TOPIC 5: INVENTORY AND WAREHOUSING

Topic Outcomes:

You should be able:

1. Define the concept of inventory management in supply chain and logistics activities
2. Explain types of inventory
3. Define the purpose in inventory
4. Describe the objectives of inventory management
5. Describe the importance of warehouse storage
6. Relate warehousing to logistics and supply chain activities

5.1 IMPORTANCE OF INVENTORY MANAGEMENT

Transportation strategy, as we have discussed in the previous chapter is concern with the inbound flow of goods. The inbound flow refers to the inflow of raw materials and semi-finished products, while the outbound flow refers to the distribution of finished products to business and end consumers.

![Figure 5.1: Inventories and the flow of materials](image)

Inventory Management is responsible for planning and controlling inventory from the raw material stage to the customer. Inventory management is not only concern with aggregate or overall inventory management but also individual item levels too.

5.1.1 Reasons for Inventory

As firm’s product could not be supplied instantaneously to meet the demand, therefore the need for inventory storage arises. Firms use inventory to improve supply-demand coordination and to lower overall costs. As it is impractical and impossible to know future demand with certainty and because the availability of supplies cannot be
guaranteed at any given moment, inventories are accumulated to assure an availability of goods and to minimize the overall costs of producing and distribution the goods.

The purpose of using inventory

- Improve customer service
- Encourage production economies
- Permit purchase and transportation economies
- Act as a hedge against prices changes
- Protect against uncertainties in demand and lead time
- Act as hedge against contingencies

5.1.2 Inventory Demand Types

- In order to deal with the challenges of controlling inventory levels, breaking inventories into various classification due to the nature of demand for the inventories. The various types of inventory demands are shown in Table 5.2

Table 5.2: Types of Inventory Demand

<table>
<thead>
<tr>
<th>Types of Inventory Demand</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perpetual Demand</td>
<td>Require continual or period replenishment. Deals with products that have a significant demand for a very long period of time. Inventory management is directed as forecasting the level of demand that will occur for each item when and quantity of stocks to be replenished.</td>
</tr>
<tr>
<td>Seasonal Demand</td>
<td>May involve products that are demanded at certain period of the year or require accurate forecasting the level of demand that will occur.</td>
</tr>
<tr>
<td>Lumpy Demand</td>
<td>This type of demand will occur due to drastic environment or lifestyle change. It is quite difficult to predict quite accurately of the coming demand trend. Close monitoring of the erratic or lumpy demand with slow response in product replenishment.</td>
</tr>
<tr>
<td>Terminating Demand</td>
<td>This is more of a planned preparation. Demand will decline and excessive inventories can be worked out slowly. The focus of the planning is when and how much should be stocked during each period (week, month or year) with preparation towards the termination period specified.</td>
</tr>
</tbody>
</table>
Derived Demand

The demand for this category of products is derived from the final consumer market. How much and when to order or produce can be accurately determined from monitoring the demand for finished products.

5.1.3 The six purposes of using inventory

<table>
<thead>
<tr>
<th>Purpose of using inventories</th>
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</thead>
<tbody>
<tr>
<td>Improve Customer Service</td>
<td>Having inventories will ensure that customer who desire or must have immediate stock availability or short delivery times are satisfied in their dealing with the firm. This measure assists the marketing department and specifically the level of customer service to the customers.</td>
</tr>
<tr>
<td>Encourage Production</td>
<td>Items purchased or manufactured in quantities greater than what is needed immediately will create lot-size inventories. This is to take advantage of quantity discounts, to reduce shipping, clerical, setup costs and in some cases, where it is impossible to make or purchase items at the same rate it will be used or sold.</td>
</tr>
<tr>
<td>Permit Purchase and</td>
<td>Inventory acts as buffer between demand and supply so that production can be geared to a more constant output than fluctuating demand. Therefore, lowest per-unit cost is possible due to the fact that production runs at a constant quantity. Inventory will also allow the seizure of lower per-unit rates of full-vehicle-load quantities. Likewise, lower prices can also be realized from price-quantity discount offer as more can be purchased and inventoried.</td>
</tr>
<tr>
<td>Transportation Economies</td>
<td>Act as Hedge against Price Changes</td>
</tr>
<tr>
<td>Protect against Uncertainties in Demand and Lead Time</td>
<td>In most cases, the level of demand on a logistics system and the time required for re-supply cannot be known for sure. To assure product availability, additional amounts of stock are maintained. These stocks are in addition to the regular stock to meet production and marketplace needs.</td>
</tr>
<tr>
<td>Act as a Hedge against Contingencies</td>
<td>Labour strikes, fire and floods are just a few of the contingencies that can happen. Therefore, maintaining backup inventories is one way in which normal supplies can be maintained for a period of time.</td>
</tr>
</tbody>
</table>
5.1.4 INVENTORY CONTROL FEATURES

These features are basic to inventory management whether these inventories are raw materials, work-in-progress goods or finished products. These features are the relevant costs associated to inventory, inventory objectives and forecasting the uncertainties. Understanding these features will assist in implementing control over inventories.

5.1.4.1 Relevant Costs

Inventory costs are important for three major reasons.

a. First, inventory costs represent a significant component of total logistics cost in many companies.
b. Second, the inventory levels that a firm maintains at points in its logistics system will affect the level of service the firm can provide to its customers.
c. Third, cost trade-off decisions in logistics frequently depend upon and ultimately affect inventory carrying costs.

Different cost categories will be involved when managing inventories. Understanding these costs is important especially when making inventory policy decisions. The major types are inventory carrying cost, order/setup cost, carrying cost versus order cost, expected stockout cost and in-transit inventory carrying costs as shown in Table 5.3.

<table>
<thead>
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<th>Types of Inventory Costs</th>
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<tr>
<td>Inventory Carrying Costs</td>
<td>Capital cost, storage space cost, inventory service cost and inventory risk costs are components of inventory carrying costs.</td>
</tr>
<tr>
<td>Order/ Setup Costs</td>
<td>Order costs refer to the activities associated with placing and receiving orders that could affect cost. While setup costs refer to the expenses each time a company modifies a production line to produce a different item for inventory. It is essential to separate the fixed and variable costs of both order and setup costs with the emphasis on the variable costs.</td>
</tr>
<tr>
<td>Expected Stockout Costs</td>
<td>This cost refer to the cost of not having product available when a customer demands or needs it. If customer turns to competitor product, the possibility of losing a customer on long-term basis might occur.</td>
</tr>
<tr>
<td>In-transit Inventory carrying Costs</td>
<td>The title F.O.B products is transferred only when the product reaches the customer. To consider the trade-off between higher cost</td>
</tr>
</tbody>
</table>
of fast delivery versus the cost of the product in transit.

5.1.4.2 Inventory Objectives

A firm wishing to maximize profits will have at least the following objectives, which are maximum customer service, low-cost plant operation or minimum inventory investment. Customer service is the ability of a company to satisfy the needs of customers through the availability of items when needed and is a measure of inventory management effectiveness. Inventories help to maximize customer service by protecting against uncertainties. If the exact forecast on what customers want and when, their demand can be fulfilled without any uncertainty.

Inventory help to make a manufacturing operation more productive in allowing operations with different rates of production to operate separately and more economically. Inventories also allow manufacturing to run longer production. This will certainly result in lower setup costs per item, increase in production capacity, larger quantity purchases and provide stocks for peak periods.

Inventory investment should also be balanced with customer service, cost associated with changing production levels, cost of placing orders and transportation costs. The benefit of carrying inventories should exceed the costs of carrying the inventories or else the purpose of carrying inventories is useless.

5.2.1 Importance of Warehouse Storage

Economically, the importance of warehouse storage is because it creates time utility for raw materials, industrial goods and finished products. The proximity of market-oriented warehouse to the customer allows a firm to serve the customer within a shorter lead-time period. Basically, the products are available according to when and where the customer’s demand is.

By warehousing some inventories, a firm can lower its production costs by avoiding wide fluctuations in outputs levels due to the uncertainties and variations in supply and demand patterns. It can also lower transportation costs through larger and economical quantities shipments. Table 5.4 shows basic reasons for warehouse storage requirements.

Table 5.4: Basic Reasons for Warehouse Storage Requirements

<table>
<thead>
<tr>
<th>Basic Reasons for Warehouse Storage Requirements</th>
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<tbody>
<tr>
<td>Transportation-Production-Cost Reduction</td>
<td>Products originate from many sources. By stocking inventories, the supplying and</td>
</tr>
<tr>
<td><strong>Coordination of Supply and Demand</strong></td>
<td>Distributing transportation and production costs will be lowered.</td>
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<tr>
<td>-------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Production Needs</strong></td>
<td>For highly seasonal production coupled with constant demand for products. Warehousing is highly needed to coordinate supply and demand and to avoid excessive costs incurred due to production and transportation.</td>
</tr>
<tr>
<td><strong>Marketing Considerations</strong></td>
<td>Fast delivery that can satisfy customers requires stock availability through stocking in warehouse.</td>
</tr>
</tbody>
</table>

5.2.2 **Warehouse Activities**

Operating a warehouse involves several processing activities and the efficient operation of the warehouse depends upon how well they are performed. The activities performed are:

**Warehouse Activities**

a. Receive goods – the warehouse accepts goods from outside transportation or an attached factory and accepts responsibility for them. This means that the warehouse must check goods against an order and the bill of lading, check the quantities, check for damage and fill out damage report if necessary and inspect goods if required.

b. Identify the goods- items are identified with the appropriate stock-keeping unit (SKU) number and the quantity received recorded.

c. Dispatch goods to storage – where goods are sorted and stored away.

d. Hold goods – where goods are kept in storage and under proper protection until needed.

e. Pick goods – items required from stock must be selected from storage and brought to a marshalling area.

f. Marshal the shipment – where goods making up a single order are bought together and checked for omissions or errors. Order records are updated.

g. Dispatch the shipment – where the orders are packaged, shipping documents prepared and goods loaded on the right vehicle.

h. Operate an information system – a record must be maintained for each item in stock showing the quantity on hand, quantity received, quantity issued and location in the warehouse.
The complexity of managing a warehouse very much depends on the number of SKUs handled, the quantities of each SKU, the number of orders received and filled. In order to maximize the use of space available in floor space and above the floor and the effective use of labour and equipment through good location system and layout moving goods efficiently.

5.3 WAREHOUSE DECISIONS

A number of choices such as ownership, number, size, location and stocking are important in warehouse decision. Regarding to the ownership, there are two basic alternatives which are private versus public warehouse or even a combination of both. Among the reason for private warehouse is that it is regarded as fixed cost that can contribute to property taxes and depreciation in cost structure, stability of demand, dense market area relatively close to the warehouse or numerous vendors relatively close to a physical supply warehouse, higher degree of control and multiple uses.

Public warehouse suits company that has no large inventory accumulation or a seasonal need for warehouse or that deals with small shipment. The main advantage is financial need for warehouse or that deals with small shipment. The main advantage is financial as it requires no or limited capital investment. Second is its flexibility whereby firm could rent space for a short period, let’s say thirty days, therefore this enables company to immediately launch in, expand in or pull out of new untried markets without prolong distribution costs.

In centralized versus decentralized warehouse decision, the decision is concern with the number of warehouse a firm should provide. It is quite common that the size of the company indicates the number or warehouses. Small and medium size firms with a regional market area often need only in warehouse. While a manufacturing firm or distribution a highly competitive and substitutable product on national basis may need to use decentralized warehouse to give rapid service in the market area.

In decision regarding warehouse size and location for public warehouse the question on size and location are less important as the company can expand or contract space according to its needs at different times. Although the location of a public warehouse is fixed, it can change necessary.

Firms have to make decisions on how to layout the warehouse’s interior. Specifically, the firm has to make decisions about aisle space, shelving, equipment and all the other physical dimensions of the interior warehouse including how to arrange stock most efficiently in the warehouse.
Regarding to the items stocked, a firm having a number of locations must decide whether all warehouse will carry the entire product line, or whether each warehouse will specialize to some extend or the warehouse will combine specialization and general stocking.

Another aspect that concerns the warehouse decision is employee safety. Risk is involved when monotonous and dangerous work situations exist in most warehouse.