



CHAPTER 12: Inventory Management



Introduction



- **Basic question:**
 - How much to order & when needed to arrive
- **Functions of Inventory:**
 - To meet anticipated demand (customer orders)
 - To protect against stock-outs
 - To take advantage of volume discounts
 - To smooth seasonal production requirements
 - To hedge against expected price increases

Objectives of Inventory Control

Inventory turnover: Ratio of average cost of goods sold to average inventory investment

- Inadequate control of inventories can result in both under and overstocking of items
- Under stocking results in:
 - Missed deliveries, lost sales, dissatisfied customer, production stoppage
- Overstocking results in:
 - Excessive cost of the inventory
- Objectives of Inventory Control
 - Have the right goods, in sufficient quantitative, in the right place, at the right time

Inventory Turn-over

Measurement of Inventory Performance – how often do we use up our raw materials inventory on hand

Ex. We use \$12 million worth of raw materials per year

Order and receive all on Jan 1st – warehouse is stuffed full of inventory – takes whole year to use up

Inv Turn = 1 per year

Order monthly requirements only – only need a WH big enough for this small amount

Inv Turn = 12 per year – much less \$ tied up in inventory!

Requirements for Effective Inventory Management

1. A system to safely store and use inventory-secure warehouse
2. A system to keep track of the inventory and a replenishment system (computer software)
3. Reliable forecasts of demand and knowledge of lead times (Chapter 3)
4. Reasonable estimate of inventory holding, ordering, and shortage costs
5. **ABC classification – prioritize each inventory item**

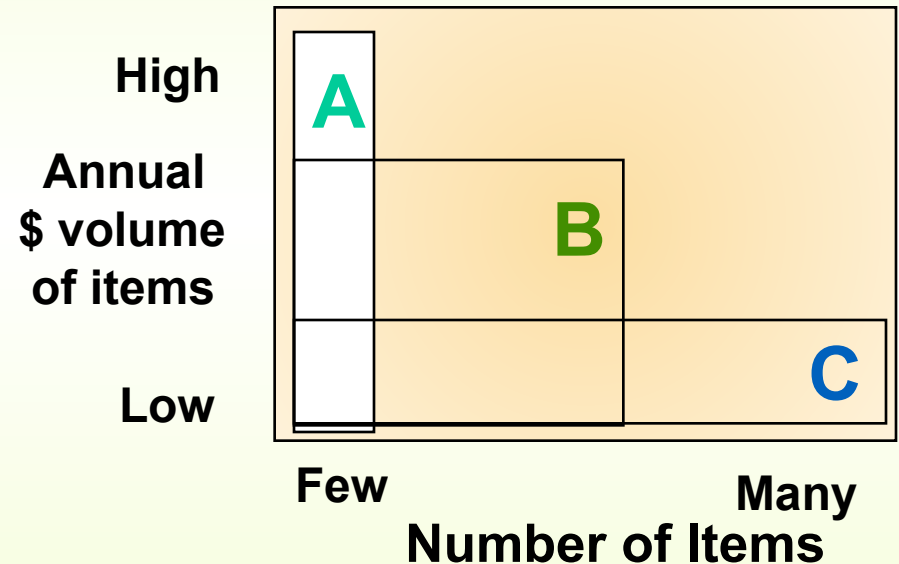
ABC Classification

Classifying inventory according to some measure of importance and allocating control efforts accordingly.

A - very important

B - Important

C - less important



WH Inventory Cycle Counting



Control & knowledge of our inventory

- Determining the importance of each inventory item
- Importance – high usage, high purchasing cost, difficult to purchase or replace, “must-have” special items
- Different methods to control different items of importance
- ABC Analysis or 80/20 Pareto Analysis
- Separate the important few from the trivial many
- Count items & resolve discrepancies according to level of importance

ABC Analysis

Classified into 3 groups or items:

A items: The 20% of our items that tie up 80% of the total inventory \$

B items: The 30% of our items that tie up 15% of the total inventory \$

C items: The 50% of our items that tie up 5% of the total inventory \$

Establish item characteristics that will influence inventory management.

- Annual \$ usage
- Scarcity of material
- Quality problems

ABC Analysis

How to classify the items in our inventory:

- Determine the annual usage for each item
- Multiply annual usage of each item by its purchase cost to get total annual money usage
 - Rank the items according to their annual money usage.
 - Calculate the cumulative annual
 - \$ usage and the cumulative % of items
- Examine the annual usage distribution and group items into A, B, and C groups based on % of annual usage

Cycle Counting –ABC Method

- A items – all items once per week. Resolve any discrepancies immediately
- B items - all items once per 1-2 months. Resolve any discrepancies immediately
 - C items –all items once per 6 months. Inventory adjust any discrepancies
- Manual or computer generated ABC cycle counting system

<i>Item</i>	<i>Stock Level</i>	<i>Counted Quantity</i>	<i>Difference (%)</i>	<i>Need to Investigate?</i>
A1005	100	91	-9.0%	Yes
B7324	55	54	-1.8%	No
A4509	18	16	-11.1%	Yes
C3467	24	31	+29.2%	Yes

Under or over are both problems to check

Inventory Counting and Replenishment Models

- **Periodic System**
 - Physical count of all items usually once a year
 - Usually done to satisfy external auditor requirements
 - May need to shut down operations to count
- **Perpetual Inventory System**
 - Continuous real-time updating in the computer of inventory levels each time a movement is made – finished good sold to customer, raw materials used in production, new raw materials arrive

Inventory Counting and Replenishment Models

- **Fixed Order Quantity/Reorder Point Model**
 - An order of a fixed size is placed when the amount on hand drops below a minimum quantity called the reorder point
- **Two-Bin System**
 - Two containers for each inventory item; reorder when the first bin is empty
- **Bar Coding**
 - A unique number assigned to an item or location, made of a group of vertical bars of different thickness that are readable by a scanner

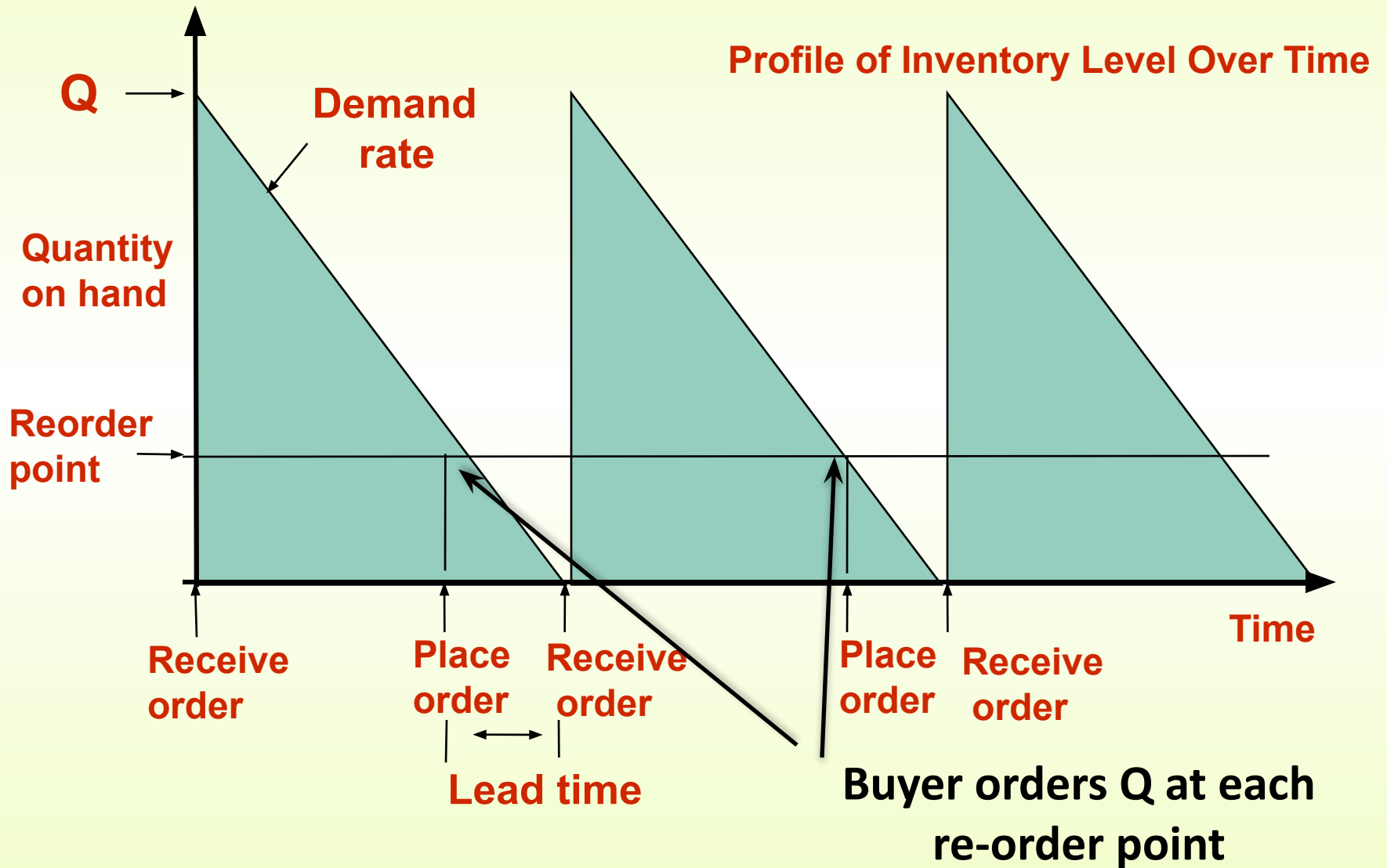
Demand Forecast

- **Lead Time**
 - time interval between ordering and receiving the order – supplier's manufacturing time plus shipping time to your location
- **Point of Sale (POS)system**
 - Software for electronically recording sales and updating inventory levels at the time and location of sale (cash register)

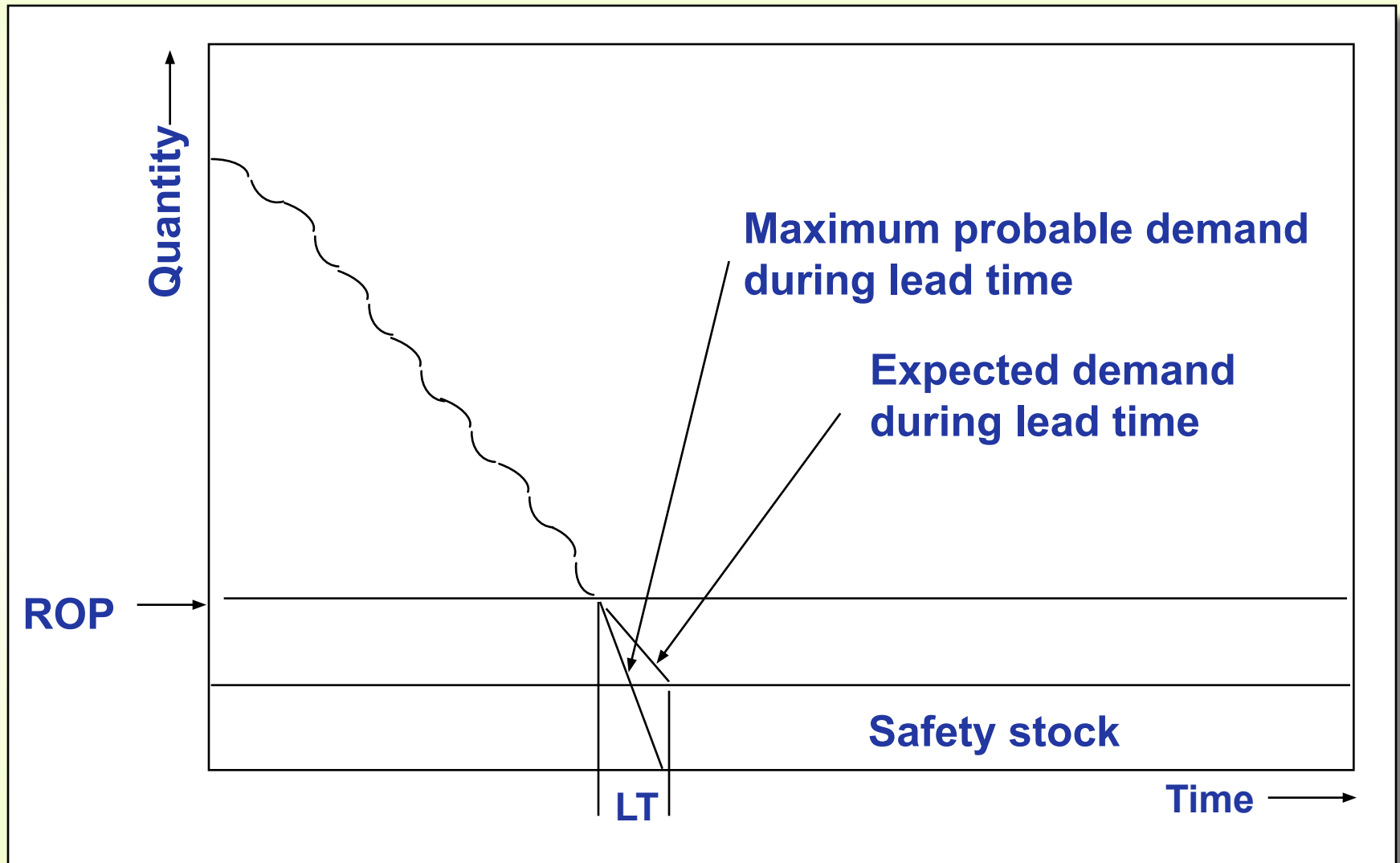
Inventory Costs

- **Holding (carrying) costs**
 - cost to carry an item in inventory – warehouse staff costs, security, taxes
- **Ordering costs**
 - costs to determine need, place purchase order, ensure delivery plus costs to receive, inspect & stock in warehouse
- **Setup costs**
 - Time spent preparing equipment for the job by adjusting machine, changing tools
- **Shortage costs**
 - costs when supply exceeds demand (stock-outs)

The Inventory Cycle



Safety Stock



Fixed-Period Ordering

- Orders are placed at fixed time intervals (example – once per week like home milk delivery)
- Suppliers might encourage fixed intervals (their scheduled delivery route)
- Ensure consistency in delivery times

Single Period Model

- **Single period model**
 - model for ordering of perishables and other items with limited useful lives
- **Shortage cost**
 - generally the unrealized profits per unit
- **Excess cost**
 - difference between purchase cost and salvage value of items left over at the end of a period (grocery store throws away up to 50% of produce due to spoilage)

Fixed Quantity Model

Quantity cannot be changed

- Supplier's pre-determined batch size or case size (example – carton of dozen eggs)

Shipments dates can change

- Can order as often as needed, even daily but the shipment quantity is always in the pre-determined batch size – but you can order as many batches as you need

Operations Strategy

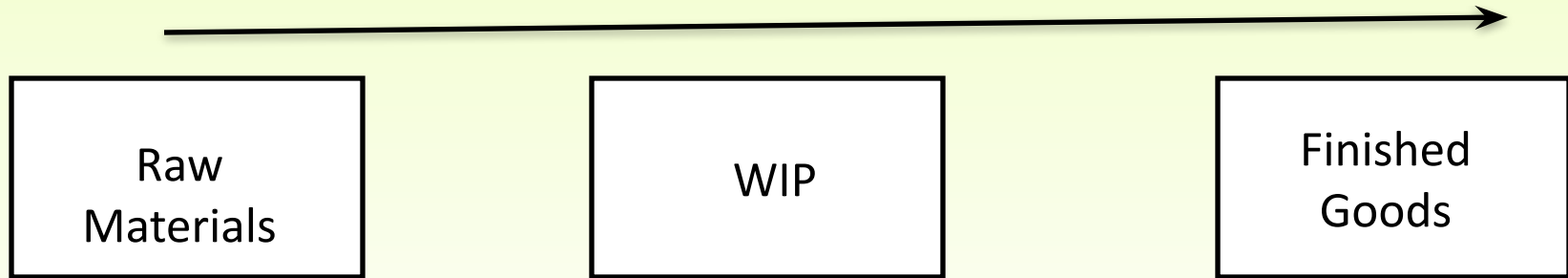
Too much inventory

- Tends to hide problems – quality, efficiency
- Easier to live with problems than to eliminate them
- Costly to maintain – tie up company \$\$

Wise strategy

- Reduce purchase order sizes –order less more often
- Reduce safety stock (if possible)

Inventory



When Production Order “released” to Production RM becomes Work In Process

When order built WIP becomes the finished products we sell to Customer