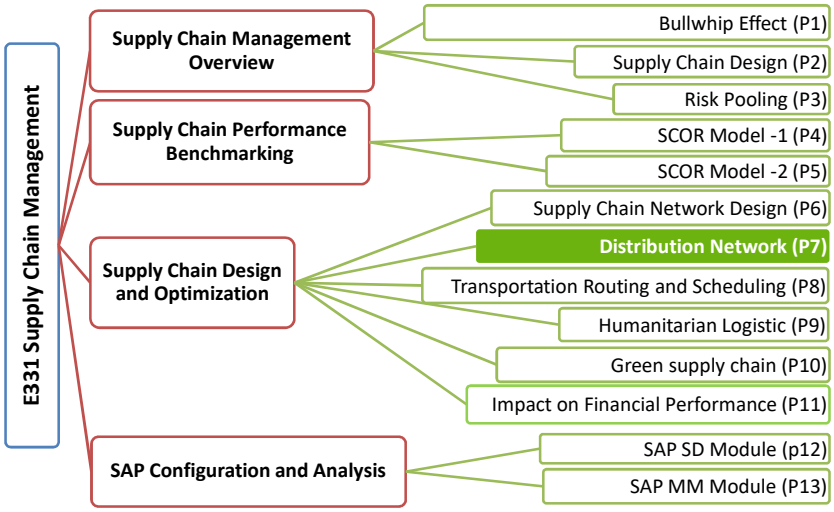
P07
Scaling New Height

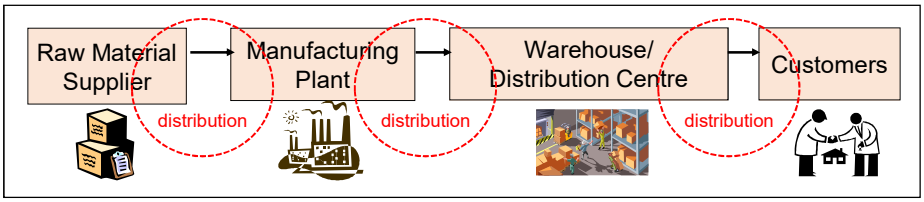
E331 – Supply Chain Management

Diploma in Supply Chain Management

E331 Module Overview



Strategic Role of Distribution



- Distribution refers to the steps taken to move and store a product from the suppliers to the customers in a supply chain.
  - *Raw materials & components are moved from the suppliers to the manufacturers*
  - *Finished products are moved from the manufacturers to the end consumers*
- Distribution is a key driver of the overall profitability of a company as it has direct impact on the supply chain costs and the customer experience

Distribution Network Design

- The design of a distribution network should be evaluated with 2 major criteria:
  - ✓ *Meeting customer needs & expectations*
  - ✓ *Managing costs of meeting the customer needs*
- The ability of meeting customer needs has an impact on company's revenue, whereas the associated costs affect the company's profitability.
- Companies must evaluate the impact of customer servicing costs when they compare the different distribution networks.

Distribution Network Design Factors

Customer Service Elements

- Response time
- Product variety
- Product availability
- Customer experience
- Order visibility
- Ability to return

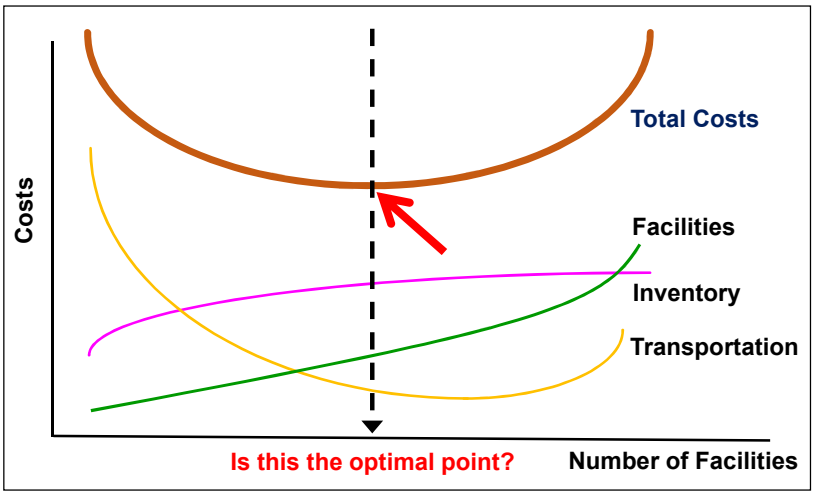
Supply Chain Costs

- Inventories
- Transportation
- Facilities and handling
- Information

Customer Service Factors

- **Response Time**
  → time between when a customer places an order and receives delivery
- **Product Variety**
  → number of different products/configurations that a customer desires
- **Product Availability**
  → probability of having a product in stock when a customer order arrives
- **Customer Experience**
  → ease of which the customer can place and receive their order
- **Order Visibility**
  → ability of the customers to track their orders from placement to delivery
- **Ability to Return**
  → ease at which a customer can return unsatisfactory or defective products and the ability of the distribution network to handle such returns

Supply Chain Cost Factors



Impact on Transportation Costs

❑ **Transportation costs**

- Outbound transportation costs per unit tend to be higher than the inbound costs because inbound sizes are typically larger
- Increasing the number of warehouse facilities decreases the outbound transportation costs and helps to reduce the total transportation costs
- There comes a point whereby the number of facilities are increased beyond a critical point and result in a significant loss of economies of scale in inbound transportation, then increasing the number of facilities does the opposite and cause the total transportation costs to increase!

Impact on Inventory & Facility Costs

❑ **Inventory costs**

- As the number of facilities in a supply chain increases, the inventory and resulting inventory costs also increase
- With fewer number of facilities that Amazon.com has, it is able to turn its inventory 12 times a year, whereas Borders is able to achieve about 2 turns a year with 400 brick-and-mortar facilities.

❑ **Facilities costs**

- Facility costs decreases as the number of facilities is reduced. This is because companies benefit from economies of scale due to consolidation of facilities.

As the number of facilities increases, the total logistics costs first decrease then increase !

Distribution Network Design Decisions

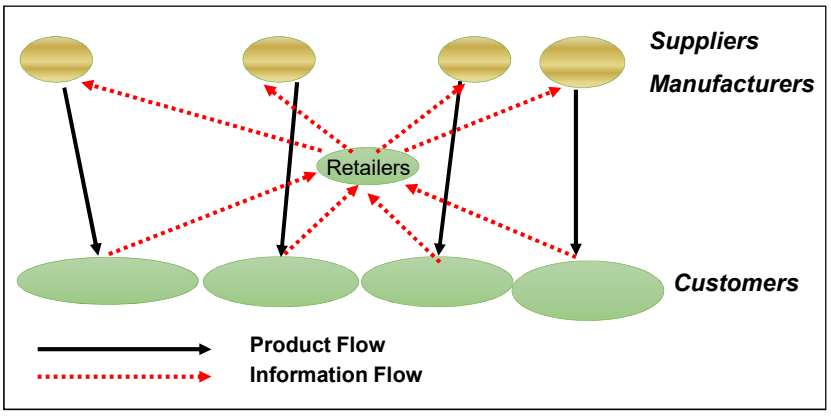
❑ When designing a distribution network, the 2 key decisions to be considered are:

- *Will the product be delivered to the customer location or picked up from a pre-ordained location?*
- *Will the product flow through an intermediary?*

Distribution Network Design Options

- **SIX (6) distinct distribution network designs** that may be used to move products from the suppliers / manufacturers to the end customers:
  1) *Manufacturer storage with direct shipping (Drop-ship)*
  2) *Manufacturer storage with direct shipping and merge in-transit*
  3) *Distributor storage with package carrier delivery*
  4) *Distributor storage with last mile delivery*
  5) *Manufacturer/distributor storage with customer pickup*
  6) *Retail storage with customer pickup*

Direct Shipping (Drop-ship)



- Product is shipped directly from the supplier to the end customer, bypassing the retailer (who takes the order and initiates the delivery request). All inventories are stored at the supplier. It is noted that the order could be placed via the retailers

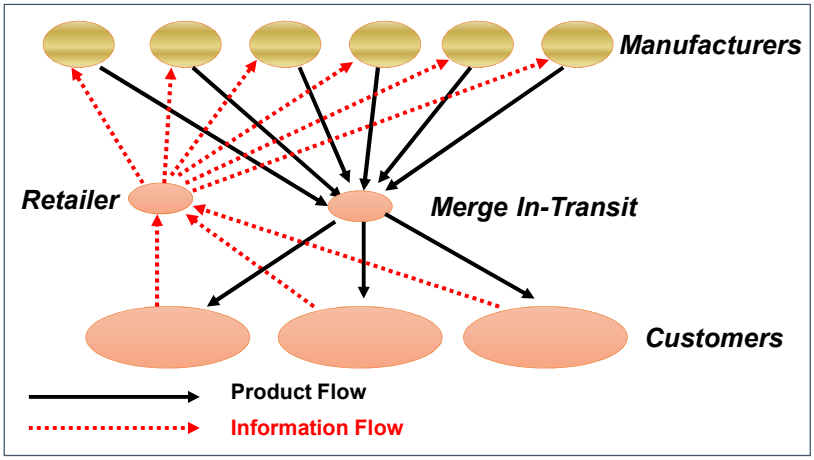
Drop-Ship

- Online retailers such as eBags does not hold any inventory of bags and has them drop-shipped directly from the manufacturer to the customer.
- Biggest advantage of drop-ship is the ability to centralize inventory at the supply point. The supply point is able to aggregate demand across all retailers, resulting in a higher level of product availability with lower levels of inventory.
- Benefits of centralization are best enjoyed by high-value, low demand items with high demand uncertainty. Also, customers are willing to wait for delivery and also willing to accept partial shipment.

Drop-Ship

Cost Factor	**Performance**
Inventory	Lower cost because of aggregation Low demand high value; product customization can be postponed
Transportation	High cost due to long distance and disaggregate shipping
Facilities and handling	Lower facility cost; handling cost may be lower if small shipments can be managed effectively
Information	Significant investment in infrastructure to integrate the supplier and buyers
Service factor	**Performance**
Response time	Longer response time
Product variety	Easily provide high level of variety
Product availability	Easily provide high level of product availability
Customer experience	Good due to home delivery; but suffer if partial shipments from different suppliers
Order visibility	More difficult but more important
Ability to return	Expensive and difficult to handle

Direct Shipping & Merge In-transit



- Merge In-transit combines pieces of the orders coming from different locations so that the customer gets a single delivery

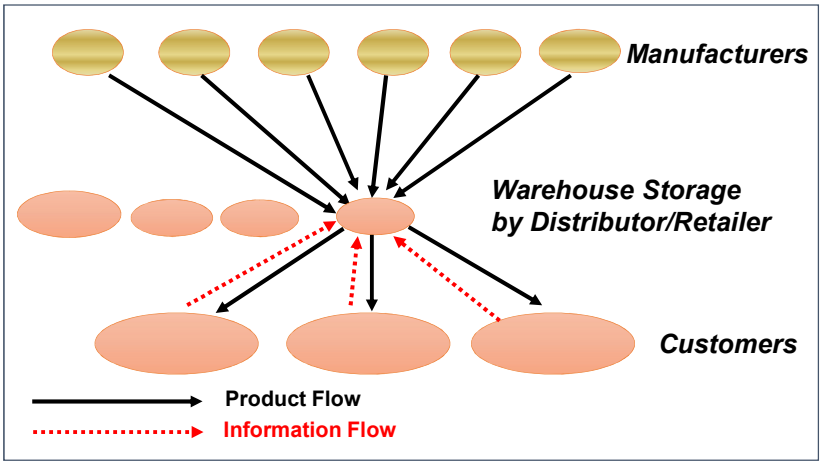
Direct Shipping & Merge In-transit

- Aggregates inventory and postpones product customization
- Suitable for high-product variety, high-value products with high demand uncertainty
- Merge In-transit is best suited if there are no more than 5 sourcing locations, otherwise the merge becomes very complicated to coordinate and implement
- Main advantage of merge in-transit over drop-ship is the lower transportation costs and improved customer service level
- Main disadvantage is the additional effort during the merge itself

Direct Shipping & Merge In-transit

Cost Factor	Performance
Inventory	Similar to drop-shipping
Transportation	Lower than drop-shipping
Facilities and handling	Receiving cost is lowers at customer; handling cost is higher than drop-shipping
Information	Investment is higher than drop-shipping
Service factor	**Performance**
Response time	Similar to drop-shipping; may be a bit longer
Product variety	Similar to drop-shipping
Product availability	Similar to drop-shipping
Customer experience	Better than drop-shipping because of single delivery
Order visibility	Similar to drop-shipping
Ability to return	Similar to drop-shipping

Distributor Storage with Package Carrier Delivery



- Inventory is held by the distributors/retailers in the intermediate warehouses and package carriers are used to transport products from the intermediate location to the final customers.

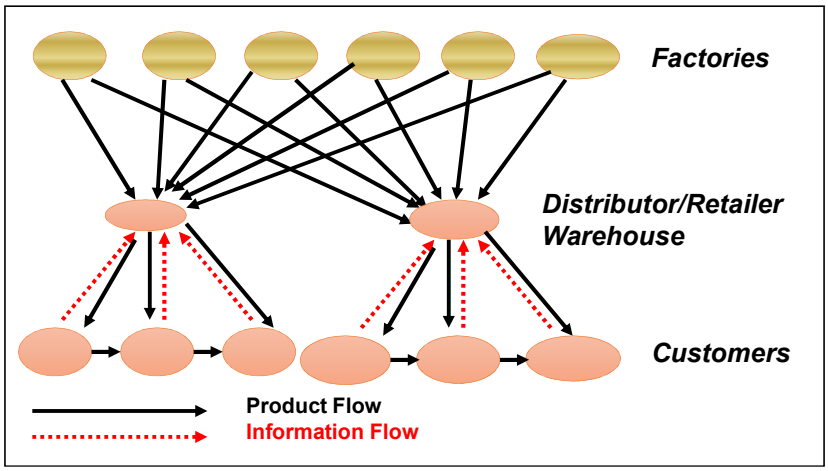
Distributor Storage with Package Carrier Delivery

- Distributor storage will require a higher level of inventory as the distributor/retailer warehouse aggregates demand uncertainty to a lower level as compared to manufacturer storage
- Suitable for medium to fast moving products. Also makes sense when customers want delivery faster than offered by manufacturer storage, but do not need it immediately. However, distributor storage can handle somewhat lower variety than manufacturer storage, but a higher level of variety than a chain of retail stores.
- Amazon.com only stocks the medium to fast-moving items at their warehouses, whereas the slower moving items are stocked further upstream at the distributor/retailer warehouse. In some cases, postponement can be implemented with distributor storage, but this requires that the distributor warehouse be equipped with some assembly capability.

Distributor Storage with Package Carrier Delivery

Cost Factor	**Performance**
Inventory	Higher than manufacturer storage. Difference is not large for fast moving items
Transportation	Lower than manufacturer storage. Reduction is higher for fast moving items
Facilities and handling	Higher than manufacturer storage. Difference is large for slow-moving items
Information	Simple infrastructure
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 product availability as compared to manufacturer storage
Customer experience	Better than manufacturer storage with drop-shipping
Order visibility	Easier than manufacturer storage
Ability to return	Easier than manufacturer storage

Distributor Storage with Last Mile Delivery



- The distributor/retailer delivers the product to the customer's home instead of using a package carrier. For example, grocery industry.

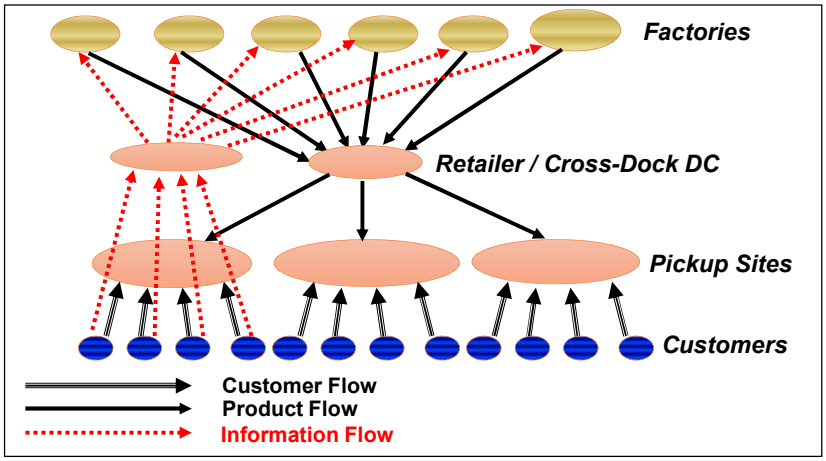
Distributor Storage with Last Mile Delivery

- Distributor storage with last mile delivery requires higher levels of inventory than the other options (except retail stores) because it has a lower level of aggregation.
- Suitable for relatively fast-moving items where disaggregation does not lead to a significant increase of inventory. Staple items in the grocery industry fit this description, for example, cooking oil, rice, salt and sugar.
- Transportation costs will be highest using last mile delivery. Maybe justifiable for bulk items whereby the customer is willing to pay for home delivery. For example, home delivery for water and large bags of rice has proven successful in China, where the high population density has helped to decrease the transportation costs.

Distributor Storage with Last Mile Delivery

Cost Factor	Performance
Inventory	Higher than distributor storage with carrier delivery
Transportation	Very high cost given minimal economies of scale. Higher than any other distribution options.
Facilities and handling	Higher than manufacturer storage or distribution with carrier delivery, but lower than a chain of retail stores.
Information	Similar to distributor storage with carrier delivery
Service factor	**Performance**
Response time	Very quick. Same day to next day delivery.
Product variety	Easily provide high level of variety
Product availability	Less than distributor storage with carrier delivery but larger than retail stores.
Customer experience	Very good, particularly for bulky items.
Order visibility	Easier to implement than manufacturer storage or distributor storage with carrier delivery
Ability to return	Easier to implement than other options. Harder and more expensive than a retail network.

Manufacturer/Distributor Storage with Customer Pickup



- Inventory is stored at the manufacturer/distributor's warehouse but customers place their orders via internet/phone, and then come to the designated pickup points to collect their orders. Orders are shipped from the storage site to the pickup points when needed

Manufacturer/Distributor Storage with Customer Pickup

- 7dream.com, operated by 7-Eleven Japan, allows customers to pickup online orders at a designated 7-Eleven store. 7-Eleven has DCs where products from manufacturers are cross-docked and sent to the retail outlets on a daily basis. Serving as an outlet for online orders allows 7-Eleven to improve the utilization of its existing logistical assets. **This distribution network is used for slow moving products at retailing and it is not economically to keep inventory at retail store.**
- Processing costs at the pickup site will be high because each order must be matched with a specific customer when he/she arrives. Creating this capability can increase processing costs significantly if appropriate storage and information systems are not available. Increased processing cost at the pickup site is seen as the biggest hurdle to the success of this approach.
- Very good coordination is needed between the retailer, the storage location and the pickup location.

Manufacturer/Distributor Storage with Customer Pickup

Cost Factor	**Performance**
Inventory	Can match other options 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 cost will be higher if new facilities need to be built. The increase in handling cost at the pickup site is significant.
Information	Significant investment in infrastructure required
Service factor	**Performance**
Response time	Similar to carrier delivery with manufacturer or distributor storage. Same day delivery 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. In high density area loss of convenience may be small
Order visibility	Difficult but essential
Ability to return	Somewhat easier given that pickup location can handle returns

Retail Storage with Customer Pickup

- Inventory is stored locally at the retail stores. Customers walk into the retail store or place an order online or on the phone and pick it up at the retail store.
- Local storage increases inventory costs because of the lack of aggregation.
- Lowers the delivery cost and provides a faster response time than other options.
- However, the major disadvantage is the increased inventory and facility costs.
- Such an option is best suited for fast-moving items or for items where customers place a high premium on fast response.

Product Characteristics & Customer Preferences

	Retail Storage with Customer Pickup	Manufacturer Storage with Direct Shipping	Manufacturer Storage with In-Transit Merge	Distributor Storage with Package Carrier Delivery	Distributor Storage with Last Mile Delivery	Manufacturer /Distributer Storage with Customer Pickup
High Demand Product	+2	-2	-1	0	+1	-1
Medium Demand Product	+1	-1	0	+1	0	0
Low Demand Product	-1	+1	0	+1	-1	+1
Very Low Demand Product	-2	+2	+1	0	-2	+1
Many Product Sources	+1	-1	-1	+2	+1	0
High Product Value	-1	+2	+1	+1	0	-2
Quick Desired Response	+2	-2	-2	-1	+1	-2
High Product Variety	-1	+2	0	+1	0	+2
Low Customer Effort	-2	+1	+2	+2	+2	-1

Comparison of Delivery Network Designs

		Retail Storage with Customer Pickup	Direct Shipping	Merge In-Transit	Distributor Storage with Package Carrier Delivery	Distributor Storage with Last Mile Delivery	Manufacturer /Distributer Storage with Customer Pickup
customer service	Response Time	1	4	4	3	2	4
	Product Variety	4	1	1	2	3	1
	Product Availability	4	1	1	2	3	1
	Customer Experience	5	4	3	2	1	5
	Order Visibility	1	5	4	3	2	6
	Ability to Return	1	5	5	4	3	2
Supply Chain Costs	Inventory	4	1	1	2	3	1
	Transportation	1	4	3	2	5	1
	Facility & Handling	6	1	2	3	4	5
	Information	1	4	4	3	2	5

Possible Options - Product

	Retail Storage with Customer Pickup	Manufacturer Storage with Direct Shipping	Manufacturer Storage with Merge In-Transit	Distributor Storage with Package Carrier Delivery	Distributor Storage with Last Mile Delivery	Manufacturer /Distributer Storage with Customer Pickup	
High Demand Product	2	-2	-1	0	1	-1	
Medium Demand Product	1	-1	0	1	0	0	
Low Demand Product	-1	1	0	1	-1	1	1
Very Low Demand Product	-2	2	1	0	-2	1	
Many Product Sources	1	-1	-1	2	1	0	
High Product Value	-1	2	1	1	0	-2	1
Quick Desired Response	2	-2	-2	-1	1	-2	1
High Product Variety	-1	2	0	1	0	2	
Low Customer Effort	-2	1	2	2	2	-1	1
Total Score	-2	2	1	3	2	-4	

- Base on analysis above, 3 potential designs may be considered.
- Assumptions:
  - Product demand is estimated to be low
  - Desired response in relation to order delivery and support services is expected to be prompt
  - Customer effort is expected to be low

Suggested Solution

	Retail Storage with Customer Pickup	Manufacturer Storage with Direct Shipping	Manufacturer Storage with Merge In-Transit	Distributor Storage with Package Carrier Delivery	Distributor Storage with Last Mile Delivery	Manufacturer /Distributer Storage with Customer Pickup	
Response Time	**1**	**4**	**4**	**3**	**2**	**4**	**1**
Product Variety	4	1	1	2	3	1	
Product Availability	4	1	1	2	3	1	
Customer Experience	**5**	**4**	**3**	**2**	**1**	**5**	**1**
Order Visibility	1	5	4	3	2	6	
Returnability	**1**	**5**	**5**	**4**	**3**	**2**	**1**
Inventory	4	1	1	2	3	1	
Transportation	1	4	3	2	5	1	
Facility & Handling	**6**	**1**	**2**	**3**	**4**	**5**	**1**
Information	1	4	4	3	2	5	
Total	13	14	14	12	10	16	

- Base on table above, Distributor Storage with Last Mile Delivery is the suggested solution.
- Customers can order online and delivery completed from a central distribution center and at the same time get reasonable aftersales support.

Other Considerations

- Setting up new distribution network requires resources so a good strategy will be to leverage on existing distribution network if possible so as to enjoy the economic of scale and lower the setup costs.
- To penetrate a new market, company could choose to start relationships with many local distributors. In this way, the company could increase its product availability to more customers and also allowing its distributors to sell more brands to customers.
- An optimized distribution network provides long term competitiveness advantage to a company so the network design must evolve as the market conditions change.

Learning Outcome

- State the strategic role of distribution in a supply chain
- Identify the key factors influencing the design of a distribution network
- Describe the 6 options for distribution network
- Compare the strengths and weaknesses of various distribution options
- Select an appropriate distribution network for real-life applications