

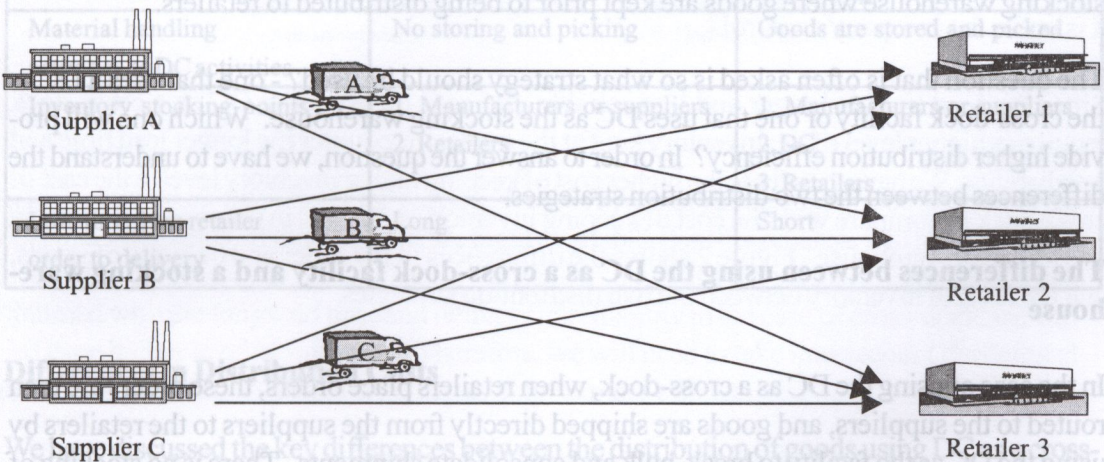
DISTRIBUTION STRATEGY THROUGH A DISTRIBUTION CENTER

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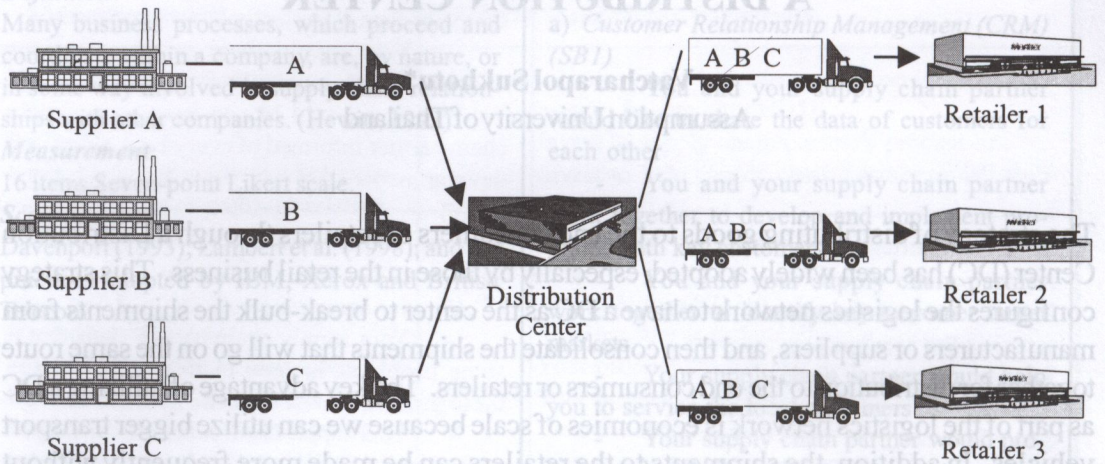
The strategy of distributing goods to the end consumers or retailers through a Distribution Center (DC) has been widely adopted, especially by those in the retail business. This strategy configures the logistics network to have a DC as the center to break-bulk the shipments from manufacturers or suppliers, and then consolidate the shipments that will go on the same route together for distribution to the end consumers or retailers. The key advantage of utilizing a DC as part of the logistics network is economies of scale because we can utilize bigger transport vehicles. In addition, the shipments to the retailers can be made more frequently without compromising the economies of scale of utilizing bigger transport vehicles. As a result of higher shipment frequency, the retailers have a lower burden of keeping inventory, and at the same time the availability at retailers is improved. Figure 1 shows the distribution strategy through a DC.

Figure 1: (a) Direct distribution



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Figure 2: (b) Distribution through a distribution center



In distributing the goods through a DC, the DC may act as just the 'flow-through' facility where there is no inventory kept at the DC (in fact, there is some level of inventory because goods spend some time at the facility; however, they are not stocked). The word that is generally used for this type of distribution is 'Cross-Dock' because the goods come in at the receiving docks and cross to the shipping docks. On the other hand, the DC may be used as the stocking warehouse where goods are kept prior to being distributed to retailers.

The question that is often asked is so what strategy should be used? - one that uses a DC as the cross-dock facility or one that uses DC as the stocking warehouse. Which one will provide higher distribution efficiency? In order to answer the question, we have to understand the differences between the two distribution strategies.

The differences between using the DC as a cross-dock facility and a stocking warehouse

In the case of using the DC as a cross-dock, when retailers place orders, these orders are then routed to the suppliers, and goods are shipped directly from the suppliers to the retailers by using the DC as the facility to break-bulk and consolidate shipments. There is no stocking of goods at the DC. The incoming goods to the DC from different suppliers are broken down, sorted according to the intended destination of the goods, and then delivered to retailers. Since the orders are placed to the suppliers, and goods are delivered from the suppliers to the retailers, the lead time from retailer order to delivery is equal to:

Order Processing Time + Order Preparation at Supplier + Transit Time from Supplier to DC + Time Spent to DC for Cross-Docking + Transit Time from DC to Retailer

In the case of the DC used as a stocking warehouse, when retailers place orders, the orders are then routed to the DC and goods are shipped from DC to the retailers. As a result, the lead time from retailer order to delivery is equal to:

$$\text{Order Processing Time} + \text{Order Preparation at DC} + \text{Transit Time from DC to Retailer}$$

Typically, the order preparation at the DC requires shorter time than the order preparation at the suppliers. Therefore, the lead time from retailer order to delivery in the case of DC used as a stocking warehouse is rather shorter than that in the case of cross-dock.

We need to understand that the lead time from retailer order to delivery is different from the total time that goods travel from suppliers to retailers. If we compare the total time that goods travel from suppliers to retailers, the case of cross-dock will have the shorter total time. However, our attention is on the lead time from retailer order to delivery.

Up to this point, we can summarize the key differences between the distribution of goods using the DC as cross-dock and stocking warehouse, shown in Table 1.

Table 1: Key differences between the distribution of goods using the DC as a cross-dock and a stocking warehouse

	Cross-Dock	Stocking Warehouse
Material handling activities at DC	No storing and picking	Goods are stored and picked
Inventory stocking points	1. Manufacturers or suppliers 2. Retailers	1. Manufacturers or suppliers 2. DC 3. Retailers
Lead time from retailer order to delivery	Long	Short

Differences in Distribution Costs

We have discussed the key differences between the distribution of goods using DC as a cross-dock and stocking warehouse. In order to determine which one is more efficient, we have to compare their total distribution costs, which consist of: 1. transportation cost, 2. goods handling cost, and 3. inventory holding cost.

In general, the order policies and the agreement with the suppliers do not vary with the distribution strategies that the company adopts; therefore, the transportation costs from the suppliers to the DC are not different. In addition, since the total volume flowing from the DC to the

retailer is identical whether or not it is a cross-dock or a stocking warehouse, the delivery frequency¹ from the DC to the retailers is not different between the two distribution strategies, then the overall transportation costs are not different.

There are still two costs that we have to consider, goods handling cost and inventory holding cost. Let us first look at the goods handling cost. Because the DC acting as a stocking warehouse requires more activities for storing and picking, the goods handling cost is higher in the case of a stocking warehouse strategy.

The inventory holding cost can be divided into two parts, the storage cost and the capital cost². Both storage cost and capital cost are typically proportional to the level of inventory held. It may be easy to jump to the conclusion that the inventory level in the case of cross-dock is lower because we do not have to keep inventory at the DC. However, we also have to look at the inventory level at the retailers.

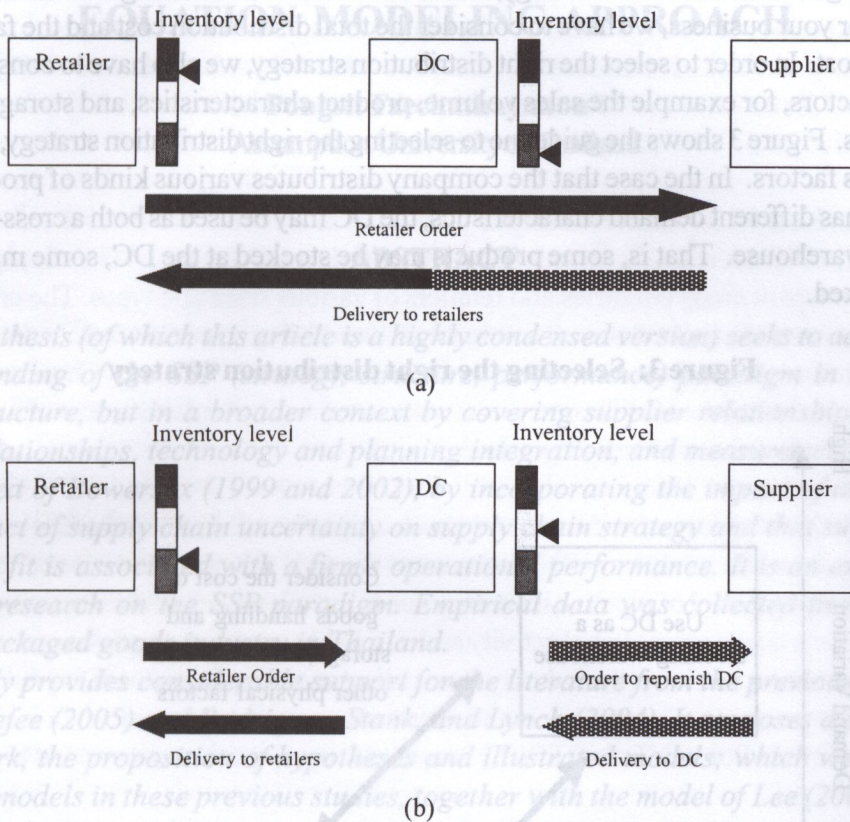
In the case of cross-dock, the lead time from retailer order to delivery is longer than in the case of using the DC as a stocking warehouse. In addition to the longer lead time, the unreliability of the lead time is also greater in the case of cross-dock because we have to rely on the delivery performance of the suppliers. Furthermore, the order frequency depends on the agreement that the company has with the suppliers. On the other hand, if the DC acts as a stocking warehouse, the retailer order is then drawn from the DC and hence the company can set any order frequency that it wants. In addition, the delivery reliability is also better because it is under the company's control.

Since the lead time is longer and less reliable, the case of using the DC as a cross-dock requires a higher level of the inventory kept at the retailer to counter the longer lead time and unreliability. We have to include the higher cost of keeping higher inventory level in the case of cross-dock to compare with the cost of keeping inventory at the DC in the case of DC acting as a stocking warehouse. Figure 2 shows the differences in the order and delivery of goods, and the level of inventory between the two distribution strategies.

¹Delivery frequency means the frequency that retailers receive goods from the DC. It is not the same as the retailer order frequency.

²The cost of holding inventory may also include the cost of perishables and goods depreciation.

Figure 2: (a) DC as a cross-dock (b) DC as a stocking warehouse



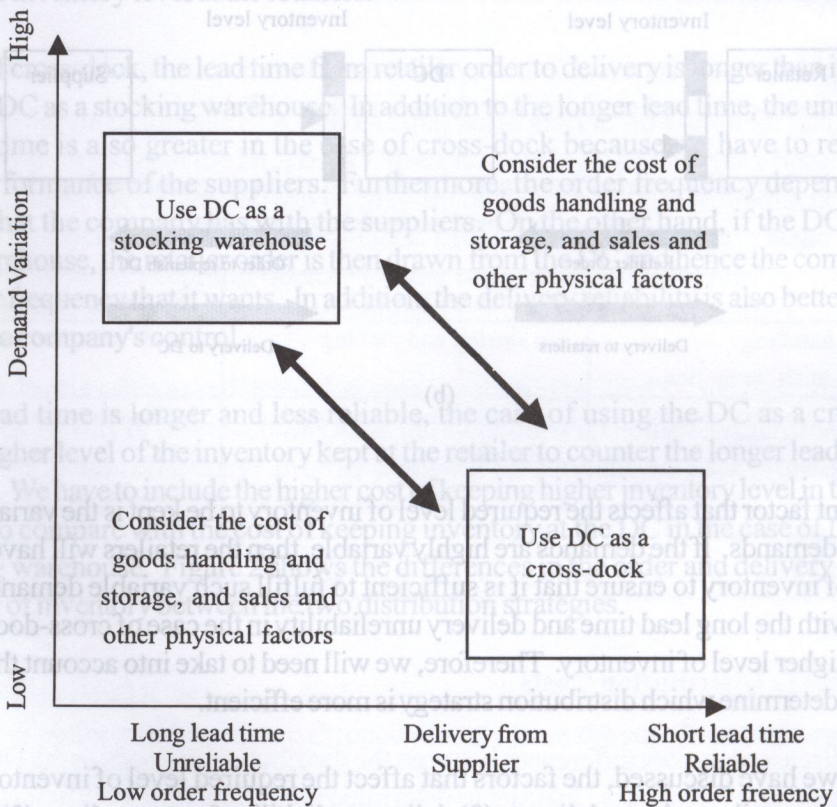
An important factor that affects the required level of inventory to be kept is the variation of the consumers' demands. If the demands are highly variable, then the retailers will have to keep a high level of inventory to ensure that it is sufficient to fulfill such variable demands. When combined with the long lead time and delivery unreliability in the case of cross-dock, we will need even higher level of inventory. Therefore, we will need to take into account the demand variation to determine which distribution strategy is more efficient.

From what we have discussed, the factors that affect the required level of inventory are: (1) lead time from retailer order to delivery, (2) delivery reliability from suppliers, (3) order frequency, and (4) demand variation.

Selecting the Right Distribution Strategy

Determining which distribution strategy, DC as a cross-dock or stocking warehouse, is more efficient for your business, we have to consider the total distribution cost and the factors that affect the cost. In order to select the right distribution strategy, we also have to consider other physical factors, for example the sales volume, product characteristics, and storage space at the retailers. Figure 3 shows the guideline to selecting the right distribution strategy, considering various factors. In the case that the company distributes various kinds of products and each kind has different demand characteristics, the DC may be used as both a cross-dock and stocking warehouse. That is, some products may be stocked at the DC, some may just be cross-docked.

Figure 3: Selecting the right distribution strategy



Distribution is an important part of the cost of goods, especially in the business that requires the distribution of goods to the retailers. Selecting the right distribution strategy will result in efficient distribution operations, which yield lower cost of goods and increase your company's competitiveness. One note though, whichever distribution strategy you select, it must be in line with the overall strategy of the company.