Supply Chain
Inventory Manangment

From Previous Session

- Supply chain structures **vary** significantly depending on the type of business, organizational size, and operating environment. (Centralized Vs Decentralized)

- Geographic location plays a critical role in **shaping** supply chain strategy, influencing transportation, supplier access, and lead times.

- **Customization** of supply chain processes is essential to align with business goals, customer expectations, and market conditions.

- Inventory acts as a **buffer** between supply and demand, ensuring continuity in operations and customer service

What is Inventory

Inventory

- Represents one of the **most valuable** assets for any business, particularly within manufacturing & supply chain management.

- Inventory refers to all the **items and materials** a company holds, ranging from raw materials awaiting production to finished goods ready for sales and MRO.

Effective **inventory management** ensures a business can meet customer demand without accumulating excessive inventory, which ties up capital and increases storage costs.

Management Vs Control

Inventory Management

Broad, strategic focus

Inventory management is the overall process of overseeing and controlling the ordering, storage, and use of a company's inventory. It includes forecasting, replenishment, lead time analysis, stock planning, and demand analysis.

Key responsibilities:

- ❑ Determining how much inventory to order and when to order
- ❑ Setting reorder points and safety stock levels
- ❑ Managing supplier relationships
- ❑ Forecasting demand
- ❑ Analyzing inventory turnover and performance

Management Vs Control

Inventory Control

Narrower, operational focus

Inventory control refers to the day-to-day activities that ensure physical inventory is accurately tracked, stored, and managed. It's about ensuring the right quantity of products is in the right place at the right time.

Key responsibilities:

- ❑ Monitoring stock levels in real-time
- ❑ Managing stock locations (e.g., shelves, bins)
- ❑ Performing cycle counts and audits
- ❑ Preventing theft, damage, or spoilage
- ❑ Handling stock discrepancies
- ❑ Using tools like barcoding, RFID, or ERP systems

Management Vs Control

Aspect	Inventory Management	Inventory Control
Scope	Strategic / broad	Tactical / operational
Focus	Planning and Optimization	Monitoring and Accuracy
Goal	Ensure availability & reduce holding costs	Ensure inventory accuracy and reduce waste
Activities	Forecasting, Ordering, Supplier Mgmt	Counting, tracking, loss prevention
Tools used	ERP systems, demand planning tools	Barcode scanners, inventory control systems

Role of Inventory within Supply Chain Life Cycle

Inventory is an integral to the supply chain, bridging production and customer fulfillment. Proper inventory management ensures that materials work in progress and finished products flow efficiently from one stage to the next, aligning production schedules with market demand

Types of Inventory

1

Raw Materials

2

Work in Progress (WIP)

3

Finished Goods

3

MRO

4

Packing Materials

Retailers

Pre-Packaged & ready for sale — the retailer doesn't assemble or modify them. Considered inventory until they are sold

Types of Inventory

1

Raw Materials

- Boeing (Aerospace Manufacturer)
  Inventory Examples: Aluminum sheets, Wiring

- Nestlé (Food & Beverage)
  Inventory Examples: Cocoa, sugar, milk powder, coffee beans

Types of Inventory

2

Work in Progress (WIP)

- Toyota (Automobile Manufacturer)
  Inventory Examples: Partially assembled vehicles, unpainted car bodies
- Intel (Semiconductor Manufacturer)
  Inventory Examples: In-process microchips or not yet fully fabricated

Types of Inventory

3

Finished Goods

- Apple (Consumer Electronics Retailer & Manufacturer)
  Inventory Examples: iPhones, MacBooks, iPads ready for sale in stores
- Nike (Footwear and Apparel
  Inventory Examples: Sneakers,

Types of Inventory

3

MRO

- Amazon (Fulfillment Centers)
  Inventory Examples: Packing tape, tools, cleaning supplies, scanners — all used to maintain operations
- Saudia Airlines
  Inventory Examples: Aircraft maintenance tools, lubricants, safety equipment

Types of Inventory

- FedEx
  Inventory Examples: Shipping boxes, bubble wrap, pallet wrap

4

Packing Materials

Types of Inventory

Clothing Retailer
Zara
Inventory Examples: Finished fashion items (dresses, shirts, jeans) in stores and warehouses

Electronics Retailer
Best Buy
Inventory Examples: TVs, laptops, phones, headphones — all held for resale

Grocery Retailer
Kroger / Tesco
Inventory Examples: Fresh produce, canned goods, dairy products, cleaning supplies

Retailers

Main Players

Main Players

Feature	Manufacturer	Distributor	Wholesaler	Retailer
Creates product	✅	❌	❌	❌
Buys in bulk	❌	✅	✅	✅
Sells to end customer	❌	❌	❌	✅
Adds branding/marketing	Sometimes	No	No	Yes
Stores inventory	Sometimes	Yes	Yes	Yes

Example

Role	Example	Function in Supply Chain
Manufacturer	**Nike Inc.** (factories in Vietnam, China, etc.)	**Produces** the shoes from raw materials.
Distributor	**Ingram Micro**, or Nike's regional distribution centers	**Moves bulk products** from Nike to wholesalers or retailers; may handle storage
Wholesaler	**Footwear wholesalers like Zappos' warehouse (if selling B2B)**	**Buys in bulk** from distributors/manufacturers, sells to retailers. Usually doesn't sell directly to consumers.
Retailer	**Foot Locker, Nike Store, Amazon**	**Sells directly** to the final customer. Often buys from wholesaler or distributor.

Example

Role	Example in Saudi Arabia	Function in Supply Chain
Manufacturer	**Nova Water (Health Water Bottling Co. Ltd.)**	**Produces** the bottled water at its factory (e.g., in Al Kharj).
Distributor	**Tamimi Logistics** or **Nova's own distribution fleet**	**Distributes** bottled water across the Kingdom to wholesalers and large retailers.
Wholesaler	**BinDawood Group Warehouse**, **local food & beverage wholesalers in Riyadh/Jeddah**	**Buys large quantities** and sells to small shops, restaurants, etc.
Retailer	**Panda**, **Tamimi Markets**, **Baqala (local grocery)**, or **online grocery apps like Nana**	**Sells directly** to end consumers. Offers convenience and packaging for retail purchase.

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

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)

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.

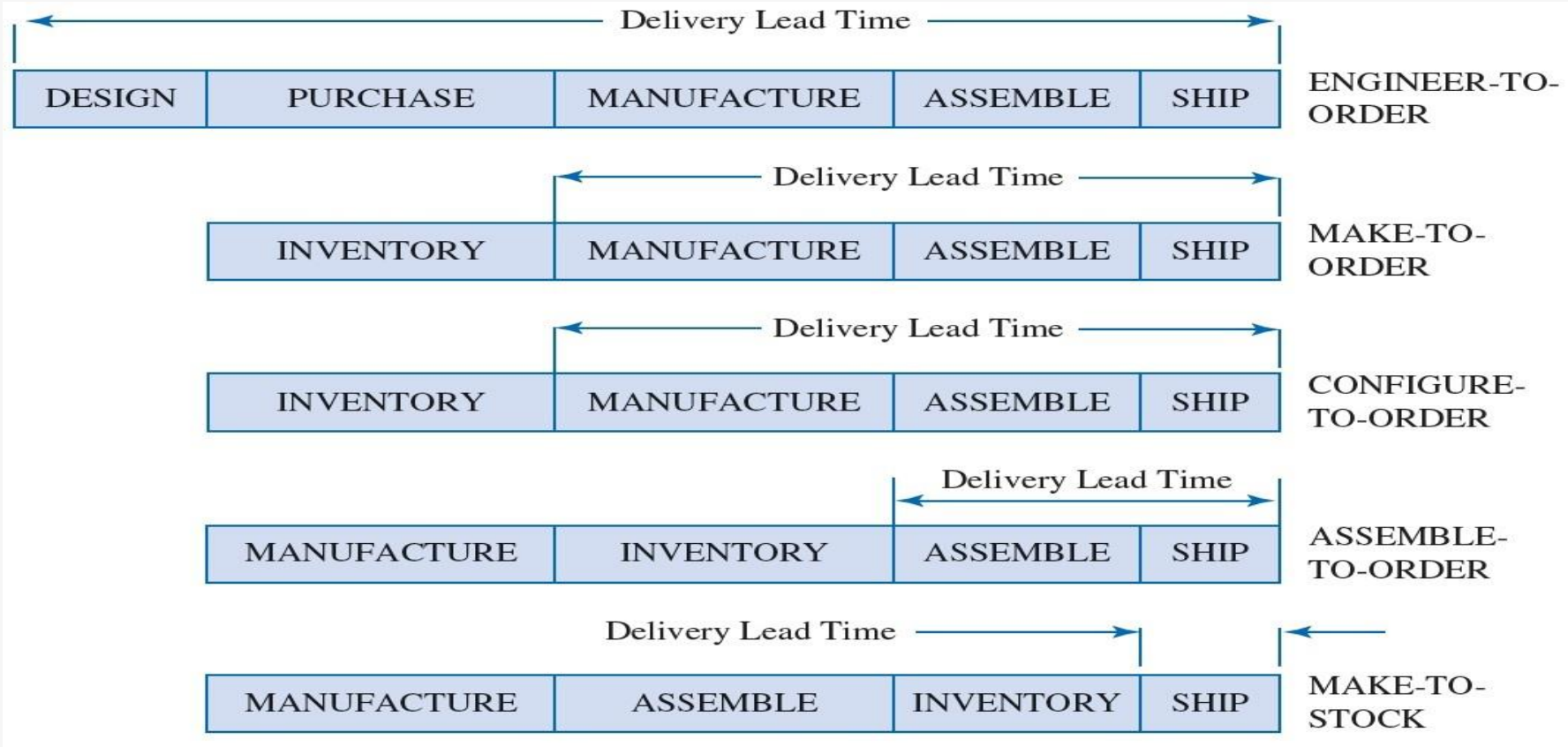
Assemble-to-Order (ATO)

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

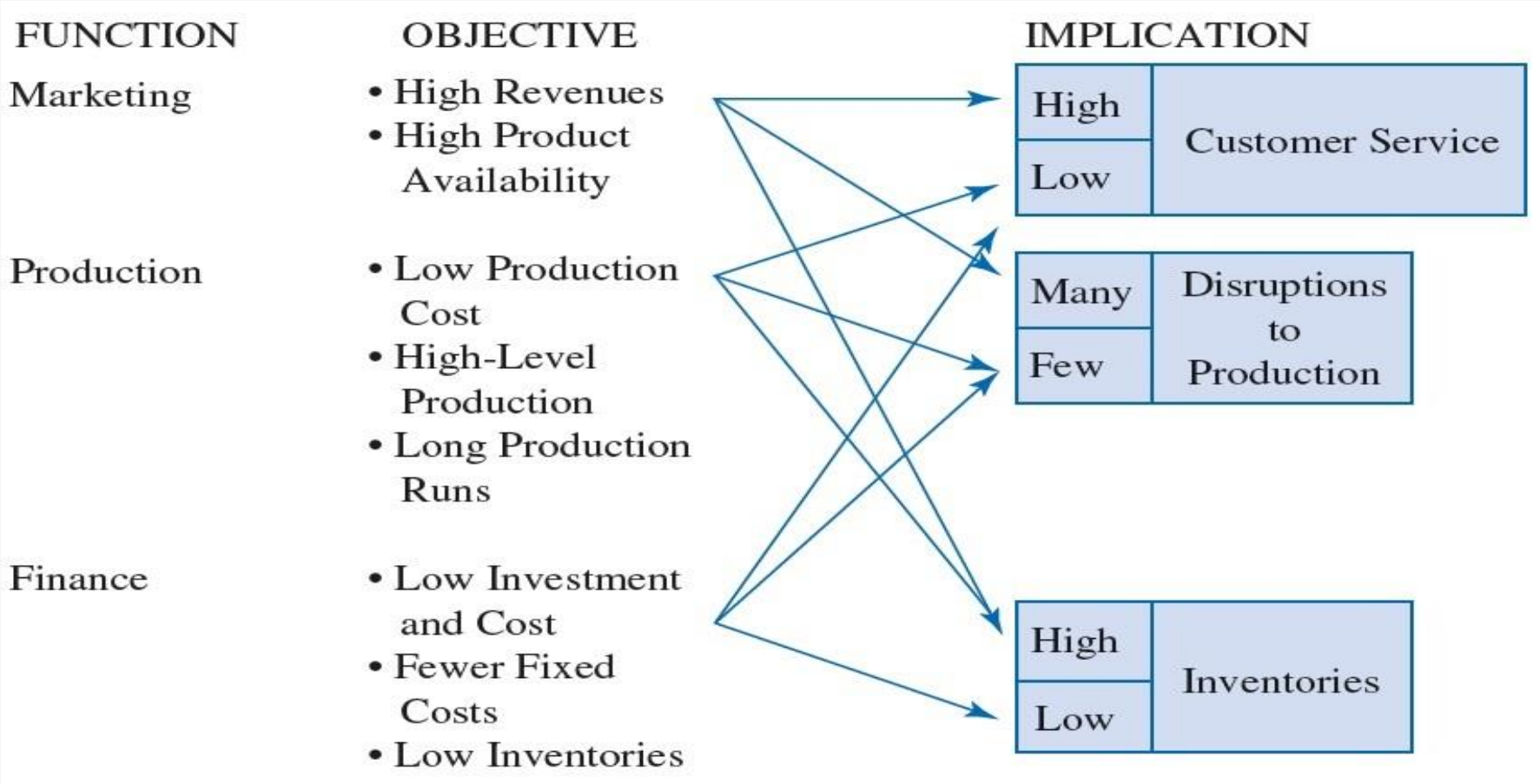
Manfacturing Strategy and Lead Time



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
</td></tr>
</table>

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

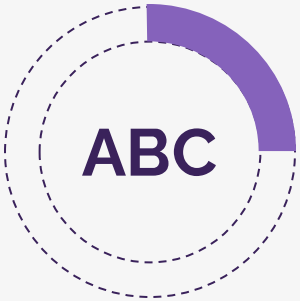
Cost reduction

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:

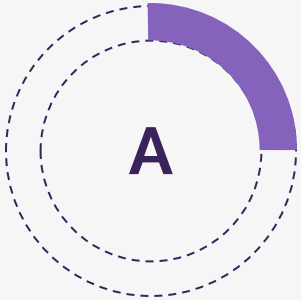


Value

Based on Pareto principle (80/20 rule)

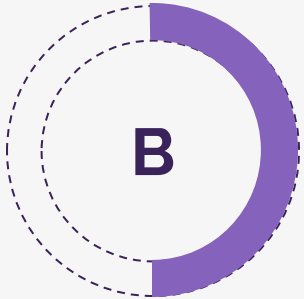
A items: High Value, low-quantity (need strict control).
B items: Moderate Value and usage.
C items: Low value, high quantity (less strict control).

ABC - Based on Pareto principle



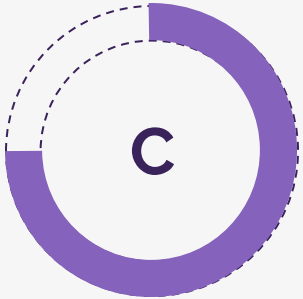
High-value, low-quantity

- Typically 10% of items but 70% of total inventory value.
- Require strict control, accurate forecasting, frequent review, and close supplier relationships.
- Example: Aircraft engines for Boeing



Moderate value and usage

- Around 20% of items but 20% of inventory value.
- Controlled with moderate attention, regular review.
- Example: Spare parts for manufacturing.



Low value, high quantity

- Around 70% of items but only 10% of inventory value.
- Simple controls, bulk ordering, less frequent reviews.
- Example: Office stationery, screws, nuts, bolts at Toyota plants

Retail Store Inventory

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

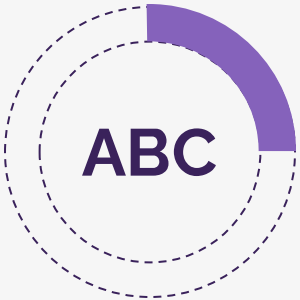
Class	Items	Control Policy
A	Smartphone, Laptop	Very tight control (accurate records, frequent review)
B	Tablet	Moderate control (periodic review)
C	Headphones, USB Drives, Chargers, Mouse	Less control (Bulk ordering)

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.

From Previous Session

- The Lead Time in relations to Inventory Management
- Effects of Stakeholders' Interests and Challenges
- Inventory Valuation Methods
- Inventory Classification types and application

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).

Movement

Based on consumption rate.

Fast: High demand, rapid movement.
Slow: Medium demand.
Non-moving: Obsolete or rarely used.

Demand

Based on predictability of demand.

X: Stable demand (e.g., milk for grocery stores).
Y: Variable demand (seasonal clothes).
Z: Highly unpredictable demand (fashion trends).

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

Usage

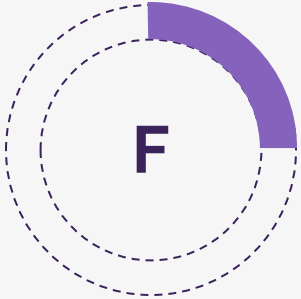
Used in manufacturing & healthcare

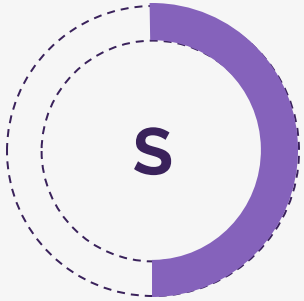
Vital: Must always be in stock (no substitutes).
Essential: Needed, but alternatives exist.
Desirable: Optional items.

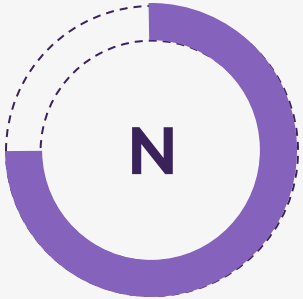
Scarcity

Based on availability in the market

Scarce: Imported or rare items.
Difficult: Limited Suppliers.
Easy: Widely available.







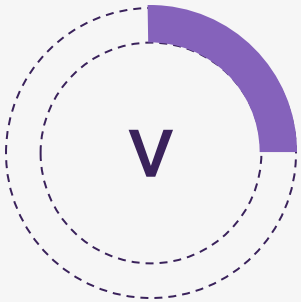
When using FSN classification, keep in mind:

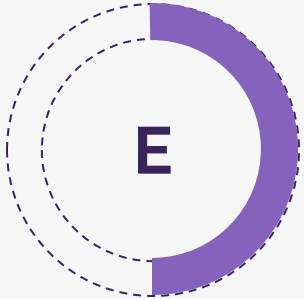
- **Time frame selection:** The review period (e.g., 6 months vs. 12 months) greatly impacts classification.
- **Dynamic nature:** Items can shift from F → S → N, so periodic reclassification is essential.
- **Stocking policies:**

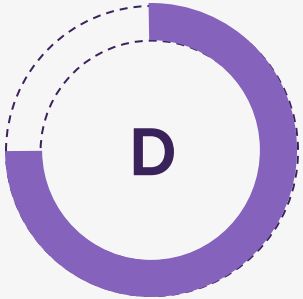
    - Fast-moving → maintain higher safety stock and frequent replenishment.
    - Slow-moving → smaller stocks, more cautious ordering.
    - Non-moving →, write-off.

- **Space utilization:** Non-moving items can block valuable storage space.

VED







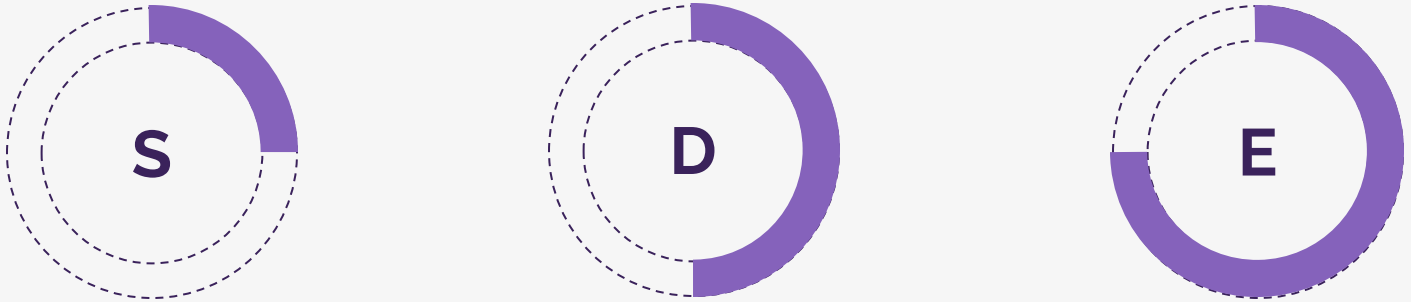
VED classification is a method in **inventory management** used to prioritize items based on their **criticality for operations or production**

V = Vital: Items that are essential for the functioning of the operation or production process. A stockout of these items may cause serious disruption or even complete shutdown. Ventilators, Life Saving Drugs

E = Essential: Items that are important but not as critical as vital ones. A stockout can cause operational difficulties, increased costs, or reduced efficiency, but work may continue in some form General antibiotics, surgical gloves.

D = Desirable: Items whose absence does not significantly affect operations. These are often non-critical, comfort, or luxury items. Vitamin supplements

SDE



SDE classification is an inventory management technique used to categorize items based on their **availability or scarcity in the market**.

S – Scarce items

Items that are **difficult** to obtain due to limited sources, import restrictions, or supplier monopoly.
Usually require long lead times and high procurement effort.
Example: Rare earth metals, specialized machine spares

D – Difficult items

Items that are not very scarce but are still difficult to procure due to constraints such as **fewer suppliers**, complex specifications, or dependency on import.
Procurement may require moderate lead time and effort.
Example: Specific alloys, customized spare parts.

E – Easily available items

Items that are readily available in the market, either domestically or from multiple suppliers.
Short lead times, low procurement risk.
Example: Standard fasteners, common raw materials like steel or packaging material.

Mix Classification

ABC – XYZ Matrix

	X (Predictable Demand)	Y (Moderate Variability)	Z (Unpredictable Demand)
A (High Value)	**AX** → High-value, stable demand. Critical items. Tight control, accurate forecasting, frequent review. (Jet Engine SP, Semiconductor)	**AY** → High-value, but seasonal/trend-driven. Careful safety stock, advanced forecasting. (Premium smartphones with seasonal launches)	**AZ** → High-value, erratic demand. Very risky. Low stock, possible make-to-order, close supplier collaboration. (Specialized Turbines)
B (Medium Value)	**BX** → Medium-value, stable demand. Automated replenishment, economic order quantities. (Lubricants)	**BY** → Medium-value, moderately variable. Some buffer stock, regular monitoring. (Construction Materials) depend on Schedule	**BZ** → Medium-value, erratic demand. Order when required, minimal stocking. (Emergency Replacement Pumps, Customs Molds)
C (Low Value)	**CX** → Low-value, stable demand. Bulk orders, blanket agreements, minimal effort in monitoring. (Nuts, Bolts)	**CY** → Low-value, moderate variability. Small safety stock if cheap, otherwise order on demand. (Seasonal Decoration items, Work uniform)	**CZ** → Low-value, unpredictable demand. Lowest priority. Typically order on demand or eliminate from stock. (Special Paint Colors)

Criteria Used for Classification

Monetary value

ABC

Usage / consumption

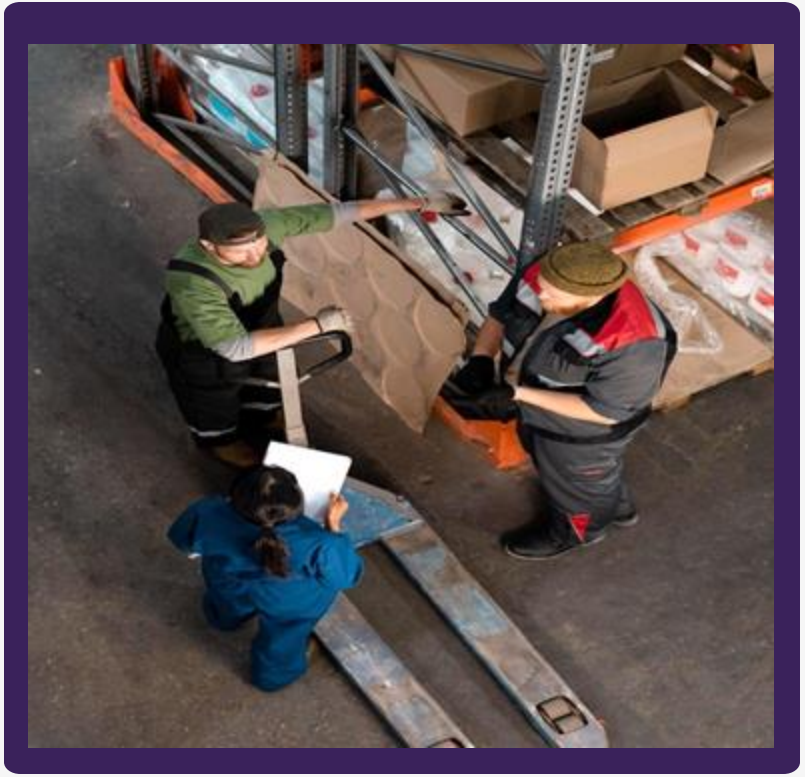
ABC / FSN

Criticality / impact on operations

VED

Availability in market

SDE



Discussion Points

What Other Mix can we apply

Incoterms

What is Incoterms

Incoterm stands for International Commercial (Commerce) Terms.
They are standard rules set by the International Chamber of Commerce (ICC) that define the responsibilities of buyers and sellers in global trade.

Shipping Cost

Who pays for shipping?

Insurance

Who arranges insurance?

Responsibility

Who is responsible if goods are damaged during transport?

Risk Transfer

At what point does ownership (risk) transfer from seller to buyer?

How is Incoterms Affect Inventory

Inventory managers care about:

Risk & Responsibility

Knowing when goods are officially theirs.

Lead Time

Depending on who arranges shipping, delivery times may vary

Cost Control

Some Incoterms mean the seller covers more cost; others mean the buyer does.

Stock Availability

Late shipments or customs delays directly affect inventory levels.

Incoterms Types – FOB – Free On Board

Seller

Delivers goods to the port and loads them onto the ship.

Buyer

Takes responsibility from that point (including freight, insurance, customs).

Example

Apple buys components from suppliers in China on FOB Shanghai. Once the chips are loaded on the ship in Shanghai, Apple owns them and must manage the shipping to California.

Inventory Impact

Apple must plan for shipping time + customs clearance in its inventory lead time.

DDP – Delivered Duty Paid

Seller

handles everything: shipping, insurance, customs, and delivery to the buyer's door

Buyer

N/A

Example

Amazon Global Store often uses DDP for customers. When you order a product from the U.S. to Saudi Arabia, Amazon arranges customs clearance and door delivery.

Inventory Impact

Buyer has almost zero logistics responsibility, but may pay higher prices. Inventory becomes easier to plan because goods arrive "ready to stock."

EXW – Ex Works

Seller

Makes goods available at their own warehouse/factory.

Buyer

Does everything else: pickup, transport, customs, insurance.

Example

A German machinery maker sells equipment EXW Berlin. Tesla (buyer) must arrange pickup, shipping, and import into the U.S.

Inventory Impact

must plan for shipping time + customs clearance in its inventory lead time.

CIF (Cost, Insurance, and Freight)

Seller

Pays for shipping and insurance up to the buyer's port.

Buyer

Takes responsibility after the goods arrive at their port.

Example

A European retailer (like H&M) importing clothes from Bangladesh may use CIF Hamburg. The Bangladeshi supplier handles shipping & insurance until Hamburg port, then H&M takes over.

Inventory Impact

Minimize the in transit risk

Incoterms


Seller
Buyer
EXW
FCA
FAS
FOB
CFR
CIF
CPT
CIP
DAP
DPU
DDP
= Seller
= Buyer
= Risk Transfer

Criteria for Choosing Incoterms

Control over Logistics

Companies with strong logistics teams (e.g., **Apple, Walmart**) prefer **FOB** because they want control over shipping costs, carriers, and reliability.

Smaller buyers often choose **DDP** so the seller handles logistics.

Risk MGT

Industries where goods are **fragile, or high-value** (e.g., pharmaceuticals, luxury goods) may prefer **CIF** to ensure seller covers insurance.

Customs Complexity

If the buyer is not experienced in customs clearance, **DDP** is safer (seller pays duties and clears goods).

Cash Flow

Buyers with **tight budgets** may prefer **EXW** or **FOB**, paying only for what they can control.
Buyers that want an **all-inclusive cost** prefer **DDP**.

Example

Industry	Preferred Incoterms	Why
Electronics (Apple, Dell)	**FOB**	Control logistics, time-sensitive, global contracts.
Fashion & Retail (H&M, Zara)	**CIF / DDP**	Sellers handle freight/insurance; buyers focus on fast replenishment.
Oil & Commodities	**FOB**	Buyers charter ships and manage bulk transport.
E-commerce (Amazon, Alibaba)	**DDP**	Customers want door delivery, no customs hassle.

Think of Incoterms choice as a balance between:

Who has better logistics capability? (Buyer vs Seller)

Big buyers with power choose FOB.

Who can handle the risk better?

Smaller buyers choose CIF or DDP

What's standard in the industry?

Fragile industries pick CIF
E-commerce lives on DDP

Summary

Incoterm	Who Pays What?	Risk Transfer Point
EXW – Ex Works	Buyer pays for everything (transport, insurance, customs).	At seller's factory/warehouse.
DDP – Delivered Duty Paid	Seller pays all costs: shipping, insurance, customs, delivery.	At buyer's door.
FOB – Free on Board	Seller pays until goods loaded on ship. Buyer pays after loading.	Once goods on the ship.
CIF – Cost, Insurance, Freight	Seller pays freight **and insurance** to port. Buyer pays import/customs.	Once loaded on the ship.

Modes of Transportation in Supply Chain

Air Transport (Airplanes)

Movement of goods through air cargo.

Criteria to Select:
High value, urgent, or perishable goods (shelf life)
When speed outweighs cost.

Pros
Fastest mode globally.
Secure, less theft.
Reliable schedules.

Cons
Most expensive.
Limited capacity.
Weather restrictions.

Example Fashion (Zara, H&M) → fast replenishment. **Healthcare (Pfizer)** → vaccines, medical supplies. **Electronics (Apple, Dell)** → chips, high-value components.

Sea Transport (Ships, Containers)

Movement of goods over oceans using cargo vessels.

Criteria to Select:
Large, heavy, or bulk shipments.
Cost efficiency over long distances.

Pros
Cheapest per unit for large volumes.
Handles oversized goods.
Global connectivity.

Cons
Slowest mode.
Risk of port congestion & delays.
Customs & documentation heavy.

Example
Oil & Gas → crude oil, Large Pipes **Automotive (Toyota, Tesla)** → vehicle export/import. **Retail (IKEA, Walmart)** → furniture, consumer goods.

Road Transport (Trucks, Vans)

Movement of goods via highways/roads.

Criteria to Select:
Short to medium distances.
Flexible door-to-door delivery.
Suitable for fragmented/last-mile distribution.

Pros
High flexibility (goes anywhere).
Fast for short distances.
Ideal for last-mile delivery.

Cons
Limited capacity.
Vulnerable to traffic, fuel prices, and regulations.
Higher cost for long distances.

Example: E-commerce & Retail (Amazon, Noon, Jahez) → last-mile delivery. **FMCG** (Coca-Cola, Nestlé) → supermarket distribution.

Multimodal Transport (Combination: Air , Road, Sea, etc)

Using more than one mode in a single supply chain journey.

Criteria to Select:
Global shipments requiring flexibility.
When cost vs. speed balance is needed.

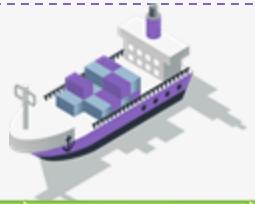
Pros
Optimizes cost + speed.
Door-to-door global coverage.
More flexible and reliable.

Cons
Requires coordination.
Higher risk of delays at transfer points.

Example
E-commerce (Amazon, Alibaba) → ships bulk by sea, then air/road for faster delivery. **Automotive** → combine sea + rail + road to distribute vehicles globally.

Other Examples






Mode	Cost	Speed	Capacity	Flexibility	Reliability	Best For
Road	Medium	Medium	Medium	High	Medium	Local distribution, last-mile deliver, e-commerce
Rail	Low	Medium	High	Low	High	Bulk over land (coal, metals, agriculture)
Air	High	Very High	Low	Medium	High	Urgent, high-value goods (electronics, pharma, fashion)
Sea	Very Low	Low	Very High	Low	Medium	Global bulk shipments (oil, furniture, cars, retail goods)
Pipeline	Very Low	Continuous	High	Very Low	High	Oil, gas, chemicals, continuous liquids transport
Multimodal	Balanced	Balanced	Medium	High	Medium/High	Global trade, e-commerce, automotive supply chains

Risk Management in Global Supply Chain

Types of Risks

Supply Risks

when suppliers fail to deliver.
Causes: natural disasters, strikes, factory shutdowns.

Transportation Risks

delays or damage in transit.
Causes: port congestion, piracy, accidents, container shortages.
Ever Given ship blocking Suez Canal in 2021

Demand Risks

Sudden changes in customer demand.
Causes: economic downturn, consumer trends, pandemics.

Financial Risks

Cost and currency fluctuations.
Causes: foreign exchange volatility, tariffs, etc

Regulatory Risks

new laws

Mian Inventory Management Risks

Overstocking

Risk: High holding costs, wastage, obsolescence.
Example: H&M in 2018 had over $4.3 billion unsold clothes, which forced them into heavy discounting.

Stockouts

Risk: Lost sales, unhappy customers, prod. stoppage.
Example: During Toyota's SC disruption after 2011 Japan earthquake, factories stopped because critical parts were missing.

Demand Uncertainty

Risk: Not knowing how much customers will actually buy.
Example: Nintendo Wii (2006) faced shortages because demand was underestimated, leading to customer frustration and lost sales.

SC Disruptions

Risk: Delays due to strikes, natural disasters, or geopolitical issues.
Example: **Apple** faced iPhone delays in 2020 because of COVID-19 shutdowns in China.

Main Risk Response Strategies

Risk Avoidance

Change strategy to avoid risk.
Example: Zara produces clothes in smaller batches, reducing the risk of excess inventory.

Risk Mitigation

Reduce impact/likelihood
Example: Toyota uses a **JIT** + **dual sourcing strategy** to reduce supplier risk after the 2011 disaster.

Risk Transfer

Share the risk
Example: Many retailers use **vendor-managed inventory (VMI)**, where suppliers carry part of the risk. Walmart does this with its suppliers.

Risk Acceptance

Accepts a small % of lost/damaged packages and simply refunds customers.

Main Risk Response Strategies

Strategy	Definition	Walmart Example	Amazon Example
Acceptance	Acknowledging the risk and budgeting for it, instead of fixing it.	Accepts spoilage of perishable food (fruits/vegetables) as normal business waste.	Accepts a small % of lost/damaged packages and simply refunds customers.
Avoidance	Changing the process so the risk doesn't occur at all.	Limits seasonal stock purchases (e.g., Christmas goods) to avoid huge unsold surpluses.	Uses pre-order systems for new products (like Kindle or Echo devices) to avoid overproduction.
Mitigation	Reducing the likelihood or impact of the risk.	Keeps **safety stock** of high-demand consumer goods (toilet paper, cleaning supplies). Uses AI for demand forecasting.	Built **fulfillment centers near customers** + robotics to reduce stockouts and delivery delays.
Transfer	Shifting the risk to another party through contracts, insurance, or outsourcing.	Uses **Vendor-Managed Inventory (VMI)** with suppliers like P&G, so the supplier bears inventory risk.	Sellers on **Amazon FBA** transfer storage & logistics risk to Amazon, while Amazon insures shipments.