Part 1: System Management

Ch. 9 Physical Distribution

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Definition of Physical Distribution.

- Physical distribution is the movement of materials from the producer to the consumer.
- Distribution adds place value and time value by placing goods in markets where they are available to the consumer at the time the consumer wants them.
Physical Distribution Activities.

Main Activities.
- Transportation.
- Distribution inventory.
- Warehouses (Distribution Center)
- Material handling.
- Protective packaging.
- Order processing and communication.
Time and Place Utility.

- Transportation creates value or place utility. Time utility is primarily added by the warehousing and storage of product until they are needed by customer.

- Transportation is also a factor in the creation of time utility because it determines how fast and how consistently products move from one point to another. These factors are referred to as time-in-transit and consistency of service.
Transportation Interface.

The transportation function must interface with other departments within and outside logistics, such as

- Accounting (freight bills)
- Engineering (packaging, transportation equipment)
- Inventory management (raw materials, parts, components, finished goods)
- Legal (warehouse and carrier contracts)
- Manufacturing (Just-in-time deliveries)
- Purchasing (expediting, supplier selection)
- Marketing/sales (customer service standards)
- Receiving (claims, documentation)
- Warehousing (equipment supply, scheduling)
## Areas in the Supply Chain Affected by Transportation.

<table>
<thead>
<tr>
<th>Planning</th>
<th>Procurement</th>
<th>Manufacturing</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Network and asset rationalization.</td>
<td>· Landed costs.</td>
<td>· Interplant movements.</td>
<td>· Load plans.</td>
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<td>· Lead times.</td>
<td>· Inbound in-transit inventory management</td>
<td>· JIT and other specialized services.</td>
<td>· Pick lists.</td>
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<tr>
<td>· Vendor sourcing.</td>
<td>· Reduced raw material and work-in-process inventories.</td>
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<td>· Shipping documentation preparation.</td>
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<td>· Economic order quantity.</td>
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<td>· Dock scheduling.</td>
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<td>· Outbound shipment management.</td>
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<td>· Mode/carrier selection.</td>
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</table>
Legal Forms of Transportation.

- **Public**
  - Common
  - Contract
  - Exempt
    - Products
    - Territory
    - Organization
  - Regular Route
    - Scheduled Service
    - Non scheduled Service
  - Irregular Route
    - Radial Service
    - Nonradial Service

- **Private**
  - Ownership
  - Leasing
  - Combination
Transportation.

Public (for hire) Carriers.

Common carriers.
- Carriers in this legal classification are available to all users at published rates.
- All tariffs are approved by the cognizant regulatory agencies. Common carriers operate all modes of transportation.

Contract carriers.
- Carriers in this legal classification perform selected transportation functions.
- Rate differentials for the same type of service are allowed. Regulatory bodies issue permits for contract carrier, but the permits are generally less restrictive than those.

Exempt carriers.
- Transportation companies in this classification primarily move unprocessed products, such as agricultural products and fish.
- Exempt carriers are exempt from economic restrictions by regulatory bodies. Exempt carriers generally include motor and water carriers.
Private Carriers.

- Carriers in this classification are operated by the producer or distributor of the cargo.
- A private carrier is not legally for hire by outside organization. Private carriage involves; ownership, leasing and a combination thereof.
- Private carriage involves ownerships, leasing, or a combination thereof, and can include all modes of transportation.
## Operational Modes of Transportation

<table>
<thead>
<tr>
<th>Operating Characteristics</th>
<th>Transportation Mode</th>
<th>Rail</th>
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Transportation.

Intermodal Transportation.

**Truck-rail (Piggyback).**
- Trailer-on-flatcar (TOFC) or container-on-flatcar (COFC).

**Truck-water (Fishyback).**
- Roll-on, roll-off (Ro-Ro): This method allows standard highway trailers and railcars to be driven directly on and off specially adapted ships via large side or stern doors.

**Air-truck.**
- It provides feeder and delivery service between major airport hubs and remote communities deprived of adequate air freight service.

**Rail-water.**
- The "hydro-train" rail-water service: It uses specially constructed ships or barges on which strings of freight cars are moved over water to the port nearest their ultimate inland destination.
Transportation.

1. Trailer on flatcar (TOFC)

2. Trailer and tractor on flatcar

3. Roadrail

4. Container on flatcar (COFC)

## Warehouse Value-Adding Roles.

<table>
<thead>
<tr>
<th>Value-Adding Roles</th>
<th>Trade-Off Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Consolidation.</td>
<td>Transportation.</td>
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<tr>
<td>· Product mixing.</td>
<td>Order Filling.</td>
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<tr>
<td>· Service.</td>
<td>Lead Time, Stockouts.</td>
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<tr>
<td>· Contingency protection.</td>
<td>Stockouts.</td>
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<tr>
<td>· Smooth operation.</td>
<td>Production.</td>
</tr>
</tbody>
</table>

[Coyle, pp286-319]
Costs of operating a warehouses.

Capital Costs.
- Those of space and material handling equipment.
- The space needed depend on the peak quantities, the methods of storage, the need for ancillary space, and so on.

Operation Costs.
- Labor cost.
- The type of MHSs, the location and accessibility of stock, warehouse layout, stock location system, and order picking system.
Warehousing.

Warehouse Activities.

1. Receiving goods.
   - a. Check the goods against an order and the bill of lading.
   - b. Check the quantities.
   - c. Check for damage and fill out damage reports if necessary.
   - d. Inspect goods if required.

2. Identify the goods with the appropriate SKU number.

3. Dispatch goods to storage.

4. Hold goods.

5. Pick goods.

6. Marshal the shipment.

7. Dispatch the shipment.

8. Operate an information system.
Several Factors of Warehouse Management.

Cube utilization and accessibility.

- Cube Utilization: The use of space horizontally and vertically.
- Accessibility: Ability to get at the goods wanted with a minimum amount of work.
- Example: Cube Utilization vs. Accessibility.

- There will be excellent accessibility for all items except item 9.
- A cube utilization = 70% \((21 \div 30 \times 100)\)
- To install tiers of racks so lower pallets can be removed without disturbing the upper ones.
Warehousing.

**Stock Locations.**

**Fixed Location.**

- A method of storage in which a relatively permanent location is assigned for the storage of each item in a storeroom or warehouse.

**Random Location.**

- A storage technique in which parts are placed in any empty space that is available when they arrive at the storeroom.
Warehousing.

Order Picking System.

Area System.
- The order picker circulates throughout the warehouse selecting the items on the order. The items are then taken to the shipping area for shipment.
- The order is self-marshalling in than when the order picker is finished, the order is complete.

Zone System.
- The warehouse is broken down into zones, and order pickers work only in their own area.
- Zones are usually established by grouping related parts together.
Roles of Warehouses: Freight Consolidation.
Roles of Warehouses: Product Mixing.
Public Warehouse.

- There are six types of public warehouses:
  1. General merchandise warehouses for manufactured goods.
  2. Refrigerated or cold storage warehouses.
  4. Household goods and furniture warehouses.
  5. Special commodity warehouses.

Contract Warehousing.

- Contract warehousing is a customized version of public warehousing in which an external company provides a combination of logistics services that the firm itself has traditionally provided.
Private Warehouse.

- This legal designation describes commercial storage facilities that are either owned or leased by the user organizations solely for support of their own logistics requirements.

- Private warehouses, in keeping with the regulatory obligations of their corporate operator, are subject to the state, local, and municipal laws, ordinances, and regulations imposed by their host communications.
### Ownership Decision of Warehouse.

<table>
<thead>
<tr>
<th>Firm Characteristics</th>
<th>Private</th>
<th>Public</th>
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<tbody>
<tr>
<td>Throughout volume</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Demand variability</td>
<td>Stable</td>
<td>Fluctuating</td>
</tr>
<tr>
<td>Market density</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Special physical control</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Customer service required</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Security requirements</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Multiple use needed</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Warehousing.

No. of Warehouses.

[Coyle, p297]
Material Handling.

Material Handling System

Storage and order picking equipment
- Racks, shelving, drawers, and operator controlled devices such as forklift trucks.

Transportation and sorting.
- The order picker can use a large selection of powered and non powered equipment for transporting and sorting items located in the racks, shelves, and drawers.

Shipping.
- Shipping of products to customers involves preparing items for shipment and loading them onto transportation carriers.
Material Handling.

Material Handling System: Forklift Truck.

The counter balanced lift truck.

Tow tractors.

Pallet trucks or jacks.

[Coyle, pp308-314]
Material Handling System: Storage Rack.

Free-standing, double-sided cantilever rack, Two-deep selective pallet rack, Drive-in rack

The Storage Rack.

Gravity Flow Racks.
Packaging.

Packaging is an important warehousing and materials management concern, one that is closely tied to warehouse efficiency and effectiveness. The best package optimizes service, cost and convenience. Good packaging can have a positive impact on layout and design, as well as overall warehouse productivity.
The General Function of Packaging.

Protection.
The contents of the package must be protected from damage or loss from outside environmental effects such as moisture, dust, insects, and contamination.

Containment.
Product must be contained before they can be moved from one place to another. If the package breaks open, the item can be damaged or lost, or contribute to environmental pollution if it is a hazardous materials.

Apportionment.
The output must be reduced from industrial production to a manageable, desirable consumer size: that is, translating the large output of manufacturing into smaller quantities of greater use to customer.
The General Function of Packaging.

Unitization.
Primary packages can be unitized into secondary packages (e.g., placed inside a corrugated case), which can then be unitized into a stretch wrapped pallet, and ultimately into a container loaded with several pallets. This reduces the number of times a product must be handled.

Convenience.
Packaging allows products to be used conveniently, that is with little wasted effort by customers. (e.g., blister packs, dispensers)

Communication.
Packaging allows the use of unambiguous, readily understood symbols such as a universal product code (UPC).
Packaging Design Principles.

- Standardization.
- Pricing.
- Product or package adaptability.
- Protective level.
- Handling ability.
- Product packability.
- Reusability and recyclability.
- High storage space utilization.
- Information communication.
Packaging Design Interface with Pallet Configuration.
Order Servicing.

**Order Management Process.**

1. Order Entry
2. Order Allocation.
3. Shipping Transaction.

**Order Management Process.**

- The Customer Master File.
- The Price Master File.
- The Item Master File.
- Customer Quotation File.
Performance Check.

1. Generally, the effective and efficient management of transportation becomes more important to a firm as transportation's share of product value ________
   A. Increases.   B. Decreases.
   C. Remains constant.   D. Varies considerably.

2. Many factors related to a product's characteristics help to determine the cost and pricing of transportation. Which of the following is NOT one of these?
   A. Density.   B. Stowability.
3. What types of the following are likely transported via air?

I. Human organs and blood.
II. Fluffy product like flowers.
III. Diagnostic medicine.
IV. High value products.

A. I, III  B. I, III, IV  C. I, IV  D. I, II, III, IV

4. What are some factors that influence a firm's warehousing policies?

I. The firm's philosophy and capital availability.
II. Product characteristics such as size and perishability.
III. Competition and seasonality of demand and economic conditions.
IV. Technology, efficiency program, and e-commerce.

5. There are six types of public warehouses. Which one is NOT one of those?
   A. General merchandise warehouse.
   B. Common or docking warehouse.
   C. Refrigerated or cold storage warehouse.
   D. Bonded warehouse.

6. Warehousing has some basic functions, which of the following may be included as one of them?
   I. Movement.
   II. Storage.
   III. Information transfer.
   IV. Inventory turns improvement.
   A. I, II
   B. I, II, III
   C. I, II, III, IV
   D. II, III
7. Which of the following is NOT an advantage of public warehousing?
   A. Conversion of capital.  
   B. Reduced risk.  
   C. Limited product grouping.  
   D. Economic of scale.

8. Which of the following is NOT one of the most important factors determining the size of a firm's warehouses?
   A. Sizes of markets served.  
   B. Number of segments served via competitors.  
   C. Material handling system used.  
   D. Stock layout and throughput requirements.
9. All of the following situations increase the need for storage space, EXCEPT:
   I. A decrease in sales.
   II. Elimination of distributors.
   III. Shorter life cycles.
   IV. Greater forward buying.
   V. Market expansion.

   A. I        B. I, II       C. I, II, III       D. I, III

10. A firm has originally two distribution centers. As time pass, they will increase their distribution centers step by step. We can expect which of the following?
   A. The cost of truckload shipments to the distribution centers to decrease.
   B. Customer complaint.
   C. Eventually, as more distribution centers are added, the marginal savings decrease.
   D. The total cost of transportation to increase.
11. In operating a warehouse, the major operating cost is:
   A. Fork truck maintenance
   B. System costs
   C. Labor
   D. Capital costs

12. The purpose of holding inventory in distribution centers is to:
   A. Improve customer service by keeping stock near the customers.
   B. Reduce transportation and warehousing costs concurrently.
   C. Minimize inventory investment.
   D. Increase inventory turns through the network.
13. Public warehouses are favored over private warehouses in all the following situations, EXCEPT.
   A. Markets are widely dispersed.
   B. Demand for stored products is relatively stable.
   C. Inbound and outbound shipments involve a multiplicity of transportation.
   D. Investment in facilities are negligible.

14. What is TRUE about gravity flow storage racks?
   A. They are often used to store low demand items.
   B. Products with uniform size and shape are well suited for such a system.
   C. Racks are sloped backward.
   D. Items flow to the rear from the front.
15. Packaging characteristics from a marketing perspective include all of the following EXCEPT:
   A. Tracking.
   B. Color.
   C. Brand name
   D. Display.

16. From a logistics perspective, the functions of packaging include:
   I. Organize and protect.
   II. Identify and track.
   III. Promote and display.

   A. I
   B. II
   C. I, II
   D. II, III
Performance Check.

Solutions.

1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16
A  D  D  D  B  B  C  B  A  C  C  A  B  B  A  C