

Supply Chain Management

Part 4

Designing the Distribution Network in a Supply Chain

The Role of Distribution in Supply Chain

- Distribution is the movement of goods and services from the source through a distribution channel, right up to the final customer.
- Distribution directly affects cost and the customer experience. (In retail industry, distribution affects about 35 percent of the revenue).
- Choice of distribution network can achieve supply chain objectives from low cost to high responsiveness.

Elements of customer service influenced by distribution network

- Response time: is the time needed to fulfill the customer's need.
- Product variety: is the number of different products which are available for the customers.
- Product availability: is the probability that the product is in the stock, i.e. the customer can be served immediately.
- Customer experience: is the ease with which customers can place and receive orders.

Elements of customer service influenced by network structure

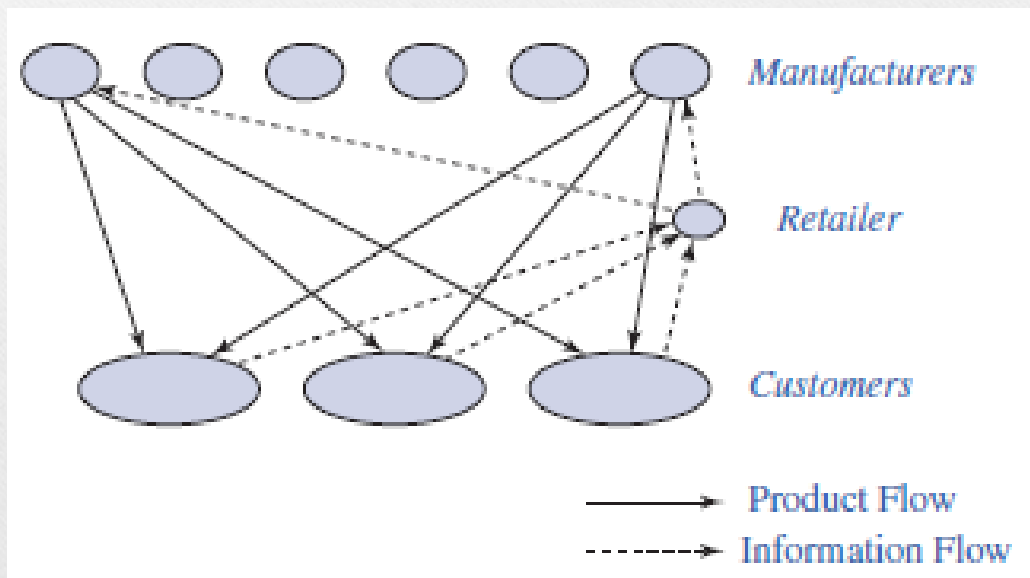
- Time to market: is the time required to bring a new product to the market.
- Order visibility: is the ability of customers to track the order from placement to delivery. (E.g. DHL)
- Returnability: is the ease with the customer can return the unsatisfactory merchandise.

Design Options for a Distribution Network

1. Manufacturer storage with direct shipping
2. Manufacturer storage with direct shipping and in-transit merge
3. Distributor storage with carrier delivery
4. Distributor storage with last-mile delivery
5. Manufacturer/distributor storage with customer pickup
6. Retail storage with customer pickup

Manufacturer storage with direct shipping (Drop-shipping)

- Product is shipped directly from the manufacturer to the end customer, bypassing the retailer who takes the order and initiates the delivery request. (Example eBags)



Manufacturer storage with direct shipping

The retailer has the functions as follows:

1. Providing information about the supply to the potential customers.
2. Collecting orders.
3. Informing the manufacturers on the orders.

The functions of the manufacturers are as follows:

1. Production.
2. Aggregate inventory holding.
3. Shipping directly to the customers.

The retailer has no inventory. Inventory is centralized at the manufacturer.

Manufacturer storage with direct shipping

- Inventory costs are low thanks to aggregation (biggest advantage)
- Transportation costs are high: the outbound distance to the customer is large and package carriers have high shipping costs compared to truckloads
- Lower facility costs because there is no extra facility.
- Response time is long: order transmission + shipping distances
- Returnability is expensive: each order may involve shipment from different manufacturers
- Significant investment in information infrastructure

Performance characteristics of manufacturer storage with direct shipping network

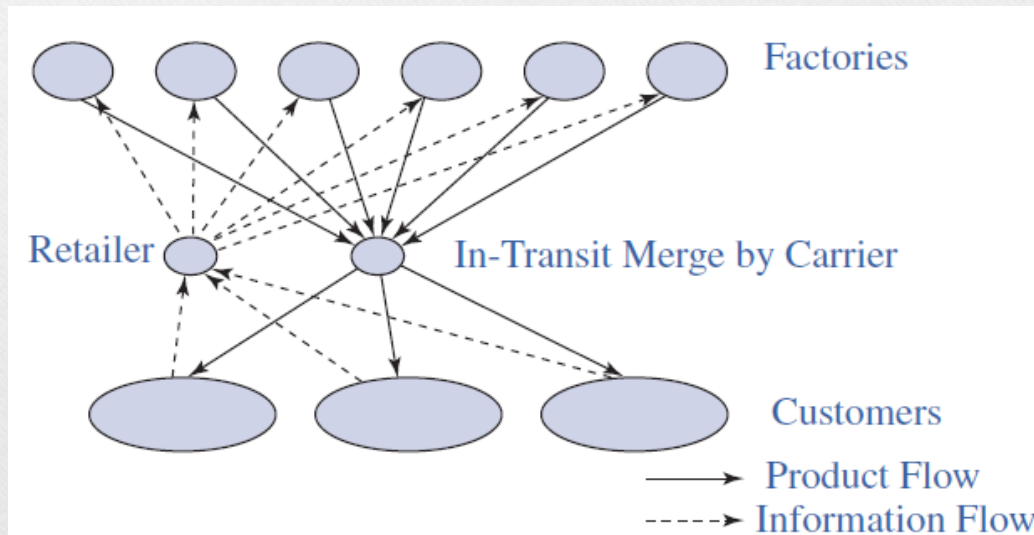
Cost Factor	Performance
Inventory	Lower costs because of aggregation. Benefits of aggregation are highest for low-demand, high-value items. Benefits are large if product customization can be postponed at the manufacturer.
Transportation	Higher transportation costs because of increased distance and disaggregate shipping.
Facilities and handling	Lower facility costs because of aggregation. Some saving on handling costs if manufacturer can manage small shipments or ship from production line.
Information	Significant investment in information infrastructure to integrate manufacturer and retailer.
Service Factor	Performance
Response time	Long response time of one to two weeks because of increased distance and two stages for order processing. Response time may vary by product, thus complicating receiving.
Product variety	Easy to provide a high level of variety.
Product availability	Easy to provide a high level of product availability because of aggregation at manufacturer.
Customer experience	Good in terms of home delivery but can suffer if order from several manufacturers is sent as partial shipments.
Time to market	Fast, with the product available as soon as the first unit is produced.
Order visibility	More difficult but also more important from a customer service perspective.
Returnability	Expensive and difficult to implement.

When to apply manufacturer storage with direct shipping

- (i) Large amount of low demand, high-valued items. The customer can wait.
- (ii) Customization is needed.
- (iii) Ideal for MTO environment.
- (iv) Few source locations.

Manufacturer storage with direct shipping and in-transit merge

- Unlike pure drop-shipping, under which each product in the order is sent directly from its manufacturer to the end customer, in-transit merge combines pieces of the order coming from different locations so the customer gets a single delivery. (Example: Dell and Sony)



Manufacturer storage with direct shipping and in-transit merge

The retailer has the functions as follows:

1. Providing information about the supply to the potential customers.
2. Collecting orders.
3. Informing the manufacturers on the orders.
4. Running the in-transit-merge center which organizes the final and single delivery to the customer.

The functions of the manufacturers are as follows:

1. Production.
2. Aggregate inventory holding.
3. Shipping to the in transit merge center.

Manufacturer storage with direct shipping and in-transit merge

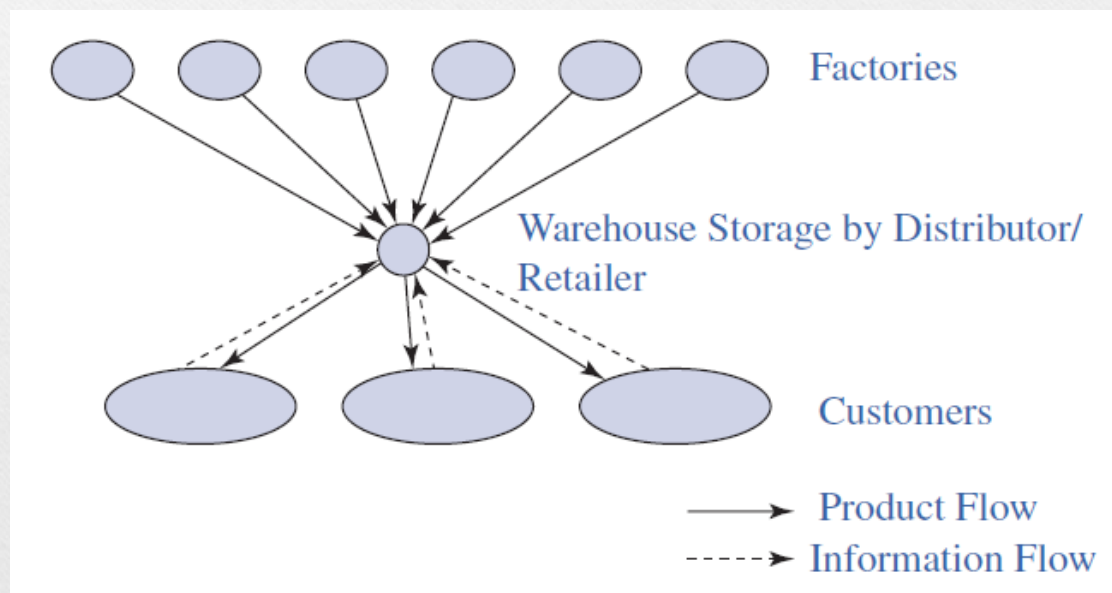
- Compared with drop shipping, in-transit merge:
- Transportation cost is lower;
- Response time is longer;
- The operation of the merge center creates extra costs, and
- A sophisticated information infrastructure is needed to allow in-transit merge.
- Manufacturer storage with in-transit merge is best suited for low- to medium-demand, high-value items the retailer is sourcing from a limited number of manufacturers.

Performance characteristics of in-transit merge

Cost Factor	Performance
Inventory	Similar to drop-shipping.
Transportation	Somewhat lower transportation costs than drop-shipping.
Facilities and handling	Handling costs higher than drop-shipping at carrier; receiving costs lower at customer.
Information	Investment is somewhat higher than for drop-shipping.
Service Factor	Performance
Response time	Similar to drop-shipping; may be marginally higher.
Product variety	Similar to drop-shipping.
Product availability	Similar to drop-shipping.
Customer experience	Better than drop-shipping because only a single delivery is received.
Time to market	Similar to drop-shipping
Order visibility	Similar to drop-shipping.
Returnability	Similar to drop-shipping.

Distributor storage with Carrier Delivery

- Inventory is not held by manufacturers but by distributors/retailers and package carriers are used to transport products from the distributor/retailer to the customer. (Example: Amazon)



Distributor storage with Carrier Delivery

The retailer has the functions as follows:

1. Providing information about the supply to the potential customers.
2. Collecting orders.
3. Informing the manufacturers on the collected orders.
4. Running the distribution center which organizes the final and single delivery to the customer.

The functions of the manufacturers are as follows:

1. Production.
2. Shipping to the distribution center.

Distributor storage with Carrier Delivery

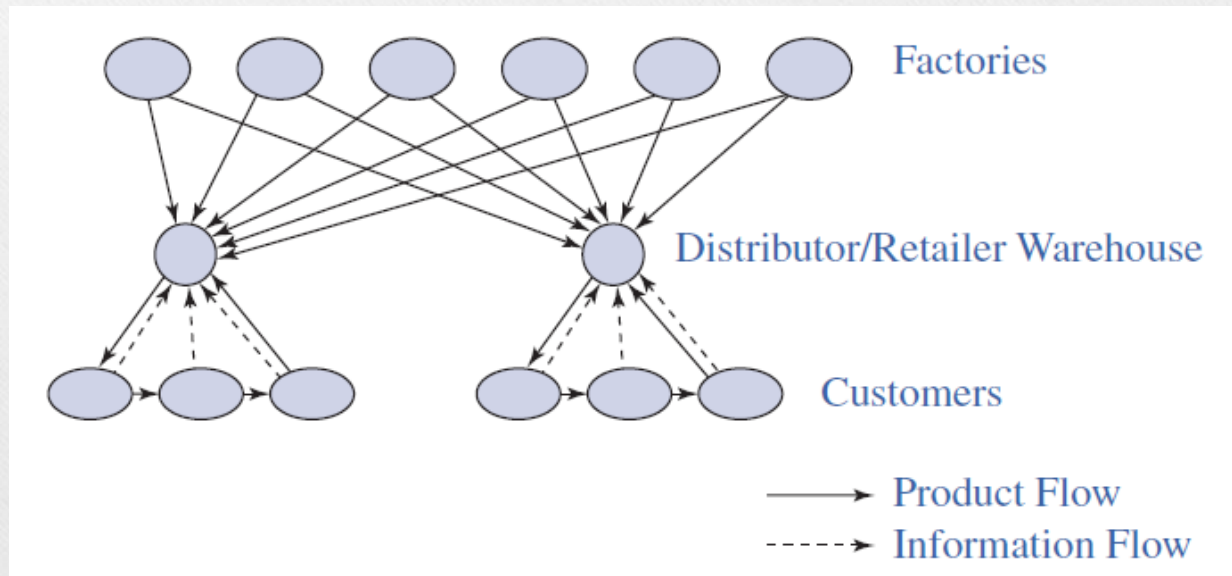
- Relative to manufacturer storage, distributor storage requires a higher level of inventory. However, still significantly lower than at a small shop retailer system.
- Transportation costs are somewhat lower for distributor storage compared with those for manufacturer storage.
- Facility costs are higher.
- Response time is better because warehouses are closer to customers.
- Information system is less complex.
- Returnability is easy.
- Distributor storage with carrier delivery is well suited for slow- to fast-moving items. Distributor storage also makes sense when customers want delivery faster than is offered by manufacturer storage but do not need delivery immediately.

Performance characteristics of Distributor storage with Carrier Delivery

Cost Factor	Performance
Inventory	Higher than manufacturer storage. Difference is not large for faster-moving items but can be large for very-slow-moving items.
Transportation	Lower than manufacturer storage. Reduction is highest for faster-moving items.
Facilities and handling	Somewhat higher than manufacturer storage. The difference can be large for very-slow-moving items.
Information	Simpler infrastructure compared with manufacturer storage.
Service Factor	Performance
Response time	Faster than manufacturer storage.
Product variety	Lower than manufacturer storage.
Product availability	Higher cost to provide the same level of availability as manufacturer storage.
Customer experience	Better than manufacturer storage with drop-shipping.
Time to market	Higher than manufacturer storage.
Order visibility	Easier than manufacturer storage.
Returnability	Easier than manufacturer storage.

Distributor storage with last-mile delivery

- In last-mile the distributor/retailer delivering the product to the customer's home instead of using a package carrier. (Example: AmazonFresh and Tesco)



Distributor storage with last-mile delivery

The retailer has the functions as follows:

1. Providing information about the supply to the potential customers.
2. Collecting orders.
3. Informing the manufacturers on the collected orders.
4. Running the distribution centers which organize the final and single delivery to the customer.

The functions of the manufacturers are as follows:

1. Production.
2. Shipping to the distribution center.

Distributor storage with last-mile delivery

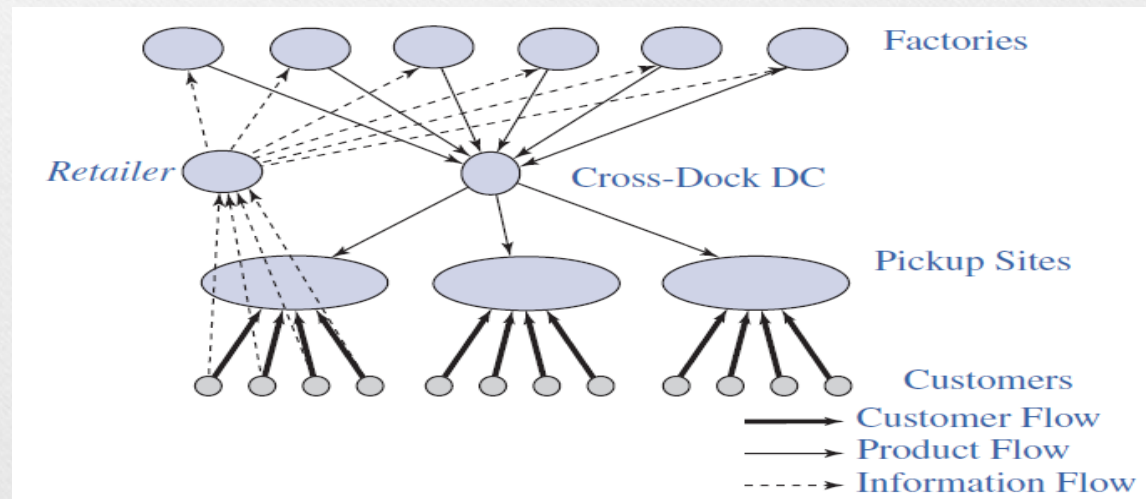
- Unlike package carrier delivery, last-mile delivery requires the distributor warehouse to be much closer to the customer, so more warehouses are required.
- Higher levels of inventories are required.
- Transportation costs are the highest compared to the other options.
- Facility costs are very high (many DCs).
- Response time is very quick (many DCs and close to customers).
- Returnability is the best (pick up car can do it).
- When to apply? (i) High customer density, i.e. in large cities, (ii) Heavy product, e.g. rice in China, (iii) Fast moving items, and (iv) Customer ready to pay for delivery.

Performance characteristics of Distributor storage with last-mile delivery

Cost Factor	Performance
Inventory	Higher than distributor storage with package carrier delivery.
Transportation	Very high cost, given minimal scale economies. Higher than any other distribution option.
Facilities and handling	Facility costs higher than manufacturer storage or distributor storage with package carrier delivery, but lower than a chain of retail stores.
Information	Similar to distributor storage with package carrier delivery.
Service Factor	Performance
Response time	Very quick. Same-day to next-day delivery.
Product variety	Somewhat less than distributor storage with package carrier delivery but larger than retail stores.
Product availability	More expensive to provide availability than any other option except retail stores.
Customer experience	Very good, particularly for bulky items.
Time to market	Slightly higher than distributor storage with package carrier delivery.
Order visibility	Less of an issue and easier to implement than manufacturer storage or distributor storage with package carrier delivery.
Returnability	Easier to implement than other previous options. Harder and more expensive than a retail network.

Manufacturer or Distributor storage with Customer pickup

- Inventory is stored at the manufacturer or distributor warehouse, but customers place their orders online or on the phone and then travel to designated pickup points to collect their merchandise. (Example: 7dream.com and Walmart “Site to Store” service)



Manufacturer or Distributor storage with Customer pickup

The retailer has the functions as follows:

1. Providing information about the supply to the potential customers.
2. Collecting orders.
3. Informing the manufacturers on the orders.
4. Collecting the items of the orders in the Cross-Dock Center
5. Sending the orders to pick up points
6. Informing the customer about the arrival

The functions of the manufacturers are as follows:

1. Production.
2. Aggregate inventory holding.

Manufacturer or Distributor storage with Customer pickup

- Inventory Costs depend on the location of inventory: Fast moving items can be kept at pickup locations, and slow moving items can be stocked at a central warehouse.
- Transportation cost is lower than the use of package carriers thanks to possible aggregation when delivering to a pickup site.
- Facility costs are high if new facilities have to be built.
- Response time is similar to package delivery.
- Information system: Sophisticated.
- Returnability is somewhat easier since pickup locations can handle returns.
- When to apply? In case of motorized customer including public transport.

Performance characteristics of Manufacturer or Distributor storage with Customer pickup

Cost Factor	Performance
Inventory	Can match any other option, depending on the location of inventory.
Transportation	Lower than the use of package carriers, especially if using an existing delivery network.
Facilities and handling	Facility costs can be high if new facilities have to be built. Costs are lower if existing facilities are used. The increase in handling cost at the pickup site can be significant.
Information	Significant investment in infrastructure is required.
Service Factor	Performance
Response time	Similar to package carrier delivery with manufacturer or distributor storage. Same-day delivery is possible for items stored locally at pickup site.
Product variety	Similar to other manufacturer or distributor storage options.
Product availability	Similar to other manufacturer or distributor storage options.
Customer experience	Lower than other options because of the lack of home delivery. Experience is sensitive to capability of pickup location.
Time to market	Similar to manufacturer storage options.
Order visibility	Difficult but essential.
Returnability	Somewhat easier, given that pickup location can handle returns.

Retail storage with Customer pickup

- It is the traditional shop system. Inventory is stored locally at retail stores. Customers walk into the retail store or place an order online or by phone and pick it up at the retail store. (Example: Walmart and Tesco).
- Inventory and facility costs are higher than all other options.
- Transportation is lower than all other options.
- Response time is very good.
- Returnability is very easy.
- Information system: minimal if customers walk, sophisticated for online orders.

Performance characteristics of Retail storage with Customer pickup

Cost Factor	Performance
Inventory	Higher than all other options.
Transportation	Lower than all other options.
Facilities and handling	Higher than other options. The increase in handling cost at the pickup site can be significant for online and phone orders.
Information	Some investment in infrastructure required for online and phone orders.
Service Factor	Performance
Response time	Same-day (immediate) pickup possible for items stored locally at pickup site.
Product variety	Lower than all other options.
Product availability	More expensive to provide than all other options.
Customer experience	Related to whether shopping is viewed as a positive or negative experience by customer.
Time to market	Highest among distribution options.
Order visibility	Trivial for in-store orders. Difficult, but essential, for online and phone orders.
Returnability	Easier than other options because retail store can provide a substitute.

E-business and distribution network

- ***Advantages of e-business:***

Higher product variability and availability.

Better forecast.

Better customer experience: non-business hours are used, personalized offers, large geographic area is served.

New products appear on the market immediately.

Direct sell to customers.

Easy way to change prices.

Easy way to transfer money.

Order visibility is high.

E-business and distribution network

- ***Disadvantages of e-business:***

The Response time is not short for physical goods but immediate for information goods (Buying physical games vs. digital games).

Returnability is harder.

E-business and costs

- Inventory cost is low because of the higher aggregation.
- Transportation cost is very cheap for information goods but high for other ones. (private mail company and longer distances due to high aggregation)
- Coordination of supply chain is easy.
- Information system needs additional investment.
- Facility cost:

Direct facility cost is low because there is no retailer.

Operating costs is low because certain part of the work is done by the customer. (there is some exception like grocery online business)