Supply Chain
Inventory Manangment

From Previous Session

- Inventory Classification types and application

ABC – XYZ Matrix

Classification	Procurement Strategy	Oil and Gas Industry Example
A–X (H value, predictable D)	Long-term Agreement, vendor-managed inventory, strict quality control	Standard-grade drilling pipes, premium lubricants used daily in rigs
A–Y (H value, variable D)	Dual sourcing, maintain buffer stock, flexible agreements	Gas turbine spare parts (usage fluctuates with maintenance cycles)
A–Z (H value, unpredictable D)	Procure only on confirmed orders	Rare replacement parts for offshore platforms or subsea equipment
B–X (M value, predictable D)	Bulk buying, stable supplier relations	Industrial paints,
B–Y (M value, variable D)	Limited safety stock, flexible sourcing	Specialty valves for refineries
B–Z (M value, unpredictable D)	Procure only on confirmed orders	Customized gaskets or seals for old machinery
C–X (L value, predictable D)	Bulk purchase, automated replenishment	Nuts, bolts, washers, PPE consumables like gloves and masks
C–Y (L value, variable D)	Order in small lots when needed	Special hand tools for maintenance crews
C–Z (L value, unpredictable D)	Avoid stocking, procure only if required	Outdated office consumables, rarely used repair kits

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

FCA (Free Carrier)

Seller

Delivers the goods to a carrier or another person nominated by the buyer

Buyer

Takes responsibility after the goods handed over to the carrier.

Example

Seller delivers the goods to the airline's cargo terminal at Riyadh Airport, cleared for export. From that moment, risk passes to the OOK buyer, who pays for the flight, insurance, and customs in destination (airport)

Inventory Impact

Early Risk Ownership

Incoterms

Incoterm	When Risk Transfers	Who Holds Risk Before Transfer
FOB (Free on Board)	When goods are **loaded on board the vessel** at the port of shipment	Seller
CIF (Cost, Insurance & Freight) **CIP (Air)**	When goods are **loaded on board the vessel** at the port of shipment (same as FOB!)	Seller (even though seller pays freight & insurance, risk transfers once goods are on the ship)
FCA (Free Carrier)	When goods are **delivered to the carrier or buyer's nominated person** at the agreed place (e.g., airport terminal, warehouse)	Seller
EXW (Ex Works)	When goods are made available at the **seller's premises** (factory/warehouse dock). Buyer takes risk from the door.	Buyer (almost everything is on buyer from the start)
DDP (Delivered Duty Paid)	Only when goods are **delivered to the buyer's premises or agreed destination, cleared of import duties**	Seller (keeps risk the longest)

Incoterm	Transport Mode	Where Risk Transfers	Notes
FOB – Free on Board	Sea / Inland Waterway only	When goods are loaded on vessel at port of shipment	Not valid for airports
CIF – Cost, Insurance & Freight	Sea / Inland Waterway only	When goods are on board at port of shipment	Seller also pays insurance
EXW – Ex Works	Any mode (Air, Sea, Road, Rail)	At seller's premises	Buyer takes full responsibility
FCA – Free Carrier	Any mode	When goods are delivered to the carrier at named place (e.g., airport, warehouse)	Common for air freight
DDP – Delivered Duty Paid	Any mode	At buyer's premises	Seller pays all costs, including customs duties

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**.

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.

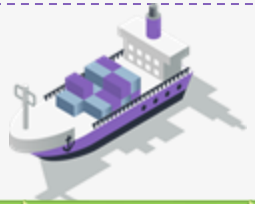
Pros
Optimizes cost + speed.
Door-to-door global coverage.
More flexible and reliable.

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 Supply Chain 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.

Inventory Turn

Inventory Turnover (Turn)

What is it

how many times a company sells and replaces its inventory during a given period (usually a year)

How to Calculate

Inventory Turnover=
Cost of Goods Sold (COGS) / Average Inventory

Why it is Important

Tells me **how efficiently a company manages inventory**.

- High turnover = Company sells products quickly (less money stuck in inventory).
- Low turnover = Products move slowly, risk of **overstock, obsolescence, or waste**.

How Management Use Inventory Turn

Efficiency

Are we moving stock too slowly

Benchmarking

Compare the Performance with Peers / Industry

Cash Flow

Fast Turn = Quicker Cash Flow

Decision Making

Adjust purchasing, pricing, or promotions

$ 1,000,000

Company sells goods in a year (COGS).

$ 200,000

Average Inventory

5

Inventory Turn

This **Company sold and replaced its inventory 5 times in a year**

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- If the industry average = 8, Company A is **slower than competitors** (risk of too much stock).
- If the industry average = 3, Company A is **more efficient than competitors**.

Example of Effect of Slow / None Moving

Usage $ 500,000	**Usage $ 500,000**
Avg Inv. 1,000,000	**Avg Inv. 600,000**
Turn = 0.5	**Turn = 0.83**

$400,000 of that inventory is **obsolete spare parts**

By cleaning up non-moving stock, the turnover **improves**, giving a clearer picture of efficiency.

MRO Inventory

Low Turns Vs Retails

Spare Parts for Critical Equipment

Benchmarking

0.5 to 1.5 is average

Slow-moving items

Turbines Spares Stay up to 5 Years