis)

1. Price: This is the most obvious factor, along with any discounts offered, although it may not be the most important.

2. Quality: A company may be willing to spend more money to obtain high quality.

3. Services: Special services such as replacement of defective items, instruction in the use of equipment, repair of equipment and the like can be key factors in selecting one supplier over another.

4. Location: Location of the supplier can have impact on shipping time, transportation costs and response time for rush orders or emergency service. Local buying can create goodwill in the community by helping the local economy.

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5. Inventory Policy of Supplier: If a supplier maintains an inventory policy of keeping spare parts on hand, this could be helpful in case of an emergency equipment break down.

6. Flexibility: The willingness and ability of a supplier to respond to changes in demand and to accept design changes could be important considerations.

- Supplier Audits: Periodic audits of suppliers are helpful in getting current information on supplier's production capabilities, quality and delivery problems and so on.
- Supplier Certification: Supplier certification is a detailed examination of the policies and capabilities of a supplier. This is particularly important when buyers are seeking to establish long-term relationship with suppliers.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

- Supplier Partnerships: Japanese firms have been very successful in building good relationships with their suppliers and getting numerous benefits from good supplier relations, including supplier flexibility in terms of accepting changes in delivery schedules, quality and quantities. Moreover, suppliers can often help identify problems and offer suggestions for solving them. Many Japanese firms rely on one or a few suppliers to handle their needs while many US firms deal with numerous suppliers. Of late, the US firms have also moved in the direction of reducing the number of suppliers.
- Reduce the cost of making the purchase
- Reduce transportation costs
- Reduce production costs
- Improve product quality
- Improve product design
- Reduce the time it takes to get the product to the market
- Improve customer satisfaction
- Reduce inventory costs and
- Introduce new products or processes

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

2. Logistics

- Logistics refers to the movement of materials within a production facility, the shipment of incoming materials from suppliers and the shipment of outgoing products to customers. Materials include all the physical items used in the production process such as raw materials, parts, components, consumable supplies, fuel, equipments, tools, office supplies and so on.
- Movement within a facility: The activities involved in the movement of materials within a production facility are:
  - Removing materials from incoming vehicles and placing them on the receiving dock.
  - Moving materials from the receiving dock to inspections.
  - Moving materials from inspection to the warehouse and strong them until needed.
  - Retrieving materials from the warehouses and delivering them to production operations when needed.
  - Moving materials between production operations.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

- Moving finished products from final assembly and storing them in the finished goods warehouse
- Retrieving finished goods from the finished goods warehouse and delivering them to packaging and shipping departments.
- Moving packaged finished goods to the shipping dock and
- Loading finished goods into outgoing vehicles at the shipping dock.

- Incoming and Outgoing Shipments : Overseeing the shipment of incoming and outgoing goods comes under the heading of traffic management.
- Computer tracking of shipments (using global positioning systems) often helps to maintain knowledge of the current status of shipments as well as to provide other up-to-date information on costs and schedules.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

3. Warehousing and Expediting

- Warehousing is the management of materials while they are in storage. It includes storing, dispersing, ordering and accounting for all materials and finished goods from the beginning to the end of the production process.

Contemporary Developments in Warehousing

- Bar Coding: The bar codes (or the universal product codes) are read by scanning devices that use the information for a variety of purposes, such as recording prices and quantities, printing sales receipts and updating inventory records.
- Bar codes are also useful in manufacturing and distribution. In distribution, companies can keep track of items in warehouses and enroute to customers. Managers can instantaneously determine the location of any item in the system and its status. (for example, enroute to customer, delivered to customer). In manufacturing, bar codes track the progress of jobs just before each operation and specific processing instructions for each job can be provided to operators. They are also used to update inventory records, monitor quality losses and monitor productivity.

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NATURE AND SCOPE OF SUPPLY CHAIN MANAGEMENT

Electronic Data Interchange: Electronic data interchange (EDI) is the direct transmission of inter-organisation transactions. EDI also known as "quick response".

- Increased productivity
- Elimination of paper work
- Lead time and inventory reduction
- Facilitation of just-in-time systems
- Electronic transfer of funds
- Improved control of operations
- Reduction in clerical work and
- Increased accuracy

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GLOBAL BUSINESS STRATEGY

Companies that pursue a global business strategy focus on increasing profitability by tasking advantage of cost reductions. This business strategy is known as low-cost strategy or cost-leadership strategy. The firms pursuing a global business strategy concentrate their production, marketing and research and development activities in a few favourable locations. Global firms prefer to market a standardized product (referred to as "global product") worldwide. Thus global firms are able to

- earn a greater return on investment from their skills and core competencies
- realize location economies where they can perform most effectively and
- realize greater experience curve economies which reduces the cost of production.

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GLOBAL BUSINESS STRATEGY

THE CONCEPT OF GLOBAL LOGISTICS AND GLOBAL SUPPLY CHAINS

- Two major aspects of global logistics and supply chain management are:
- global or international sourcing and
- global manufacturing or focused manufacturing.

Global sourcing which is also referred to as outsourcing involves procurement of raw materials, components, parts, sub units and finished goods from foreign suppliers. It is a critical component of the logistics supply chain in many global companies. The major reason for outsourcing is lower cost. Lower labour costs in developing countries mean lower prices for materials and higher profits for the buying firm.

The trend today is to outsource from any part of the world that offers a cost advantages and move it to any destination through the global logistics chain. This concept is extended by shifting production to a foreign country which is known as global manufacturing or focused manufacturing. The global logistics is responsible to ensure that the finished products are at the right place, in the right quantity, at the right time anywhere in the global market place.

Global corporations design their operating strategy objectives around four components (i) technology, (ii) marketing, (iii) manufacturing and (iv) logistics.

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GLOBAL BUSINESS STRATEGY

- For example, Toyota has a strategy of producing more automobiles within the national markets and outsource parts and components from Japan and other countries instead of producing automobiles solely in Japan for export throughout the world. Toyota has developed the Just-In-Time concept for global operations. By refining its information and planning systems, it is capable of outsourcing parts and components from many different countries for its manufacturing plants in twenty-five countries all over the world.

For companies serving global markets, logistics networks tend to become more expensive and complex. As a result, usually, lead times increase and inventory levels rise. Therefore, to operate successfully in a time-based competitive environment, firms emphasise managing logistics as a system, shortening lead times when possible, and moving towards focused manufacturing.

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CONVENTIONAL SUPPLY CHAIN

- In the **conventional supply chain**, store brands typically trust the contract manufacturer to buy the raw material. The manufacturer may buy from perhaps five different exporters from a number of different countries to spread their risk and be able to buy any particular species at the lowest price.

Reference:

https://www.researchgate.net/figure/Differences-between-a-conventional-supply-chain-and-one-adopting-AM_tbl2_308390849

SUPPLY CHAIN PARTICIPANTS

- Four Participants in Every Supply Chain

1. Producers

- Producers or manufacturers are organizations that make a product. This includes companies that are producers of raw materials and companies that are producers of finished goods. Producers of raw materials are organizations that mine for minerals, drill for oil and gas, and cut timber. It also includes organizations that farm the land, raise animals, or catch seafood. Producers of finished goods use the raw materials and sub-assemblies made by other producers to create their products.

2. Distributors

- Distributors are companies that take inventory in bulk from producers and deliver a bundle of related product lines to customers. Distributors are also known as wholesalers. They typically sell to other businesses and they sell products in larger quantities that an individual consumer would usually buy. Distributors buffer the producers from fluctuations in product demand by stocking inventory and doing much of the sales work to find and service customers. For the customer, distributors fulfill the "Time and Place" function – they deliver products when and where the customer wants them.

Reference:

https://www.researchgate.net/figure/Differences-between-a-conventional-supply-chain-and-one-adopting-AM_tbl2_308390849

SUPPLY CHAIN PARTICIPANTS

•A distributor is typically an organization that takes ownership of significant inventories of products that they buy from producers and sell to consumers. In addition to product promotion and sales, other functions the distributor performs are ones such as inventory management, warehouse operations and product transportation as well as customer support and post sales service. A distributor can also be an organization that only brokers a product between the producer and the customer and never takes ownership of that product. This kind of distributor performs mainly the functions of product promotion and sales. In both these cases, as the needs of customers evolve and the range of available products changes, the distributor is the agent that continually tracks customer needs and matches them with products available.

3. Retailers

•Retailers stock inventory and sell in smaller quantities to the general public. This organization also closely tracks the preferences and demands of the customers that it sells to. It advertises to its customers and often uses some combination of price, product selection, service, and convenience as the primary draw to attract customers for the products it sells. Discount department stores attract customers using price and wide product selection. Upscale specialty stores offer a unique line of products and high levels of service. Fast food restaurants use convenience and low prices as their draw.

4. Customers

•Customers or consumers are any organization that purchase and use a product. A customer organization may be an organization that purchases a product in order to incorporate it into another product that they in turn sell to other customers. Or a customer may be the final end user of a product who buys the product in order to consume it.

Reference:

https://www.researchgate.net/figure/Differences-between-a-conventional-supply-chain-and-one-adopting-AM_tbl2_308390849

UNIT LOAD

- The term **unit load** refers to the size of an assemblage into which a number of individual items are combined for ease of storage and handling, for example a pallet load represents a unit load which can be moved easily with a pallet jack or forklift truck, or a container load represents a unit for shipping purposes. A unit load can be packed tightly into a warehouse rack, intermodal container, truck or boxcars, yet can be easily broken apart at a distribution point, usually a distribution center, wholesaler, or retail store for sale to consumers or for use.
- Most consumer and industrial products move through the supply chain in unitized or unit load form for at least part of their distribution cycle. Unit loads make handling, storage, and distribution more efficient. They help reduce handling costs and damage by reducing individual handling.
- A typical unit load might consist of corrugated fiberboard boxes stacked on a pallet or slip sheet and stabilized with stretch wrap, pressure-sensitive tape, strapping or shrink wrap.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

UNIT LOAD

Concept of Unit Load:

- Principle of Unit Load states that, **"it is quicker and economical to move a lot of items at a time rather to move each one of them individually".** In other words this principle suggested that, the larger the load handled, the lower the cost per unit handled.
- For small parts, or parts where machines are engaged for handling, movements are made in containers. When machines are used for materials handling, units can be made machine size rather man size. Unit load principle implies that materials should be handled in most efficient, maximum size unit, mechanical means to reduce the number of moves needed for a given amount of material.
- A number of items, or bulk material, so arranged or restrained that the mass can be picked up and moved as a single object too large for manual handing, and which upon being released will retain its initial arrangement for subsequent movement.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

UNIT LOAD

Characteristics of a Unit Load:

- 1. There should be minimum number of handlings.
- 2. Manual handling should be eliminated.
- 3. Materials are assembled into a unit load for economy of handling and storage.
- 4. Redesign packages, containers etc. for better assembly into unit loads and retain them to prevent product damage.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

TYPES OF UNIT LOADS

1. Unit Load on a Platform:

(i) Pallet:

- Pallet is a horizontal portable platform device used as a base for handling materials in a unit load. Pallet is basically a portable platform, with or without superstructure, and consists of two decks separated by bearers or a single deck supported by small feet and handled by means of fork lift trucks and pallet trucks. The pallets may be flat pallets, box pallets and post pallets

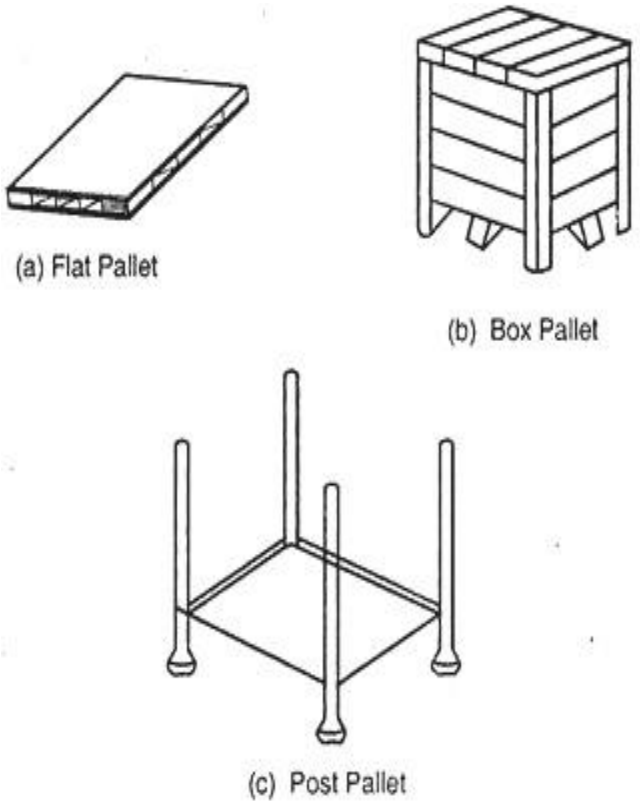

Fig. 34.1. Pallete

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

TYPES OF UNIT LOADS

(ii) Skid:

- These are non-stackable, single-faced device elevated above the floor to allow lifting by lift trucks. Goods may be loaded on the skids and then picked up with lift trucks. The skid can be loaded as a unit and transferred from position to position without subsequent loading and unloading like pallets

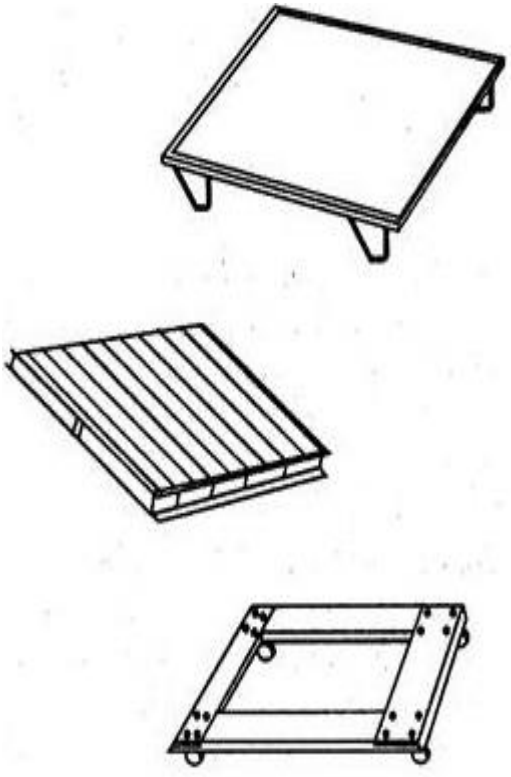

Fig. 34.2. Skids

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

TYPES OF UNIT LOADS

2. Unit Load on a Sheet:

(i) Flat Sheets:

- The sheet may be plain or corrugated, and made of cardboard, chip board or plywood.

(ii) Molded Sheets:

- These are especially formed to facilitate building the load. These sheets are made in such way that they have hollow spaces for fork entry.

3. Unit Load on a Rack or Trays:

- These racks or trays are designed to hold parts in a desired position and may have wheels. These are provided with inserts, holes or pegs or dividers for ease of handling and inspection etc.

4. Unit Load in a Container:

- Containers are made in the form of full or partial enclosures to suit requirements. Containers include boxes, bins, crates etc.

5. Self-contained Unit Load:

- These do not require auxiliary aids. Examples of such unit loads are bundles, bales, interlocked unit loads and fastened unit loads.

Reference:

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SECURING THE UNIT LOAD

Securing the Unit Load:

Commonly used methods of securing the unit loads (unitizing) are:

- 1. Wire.
- 2. Steel trap.
- 3. Cloth or paper tape.
- 4. Adhesive.
- 5. Chip board or paper sheet.
- 6. Containers.
- 7. Clamps.
- 8. Interlocking.

Reference:

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DESIGNING THE UNIT LOAD SYSTEM

- ***Designing the Unit Load System:***
- **(A) Factors considered for designing:**
- **For designing (planning) the unit load system following factors should be considered:**
- 1. Material and its characteristics.
- 2. Quantity to be handled and duration.
- 3. Starting point and destination.
- 4. Loading and unloading techniques.
- 5. Objective of space utilisation.
- 6. Environment, storage requirements in route.
- 7. Limitations of aisles, doors, height, column, machine arrangement, and storage space dimensions, etc.
- 8. Weight limitations.
- 9. Volume limitations.
- 10. Cost of handling equipment and other handling aids.
- 11. Cost of consumable (expendable) unitizing materials.
- 12. Labour cost.
- 13. Time consumed in preparing the unit load.
- 14. Cost of entire handling system.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

DESIGNING THE UNIT LOAD SYSTEM

(B) Criteria for unit load design:

- 1. Mechanical strength.
- 2. Low cost.
- 3. Disposable.
- 4. Optimum size.
- 5. Universal in application.
- 6. Stackable.
- 7. Easy to store.
- 8. Versatility.
- 9. Ease of unitising or de-unitising.
- 10. Low maintenance

(C) Unit Load Design:

- After having understood the factors and criteria for unit load design, next step is to design (or plan) the unit loads. A logical approach must be followed to solve the unit load problem.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

GUIDELINES

For this purpose following guidelines must be followed:

1. Whether unit load concept is necessary:

- First of all it is necessary to determine whether there is need for unitizing at all? For this purpose size, volume, frequency of movement, distance, equipment used, cost justification, and customers' acceptance are the main considerations. If it is found necessary to have unit load design, we should move to next step.

2. Selection of type of unit load:

- Type of unit load is selected by considering the materials whether it can withstand load, and whether its irregular shape is strong enough to support the load.

3. Establish distribution requirement:

- Objective of designing a unit load is more efficient shipping and subsequent handling, storage and disbursement.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

GUIDELINES

4. Determining the size of unit load:

- Size and shape of the unit load is decided considering the size and shape of the product, size of the shipping container.

5. Configuration of the unit load:

- This includes the shape and pattern of the loading, shape and dimensions of the items to be unitised and whether the items are unstackable, whether auxiliary attachments like sides, ends or corners, or some kinds of container can be provided to unitize the load.

6. Method of building the unit load:

- Method of building the load is decided considering different factors along with some additional factors, like, unitising aids, methods of building unit load i.e. manual, semi-mechanised or palletizers, and method of securing the unit load e.g. steel strap, wire, rope, tape of cloth or paper, adhesives, chip board or paper sheets, rubber bands, filament tapes, storage aids, interlocking etc.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

ADVANTAGES

Advantages of Unit Load Concept:

- 1. Possible to handle large loads.
- 2. Reduce handling cost of one unit.
- 3. Reduce packaging costs.
- 4. Maximise space utilisation.
- 5. Faster movement of materials.
- 6. Reduces loading and unloading time.
- 7. Reduces pilferage/damage during transit or storage.
- 8. Safer handling.
- 9. Reduces cost of transportation.

Reference:

https://www.businessmanagementideas.com/project-report/materials-management/unit-load-concept-characteristics-and-types/6686

PALLETIZATION

What is palletization?

- Palletization refers to the process of placing goods or materials, either packaged or bulk, onto pallets. The pallet provides a base for the goods and materials, thereby promoting the efficient storage, handling and transport for the combination of goods and the pallet base, referred to collectively as the unit load.
- Then as now, the use of pallets as a base for unit loads offers a number of benefits versus unpalletized handling that result from the more efficient handling of goods. These include:
- Standard sized pallets can optimize operations in pallet racks and other warehouse storage solutions.

Reference:

https://packagingrevolution.net/why-palletize/#:~:text=Palletization%20refers%20to%20the%20process,collectively%20as%20the%20unit%20load.

APPROACHES TO PALLETIZATION

Approaches to palletization

There are four basic approaches to palletization. These are manual palletization, semi-automated palletization, automated palletization and robotic palletization.

- Mannual palletization, involves the placement of items on the pallet by the use of manual force. For example, a worker may lift boxes coming off of an assembly line conveyor and stack them onto a pallet, or if the employee is selecting an order for a customer using a pallet placed on a pallet jack, he or she may remove boxes as required from several pallets to put on the pallet being built for the order.
- In semi-automated palletization, cartons are manually slid to form a layer, without the need for lifting or walking around the pallet. Once a layer is formed, the operator presses the start button and the layer is palletized automatically.
- An automated palletizer is a machine that takes containers from the end of a conveyor, and assembles them into a prescribed pattern for forming layers and then building the layers onto a pallet to create a unit load.
- Increasingly popular robotic palletizers utilize a robot to place individual cases or layers onto a pallet. They provide great flexibility and the capability of palletizing multiple SKUs and package sizes onto the same pallet.

Reference:

https://packagingrevolution.net/why-palletize/#:~:text=Palletization%20refers%20to%20the%20process,collectively%20as%20the%20unit%20load.

EXPORT PACKAGING

Export packing

The preparation of goods for international shipping. The degree of export packing required greatly depends on the kind of product, the mode of transportation, and the facilities at the shipment and destination port or airport. Shipments made by vessel typically require extensive packing and moisture protection because of longer transit time, exposure to the humid environment, and the fact that they are usually handled and re-handled more than with other transport modes. Although containerization may reduce the need for crating, it does not remove the need for robust packing and careful container loading. Shipments made by air may require a lesser degree of export packing than vessel shipments because the transit times are shorter and air cargo itself tends to be of a lighter weight. However, changes in temperature and altitude may cause condensation, so effective moisture protection is often required. Ground-only shipments made among countries connected by first class infrastructure may often be treated as domestic shipments, unless long distances or multi-modal transport (truck-rail-truck) is involved. Shippers of fragile products or those receiving frequent complaints of in-transit damage should consider consulting a surveyor for specific packing recommendations. To prevent introduction of non-native pests, some countries (for example, Australia) prohibit the importation of non-treated coniferous wood packing materials (pallets) from certain originating countries.

Reference:

https://www.globalnegotiator.com/international-trade/dictionary/export-packing/

EXPORT PACKAGING

- From a contractual point of view, responsibility for the export packaging always lies with the exporter, who must ensure that it withstands the international journey. If the packaging is damaged upon arrival in the port of destination, and the carrier proves that its handling of the cargo did not produce the damage, the seller–the exporter–will be responsible for any deterioration.
- However, the function of packaging is not limited to protecting the cargo during the international logistics process. The packaging is an element of the product's marketing. In this regard, the packaging should allow the company to adequately convey its image to customers.
- Likewise, the packaging must also adapt to cargo units deployed, in order to optimize the use of containers, trucks, or other forms of cargo. For example, if the product is packaged in boxes that are not properly sized to the pallets used, space in the cargo unit will be wasted. For example, wasting up to 20% of the space in a container can represent extra costs of up to 4% on the price of the product (i.e., if we consider that the freight can cost 20% of the value of the goods, and 20% of it is wasted that represents 4% of the cargo value).

Reference:

https://www.mastercardbiz.com/caribbean/2016/11/11/packaging-and-its-purpose-in-exports/

EXPORT PACKAGING

- The packaging is also important in terms of the instructions and other handling information; the individuals handling the product will reply on the packaging for information about how the cargo must be handled. On more than one occasion I have witnessed a customer file a complaint with an exporter because there were no instructions on the boxes as to how they needed to be stacked. Some of the boxes were placed upside down during the stacking process and product was damaged as a result. The packaging failed to fulfill one of its main purposes, and the exporter had no option but to assume responsibility and the losses.

The above example shows that the packing must fulfill at least the following functions:

- Protect the cargo during international logistics and the national leg of transport in the target market;
- Constitute an element of marketing;
- Determine the possibility of placing merchandise in the cargo units;
- Mirror customers' cultural values; and
- Communicates how the product should be handled.

Reference:

https://www.mastercardbiz.com/caribbean/2016/11/11/packaging-and-its-purpose-in-exports/

EXPORT PACKAGING

In order to properly design export packaging according to the abovementioned functions, companies should consider the following:

- **Ensure that the goods are properly protected.**

  Contact should be made with packaging manufacturers in order to obtain technical information about required strength, insulation, weight, thickness and other key characteristics. Based on this information, the company will request samples and will test the packing materials and packaging. Remember that there are testing labs for packaging and packing materials where one can test their correct operation. In exports, depending on the transport used and distances covered, it may be necessary to use different types of packaging and packing materials for different orders and different target markets. For example, there are companies that use different packaging when their product is being shipped by sea crossing the Equator, given the conditions of extreme temperatures that the cargo is subject to en-route. In other cases, the stacking of boxes is a key factor when looking for the optimization of the use of containers or other cargo units. Stacking may damage packaging, and everything must be tested prior to the loading of the cargo. In this regard, it is always good practice to places the boxes on pallets, in order to reduce the amount of handling. While the pallet utilizes some of the cargo space, it is essential for ensuring that the packaging is intact upon arrival.

Reference:

https://www.mastercardbiz.com/caribbean/2016/11/11/packaging-and-its-purpose-in-exports/

EXPORT PACKAGING

- **Ensure good business communications**

  Given that more often than not, the packaging will end up on the gondola, it is also an element that communicates the product's features to the potential end consumer, making it an important marketing tool. The purchasing decision at the gondola may depend heavily on the condition of the packaging, and this should be taken into account when designing it. For this reason, the packaging design has to balance the technical component (resistance, content, thickness, etc.) with its commercial function. Before carrying out an export operation, preferences of the consumers in the target market should be assessed to ensure that the packaging meets their expectations.

- **Calculating the size of the packaging and packing materials will depend on the cargo space and the number of units to be shipped.**

  For export, packaging and packing materials must maximize the use of the cargo units. In order to do this, they should be designed so that the largest number of packages fit in each box, and the boxes' measurements must be multiples of the pallets used. The most commonly used pallet in foreign trade is the so-called EUR-pallet, which measures 1,200 by 800 by 144 millimeters (47.2 in × 31.5 in × 5.7 in). So, if the boxes used are multiples of those measurements, then the exporter can ensure their maximum utilization. Moreover, when the merchandise is placed in containers, it is important to do the same calculation, according to the type of container, in order to optimize the use of the space.

Reference:

https://www.mastercardbiz.com/caribbean/2016/11/11/packaging-and-its-purpose-in-exports/

EXPORT PACKAGING

- **The packaging must indicate how the product is to be handled.**

  It is essential that the packaging and packing materials clearly communicate how a product should be handled. Indications such as "handle with care," "maximum stacking height," "this side up," among others, are the type of indications that should be included on the outside of all packages. Other indications to consider if they apply to your company's product include precautions regarding exposure to sunlight, damp or extreme temperatures.

- **Furthermore, all packaging should comply with the local standards established in the destination market.**

  All packaging must include all markings and labelling required by the country of destination. Local requirements usually include expressing weight and volume according to the system of measurement in use (i.e., the Imperial System of Measurement versus the Metric System of Measurement), the nutritional information for food imports, safety information in the case of any health risks, the product brand, and the consideration of all aspects which refer to the defense of the consumer. This is an aspect of considerable care; companies generally hire consultants to ensure the correct packaging.

Reference:

https://www.mastercardbiz.com/caribbean/2016/11/11/packaging-and-its-purpose-in-exports/

THANK YOU