Inventory Management

Amazon – The Master of Inventory Management

- Estimated over 85% of the world's products will be available on Amazon.
- The company currently stocks over 200 million products.
- Global warehouse 185 and in India 60.
- Amazon keeps accelerating delivery time from 2-day, to next day, to the evening of the same day in some market.

- The giant retailer sells products from inventory managed at its own warehouses or from the inventory of third-party partners.
- The game of managing millions of orders needs to be done accurately and optimized for maximum efficiency

How much should be ordered from its vendors?

When should the orders be placed?

These are the two fundamental questions that Amazon needs to answer millions of times each week

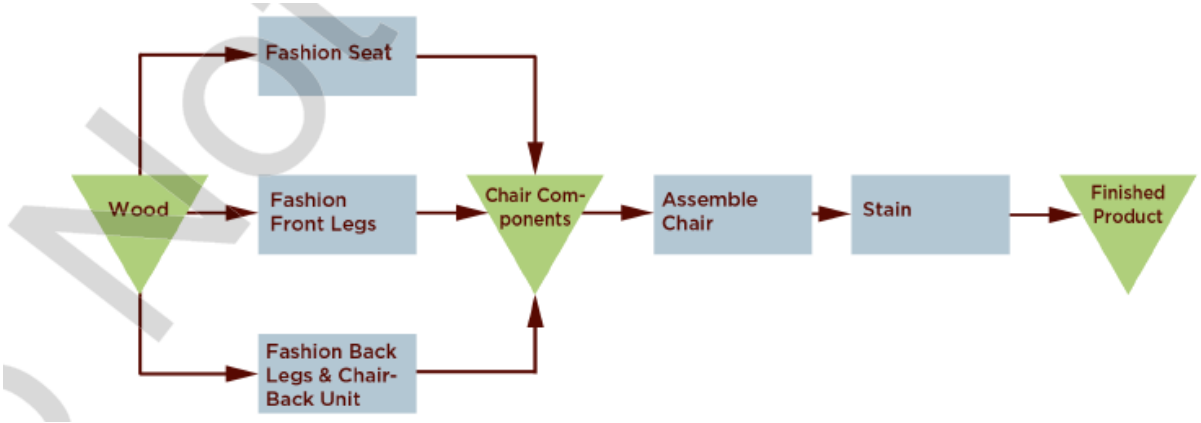
Types of Inventory

General Inventory

- Raw materials and purchased parts
- Work-in-process (WIP)
- Finished goods inventories or merchandise
- Maintenance, repair and Operations (MRO) inventory

Functional Inventory

- Cycle Inventory or lot size inventory
- Buffer Inventory or Safety Stock (extra stock)
- Pipeline Inventory (Goods-in-transit to warehouses, distributors, or customers)
- Decoupling Inventory



Inventory Purposes

Inventories serve a number of purposes such as:

1. To meet anticipated customer demand
2. To smooth production requirements
3. To decouple operations
4. To protect against stockouts
5. To take advantage of order cycles
6. To hedge against price increases
7. To take advantage of quantity discounts

Concerns in Inventory Management

Inventory manager has two main concerns:

1. Level of customer service

   Having the right goods available in the right quantity in the right place at the right time

2. Inventory cost

The overall objective of inventory management is to achieve satisfactory levels of customer service while keeping inventory costs within reasonable bounds

Inventory Cost

Purchase cost

- The amount paid to buy product per unit for inventory

Ordering costs

- Costs of ordering inventory

Holding (carrying) costs

- Cost to hold an item in inventory for a length of time
- Holding cost includes Shrinkage Cost (damage/theft) and Obsolescence Cost (Expiry Date)

Shortage costs / Stock-out cost

- Costs resulting when demand exceeds the supply of inventory; often unrealized profit per unit

Choosing an Inventory model for a company

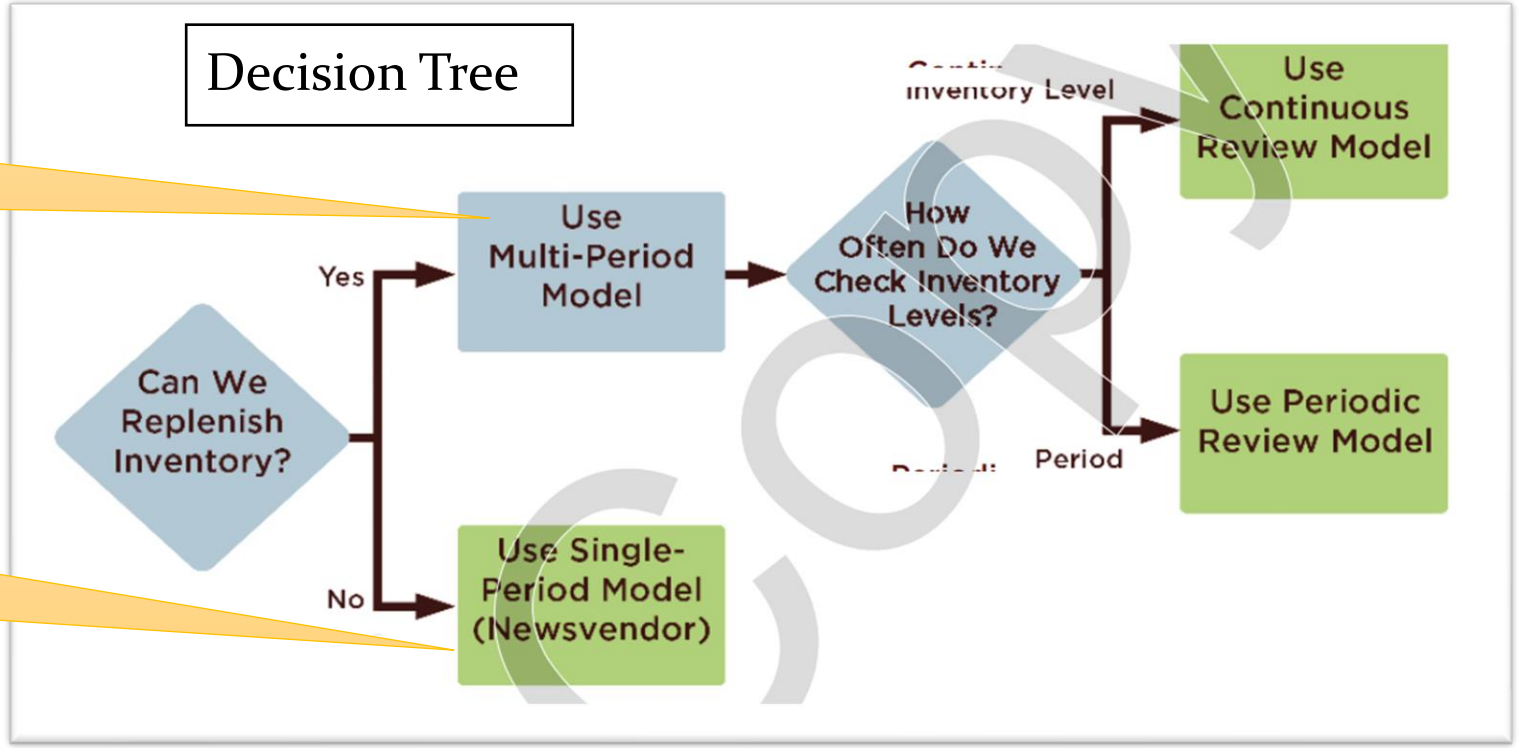
Selecting an Inventory model depends on two *managerial questions*.

Question 1: Can we replenish Inventory within the selling period?

Question 2: How often are inventory levels assessed?

Product is saleable over a period that allows replenishment within the selling period

Product cannot be replenished within its selling period or its procurement lead time is too long.



Inventory Control System

Single-period inventory model

- One time purchasing decision, because, short selling period, long lead time to replenish.
  - Example: vendor selling t-shirts at a football game, fresh fruits, vegetables, seafood, & cut flowers, newspaper etc.
- Seeks to balance the costs of inventory overstock and under stock

Multi-period inventory models

- More than one time purchasing decision, because, selling period is high compare to lead time to replenish.
  - Fixed-order quantity models (Continuous Review Model)
    - Event triggered
      - Example: running out of stock
  - Fixed-time period models (Periodic Review Model)
    - Time triggered

Single-period inventory model

Newspaper vendor

Single-period inventory model

Scenario 1: Newspaper vendor

- Consider the problem that the newsperson has in deciding how many newspapers to put in the sales stand outside a busy street each morning
- Too few papers and some customers will not be able to purchase a paper, and profits associated with these potential sales are lost
- Too many papers and the price paid for papers that were not sold during the day will be wasted, lowering profit
- This is a very common problem in many organization. (Due to selling period is short compare to replenishment period)

Times-of-India distribution in Delhi, India

Arrival of Newspapers from the TOI printing press at Shahibabad to the Nehru Place Newspaper depot at 4:00am. Labor is unloading

Vendors claiming their TOI copies once their stacks are unloaded at the depot

Vendors queue to buy their daily demand of TOI from the TOI Salesmen

Almost 27,000 copies of TOI arrive at Nehru Place depot each day.

Salesman collect cash payment from a vendor.

Vendor counting copies after purchase

Vendors squatting on a pavement side for sorting copies as per distribution areas and inserting pamphlets

Vendor segregating copies of almost 30-40 varieties of newspapers for each delivery boy to be delivered in different areas

Copies mounted and vendor off to delivery

Newsvendor model

How the Newsvendor model works

Generate a demand model:

Determine a distribution function that accurately reflects the possible demand outcomes, such as a normal distribution function.

Determine the degree of uncertainty using mean and standard deviation

Gather economic inputs:

Selling price, production/procurement cost, salvage/Liquidity or Disposal value of a product.

Choose an objective:

For example maximize expected profit or satisfy an in-stock probability.

Choose a quantity to order.

Service Level and Quantity Stock

Situation One: If the vendor is fixed with Service level to the customer

Situation Two: If the vendor is fixed with Quantity

- https://s3.amazonaws.com/he-assets-prod/interactives/004_servicelevel/launch.html

Gather economic inputs:

Selling price, production/procurement cost, salvage/Liquidity or Disposal value of a product.

Underage Cost – The cost of having one less unit than customers demand

Underage cost = lost gross margin per unit

= selling price per unit – cost per unit

Overage cost – The cost of having one more unit than customers demand.

Overage cost = cost per unit – salvage value per unit

Some time Overage cost will be = cost per unit + disposal value per unit

https://s3.amazonaws.com/he-assets-prod/interactives/005_newsvendor/launch.html	https://s3.amazonaws.com/he-assets-prod/interactives/018_newsvendor_profit/Launch.html

Thank you