Supply Chain
Inventory Manangment

From Previous Session

- The Difference between Inventory Management Vs Inventory Control
- Inventory Types (Raw, WIP, Finished Goods, MRO, Packing Materials, etc)
- Main Players in Supply Chain (MFR, Distributors, Retailers and Consumers)
- Types of Inventory Costs (Definitions, Examples)

What is Inventroy Costs

Inventory costs represent the total expenses associated with acquiring, storing, and managing inventory throughout its lifecycle.

Ordering Costs

Holding (Carrying) Costs

Stockout (Shortage) Costs

Purchase Costs

What is Inventroy Costs

Ordering Costs

What:

Costs incurred every time an order is placed to replenish inventory. This includes costs for order processing, shipping, receiving, and inspection.

Amazon places millions of orders with suppliers worldwide. Each order requires **administrative work**, **shipping fees**, and **logistics coordination**. Even if an order is small, these costs remain, so Amazon tries to balance order size and frequency to minimize ordering costs.

Impact:

Placing many small orders increases ordering costs; placing fewer large orders reduces ordering costs but may increase holding costs.

Formula: Total Ordering Cost = Number of Orders per Period × Cost per Order

What is Inventroy Costs

Holding (Carrying) Costs

What:
Costs associated with storing unsold inventory. This includes warehousing rent, utilities, insurance, security, depreciation, and obsolescence risk

Apple produces large quantities of iPhones and other devices. Holding excess inventory ties up capital and risks obsolescence (older models becoming outdated quickly). Apple's holding costs include storage in warehouses, insurance, and potential markdowns for unsold stock.

Impact:

Higher inventory levels increase holding costs, so companies like Apple strive to keep inventory lean but sufficient to meet demand.

Formula: Holding Cost = Average Inventory Level × Holding Cost per Unit

What is Inventroy Costs

Stockout (Shortage) Costs

What:

Costs when inventory runs out, leading to lost sales, delayed orders, or customer dissatisfaction

Imagine **Nike** runs out of popular sneaker sizes during a major sale. The company loses potential sales, damages customer loyalty, and may lose customers to competitors.

Impact:

Stockouts can result in lost revenue and damage brand reputation, pushing companies to maintain safety stock or better forecast demand.

Formula: Stockout Cost = Number of Stockouts × Cost per Stockout

What is Inventroy Costs

Purchase Costs

What:

The actual cost of buying the inventory items, which might vary based on order size, supplier negotiations, and bulk discounts.

Walmart uses its massive buying power to negotiate lower purchase costs from suppliers. By purchasing in bulk, Walmart reduces its per-unit cost, allowing competitive pricing.

Impact:

Lower purchase costs improve profit margins but may lead to higher holding costs if inventory levels grow too large.

Summary

Inventory Cost Type	Description	Business Impact
Ordering Cost	Cost per order placed	More orders → higher cost, fewer orders → risk stockouts
Holding Cost	Storage, insurance, depreciation	Higher inventory → higher cost, risk of outdated products
Stockout Cost	Lost sales, customer dissatisfaction	Stockouts → lost revenue & damaged reputation
Purchase Cost	Cost to buy goods	Bulk buying → lower cost but possibly higher holding costs

What is Inventroy Costs

Formula: Shrinkage Cost = (Recorded Inventory - Actual Inventory) × Cost per Unit

Shrinkage Costs

Losses due to theft, damage, or inaccuracies in inventory records

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Lead Time

Manfacturing Strategy and Lead Time

Lead time refers to the total time taken between placing an order to the final delivery of goods or services.

Engineer-to-Order (ETO)

Make-to-Order (MTO)

Configure-to-Order (CTO)

Assemble-to-Order (ATO)

Manfacturing Strategy and Lead Time

Lead time refers to the total time taken between placing an order to the final delivery of goods or services.

Engineer-to-Order (ETO)

Products are designed and engineered from scratch based on unique customer specifications

Custom machinery, specialized equipment

- Longest lead time
- Involves concept design, engineering, prototyping, sourcing, and production

- Custom Designs / Unique Products / Inventory purchased after product designed

Manfacturing Strategy and Lead Time

Lead time refers to the total time taken between placing an order to the final delivery of goods or services.

Make-to-Order (MTO)

Products are manufactured only after receiving a customer order, but the design / components are standard

Industrial parts, machinery

- Shorter than ETO, but still substantial
- No production starts until order is confirmed
- Inventory held as raw materials

Manfacturing Strategy and Lead Time

Lead time refers to the total time taken between placing an order to the final delivery of goods or services.

Configure-to-Order (CTO)

Products are configured from a set of pre-defined modules or options, based on customer choices.

Servers, cars with selectable options (e.g., color, engine, interior)

- Shorter lead time
- High responsiveness

Manfacturing Strategy and Lead Time

Lead time refers to the total time taken between placing an order to the final delivery of goods or services.

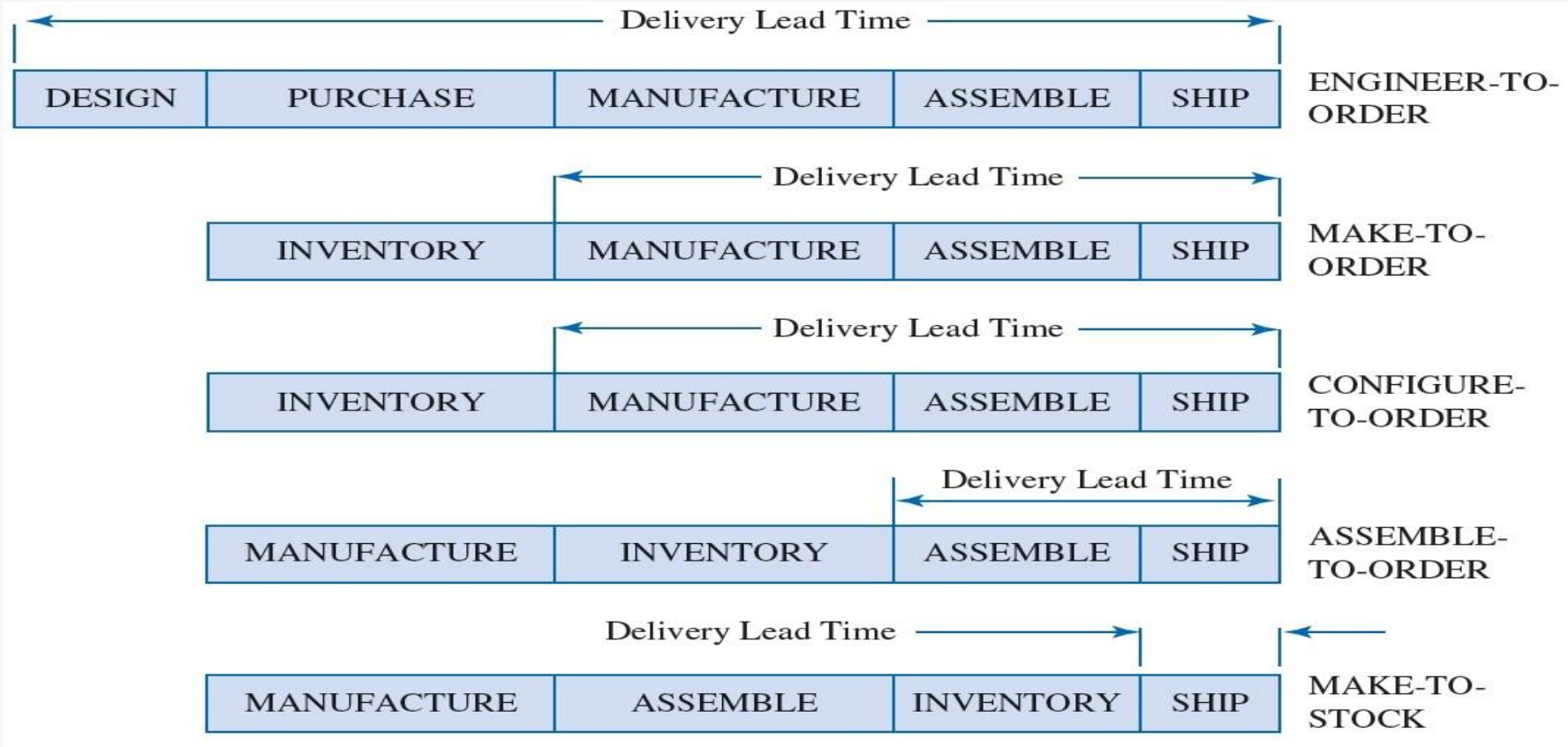
Assemble-to-Order (ATO)

All components are pre-manufactured and stocked; final assembly is triggered by the customer order.

Personal computers, bicycles, fast-food meal kits

No Design required
Only assembly required

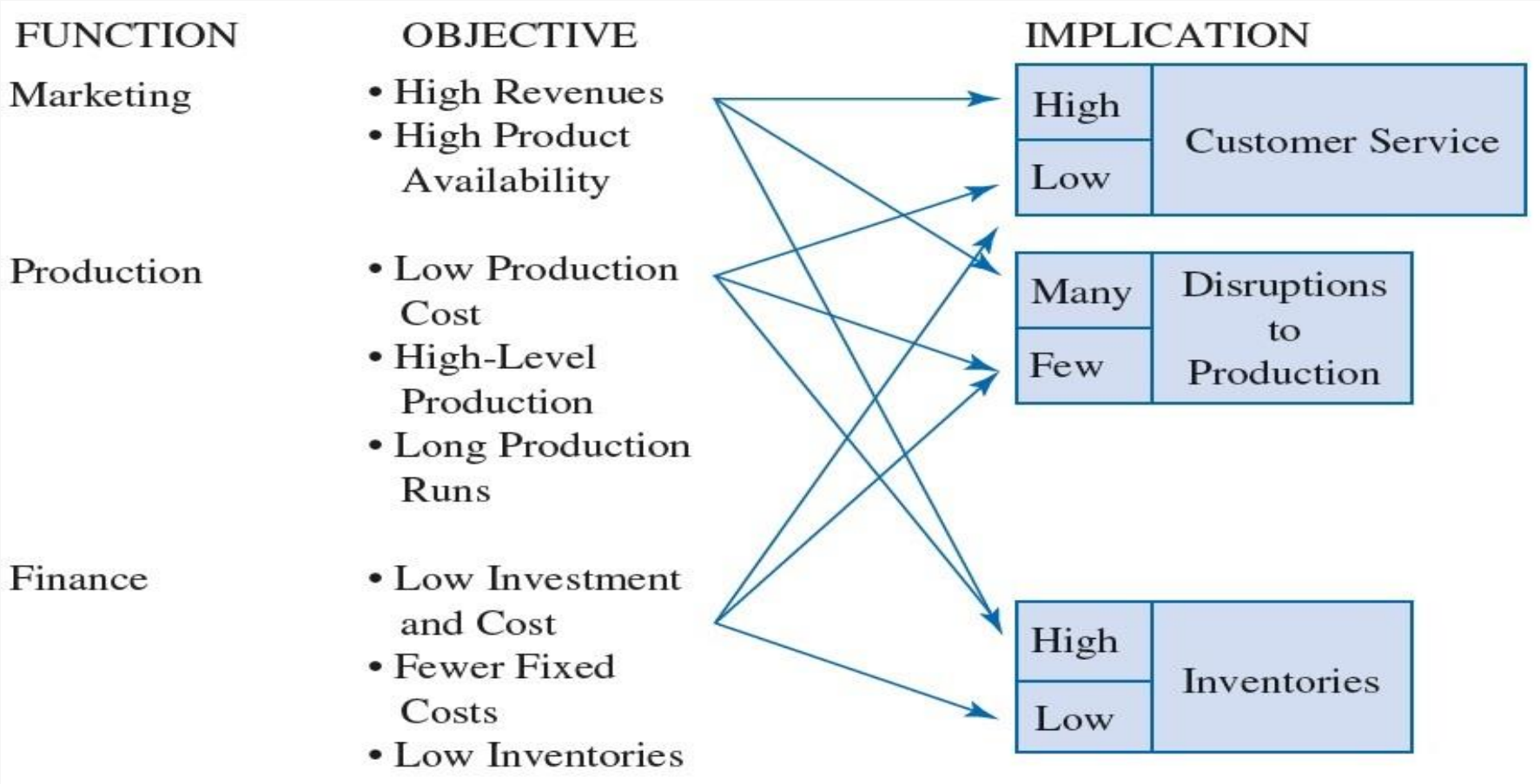
Manfacturing Strategy and Lead Time



Manfacturing Strategy and Lead Time

Production Model	Customization	Inventory	Lead Time	Example Products
ETO	Fully custom	None	Longest	Power plants, bridges **(Boeing, Bechtel)**
MTO	Standard design, custom production	Limited RAW	Long	Heavy equipment (**Caterpillar**)
CTO	Configured from modules	Partial	Medium	Cars, laptops **(Cisco Systems, HP)**
ATO	Pre-made parts, assembled on order	High	Short	Bicycles **(Subway)**
MTS	No customization	Very high	Very short	Groceries **(P&G, Unilever)**

Stakeholders' Challenges



Marketing Team Objective

Challenge	Explanation
Push for high inventory levels	Marketing wants to avoid stockouts during promotions, leading to pressure for excess inventory.
Unpredictable demand	Marketing campaigns can cause sudden spikes in demand that are hard to forecast or prepare for.
Poor communication with inventory planners	If marketing doesn't share timely campaign plans, inventory teams can't align stock levels.
Obsolescence risk	New products launched for marketing appeal may not sell as expected, leading to slow-moving or obsolete stock.

Production / Operations Team Objective

Challenge	Explanation
Preference for large batch sizes	Production teams may overproduce to reduce setup costs, leading to excess inventory.
Mismatch with real demand	Production may create items based on forecast or capacity, not real-time sales data.
Limited flexibility	Rigid production schedules make it hard to respond to demand changes quickly.
Raw material inventory issues	Shortages or delays in raw materials can halt production and disrupt finished goods inventory.

Finance Team Objective

Challenge	Explanation
Pressure to reduce inventory	Finance wants lower inventory to free up cash, which may conflict with marketing or production needs.
Inventory carrying costs	High inventory levels increase warehousing, insurance, and opportunity costs.
Risk of inventory write-downs	Excess or obsolete inventory affects balance sheets and requires financial adjustments.

Inventory Valuation Methods

- Moving Average Price (MAP)
- Weighted Average Cost (WAC)
- FIFO (First-In, First-Out)
- LIFO (Not Accepte by IFRS)

Inventory Valuation Methods

Method	Industries/Use Cases	Popular ERP Systems	Global Usage
MAP	Manufacturing, SAP-based companies	SAP, Oracle	🔥 Very High
WAC	Distribution, Small Business, Periodic use	QuickBooks, NetSuite	🔥 High
FIFO	Food, Pharma, Inventory with shelf life	All major ERPs	🔥 Very High
LIFO	US-only legacy systems	US based systems	❄️ Declining

Inventory Valuation Methods

Method	Example
MAP	Your current stock is: 100 units @ $10 → Inventory Value = $1,000 Then you buy: 50 units @ $12 → Cost = $600 **MAP (Real-time update):** **New MAP** = (1000 + 600) / 150 = **$10.67** This price is now applied to **future goods issues** (in systems like SAP).
WAC	Same but not in a real time or per transaction (Done Monthly, Quarterly or Annually)

Inventory Valuation Methods

<table>
<tr><th>Method</th><th>Example</th></tr>
<tr><td>FIFO</td><td>
<table>
<tr><th>Date</th><th>QTY</th><th>Unit Price</th><th>Total</th></tr>
<tr><td>Jan 2025</td><td>100</td><td>$10</td><td>$ 1000</td></tr>
<tr><td>Feb 2025</td><td>150</td><td>$12</td><td>$ 1800</td></tr>
<tr><td>Mar 2025</td><td>200</td><td>$11</td><td>$ 2200</td></tr>
<tr><td>Total</td><td>450</td><td></td><td>$ 5000</td></tr>
</table>
You then sell 300 units by April.
Sell oldest first:
100 units @ $10 = $1,000 and 150 units @ $12 = $1,800 and 50 units @ $11 = $550
COGS = $3,350
Ending Inventory = 150 units @ $11 = $1,650
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Inventory Classification

Instead of managing all inventory the same way, companies use classification to **apply different policies** depending on the importance of each item.

Inventory classification is the **process of categorizing inventory items into groups** based on specific criteria such as **value, demand, usage, or criticality.**

The purpose is to **prioritize resources, optimize stock levels, and improve control**.

Why Do We Need Inventory Classification

Better resource allocation

focus on high-value or critical items

Risk management

ensure critical and scarce items are always available

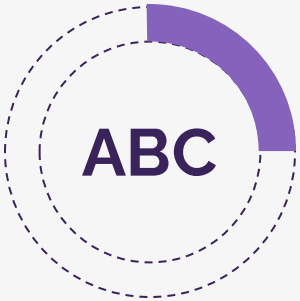
Cost reduction

avoid excess stock of low-value items

Support Org. strategy

e.g., fast fashion (Zara) or just-in-time (Toyota)

There are multiple ways to classify inventory. The most common frameworks are:



Value

Based on Pareto principle (80/20 rule)

A items: High Value, low-quantity (need strict control).
B items: Moderate Value and usage.
C items: Low value, high quantity (less strict control).

Retail Store Inventory

Item	Annual Demand (units)	Unit Cost ($)
Laptop	500	800
Smartphone	1,000	600
Tablet	800	300
Headphones	2,000	50
USB Drives	5,000	10
Chargers	3,000	15
Mouse	4,000	8

Retail Store Inventory

Step 1: Calculate Annual Consumption Value

Annual Consumption Value = Annual Demand × Unit Cost

Item	Demand	Cost	Annual Value ($)
Laptop	500	800	400,000
Smartphone	1,000	600	600,000
Tablet	800	300	240,000
Headphones	2,000	50	100,000
USB Drives	5,000	10	50,000
Chargers	3,000	15	45,000
Mouse	4,000	8	32,000

Total Value = 1,467,000

Retail Store Inventory

Step 2: Rank Items by Value (Highest → Lowest)

Item	Annual Value ($)
Smartphone	600,000
Laptop	400,000
Tablet	240,000
Headphones	100,000
USB Drives	50,000
Chargers	45,000
Mouse	32,000

Total Value = 1,467,000

Retail Store Inventory

Step 3: Calculate % of Total & Cumulative %

Item	Value ($)	% of Total	Cumulative %
Smartphone	600,000	41%	41%
Laptop	400,000	27%	68%
Tablet	240,000	16%	84%
Headphones	100,000	7%	91%
USB Drives	50,000	3%	94%
Chargers	45,000	3%	97%
Mouse	32,000	2%	100%

Total Value = 1,467,000

Retail Store Inventory

Step 4: Classify into A, B, C

Item	Value ($)	Cumulative %	ABC
Smartphone	600,000	41%	A
Laptop	400,000	68%	A
Tablet	240,000	84%	B
Headphones	100,000	91%	C
USB Drives	50,000	94%	C
Chargers	45,000	97%	C
Mouse	32,000	100%	C

A items = top ~70–80% of value → Smartphones, Laptops
B items = next ~15–25% → Tablets
C items = last ~5% → Headphones, USBs, Chargers, Mouse

Retail Store Inventory

A items = top ~70–80% of value → Smartphones, Laptops
B items = next ~15–25% → Tablets
C items = last ~5% → Headphones, USBs, Chargers, Mouse

Class	Items	Control Policy
A	Smartphone, Laptop	Very tight control (accurate records, frequent review)
B	Tablet	Moderate control (periodic review)
C	Headphones, USB Drives, Chargers, Mouse	Less control (Bulk ordering)

Even though Mouse **(4,000 units)** is the highest in count, it is C-class because its contribution to value is very small. Meanwhile, **Smartphones & Laptops** make up 68% of total value despite being fewer in quantity → they deserve maximum attention.