

# Supply Chain Management

**Prepared by Dr. Tarek Mohamed**

**MGM 660**

**Lecture 1**



# Introduction to Supply Chain Management

## Lecture 1

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**Dr. Tarek Mohamed**

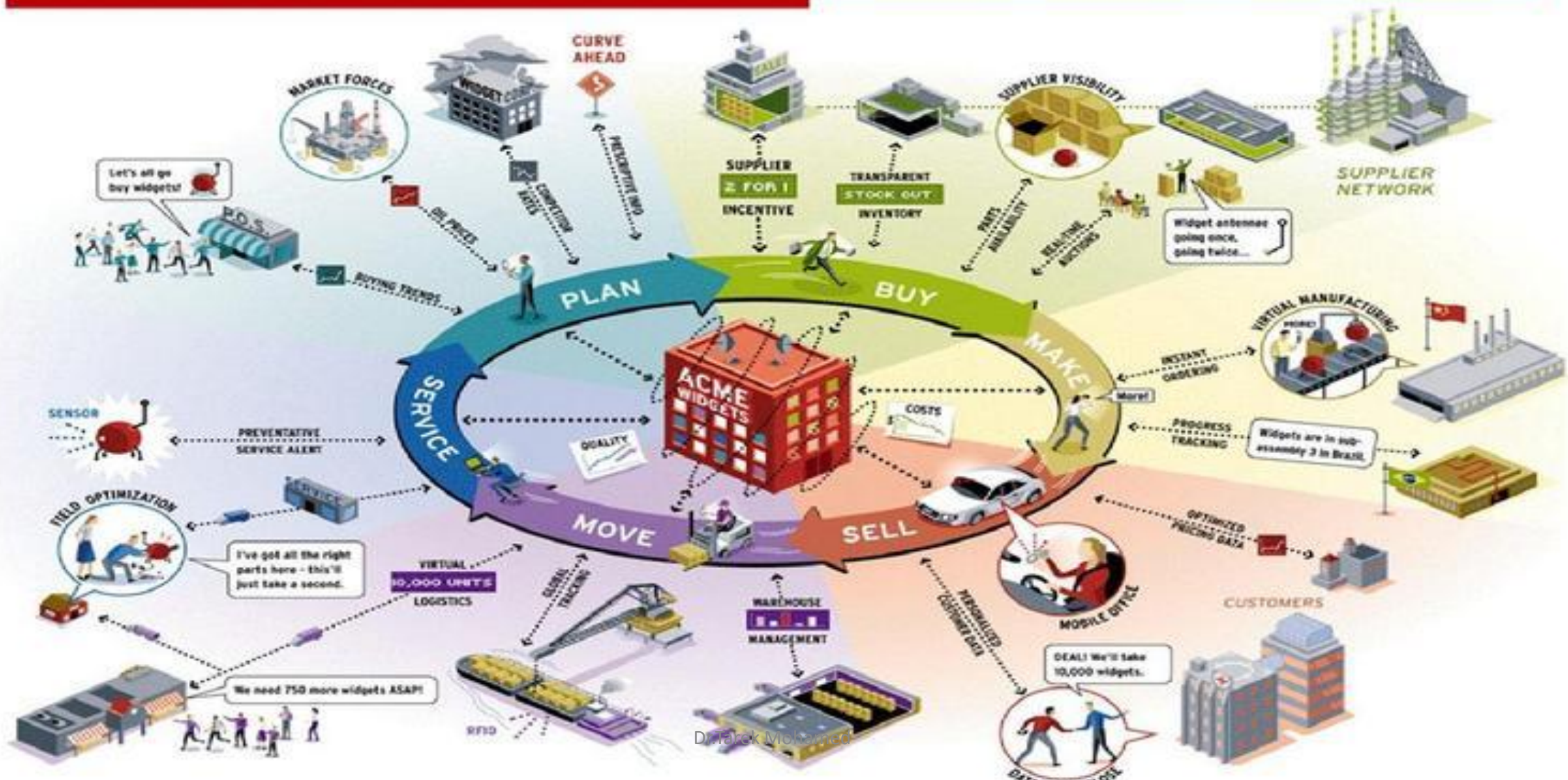
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# Course Agenda

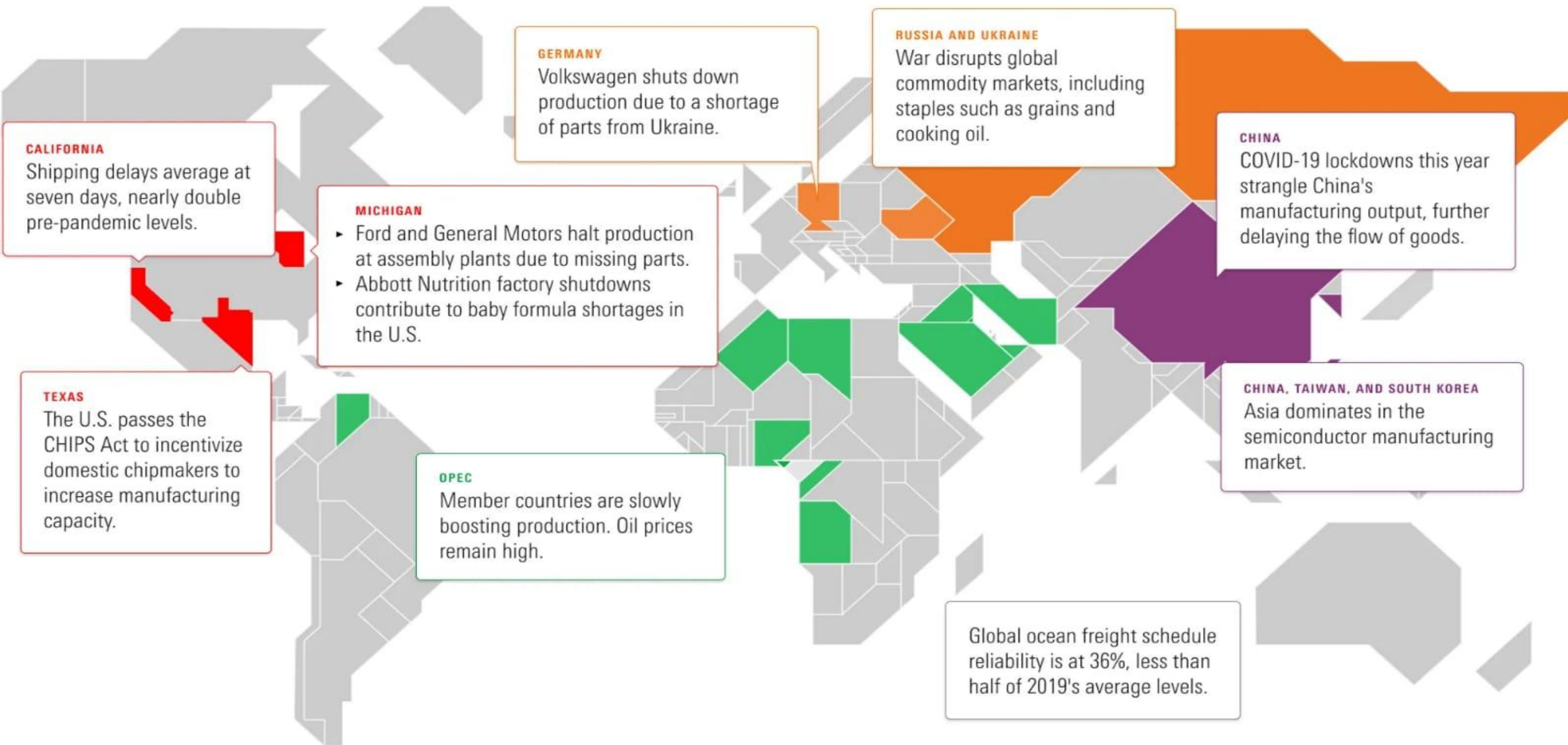
Chapter

- 
- 1-Discuss the goal of a supply chain and explain the impact of supply chain decisions on the success of a firm.
  - 2-Identify the three key supply chain decision phases and explain the significance of each one.
  - 3-Describe the cycle and push/pull views of a supply chain.
  - 4-Classify the supply chain macro processes in a firm.
  - 5- Applications of Artificial Intelligence.

# Supply Chain Today..



# Supply Chain Disruptions Across the World



### **Environmental Risks**

Natural disasters, Weather-related incidents, Geopolitical risks, Terrorism, War, Regulatory changes, Pandemics, Strikes, etc.

### **Supply Chain Configuration Risks**

Insufficient industry-level connection, Insufficient coordination among supply chain members, Insufficient visibility in supply chain, Insufficient collaboration, Cyber security issues, Intellectual property rights (IPR) protection, Asymmetric power relationships, Social & Environmental Sustainability-related issues, etc,

### **Supply Risks**

Supply uncertainties  
Disruption due to pandemic  
Dependence on key suppliers  
Geographical concentration  
Quality management issues  
Erratic lead-times  
Unexpected price increases  
Duties & tariffs  
Exchange rate fluctuations

### **Internal Risks**

Labor shortages  
Process disruptions due to social distancing, safety  
Equipment breakdowns  
Yield variability  
Lengthy setup times  
Inflexible processes  
Bottlenecks  
Disruptions in outsourcing

### **Demand Risks**

Demand volatility  
Unexpected market shifts  
Forecast errors  
Panic buying  
Dependence on few customers  
Short life cycles  
Increased product variety  
Competitor actions

### **Logistical Risks**

Port congestion, Disruptions in port operations, Air/Ocean/Rail/Road accidents, Truck driver shortage, Container shortage, Insufficient warehouse space during demand surge, etc.

## **Types of disruption risks in supply chains**



**Balancing supply chain risks**

## Types of disruption risks in supply chains

- ❑ **Toyota** has one of the most robust risk management strategies in the automotive industry. After the 2011 earthquake and tsunami in Japan, which disrupted their supply chain.
- ❑ **Toyota** implemented a strategy called "Resilient Supply Chain" that included having backup suppliers, maintaining higher inventory levels, and ensuring supplier geographic diversification.
- ❑ This enabled **Toyota** to recover quickly from supply disruptions, keeping their production lines running.

## Types of disruption risks in supply chains

- ❑ **Unilever** experienced significant challenges during the COVID-19 pandemic.
- ❑ With spikes in demand for hygiene products like soap and sanitizers, and a dip in demand for other categories, **Unilever** had to quickly adapt its supply chain operations.
- ❑ By redirecting resources and production capacity to meet hygiene product demand, Unilever demonstrated flexibility in its demand management.

- ❑ During the COVID-19 pandemic, **Procter & Gamble (P&G)** faced significant demand uncertainty for essential products like paper towels and hand sanitizers.
- ❑ **P&G** responded by ramping up production capacity, working closely with suppliers, and ensuring that production facilities could meet the surge in demand without overproducing other items with declining demand

- ❑ All stages involved, directly or indirectly, in fulfilling a customer request.
- ❑ Within each company, the supply chain includes all functions involved in fulfilling a customer request (product development, marketing, operations, distribution, finance, customer service).
- ❑ All facilities, functions, and activities, associated with the flow and transformation of goods and services from raw materials to customer, as well as the associated information flows.
- ❑ An integrated group of processes to “Plan,” “Source,” “Make,” and “deliver” products to customers.

# What is Supply Chain Management

- ❑ **Customer** is an integral part of the supply chain.
- ❑ Includes movement of products from suppliers to manufacturers to distributors and information, funds, and products in both directions.
- ❑ May be more accurate to use the term “supply network” or “supply web”.
- ❑ Typical supply chain stages: customers, retailers, wholesalers/distributors, manufacturers, component/raw material suppliers.
- ❑ All stages may not be present in all supply chains (e.g., no retailer or distributor for Dell).



**Raw Materials**



**Supplier**



**Manufacturing**



**Consumer**

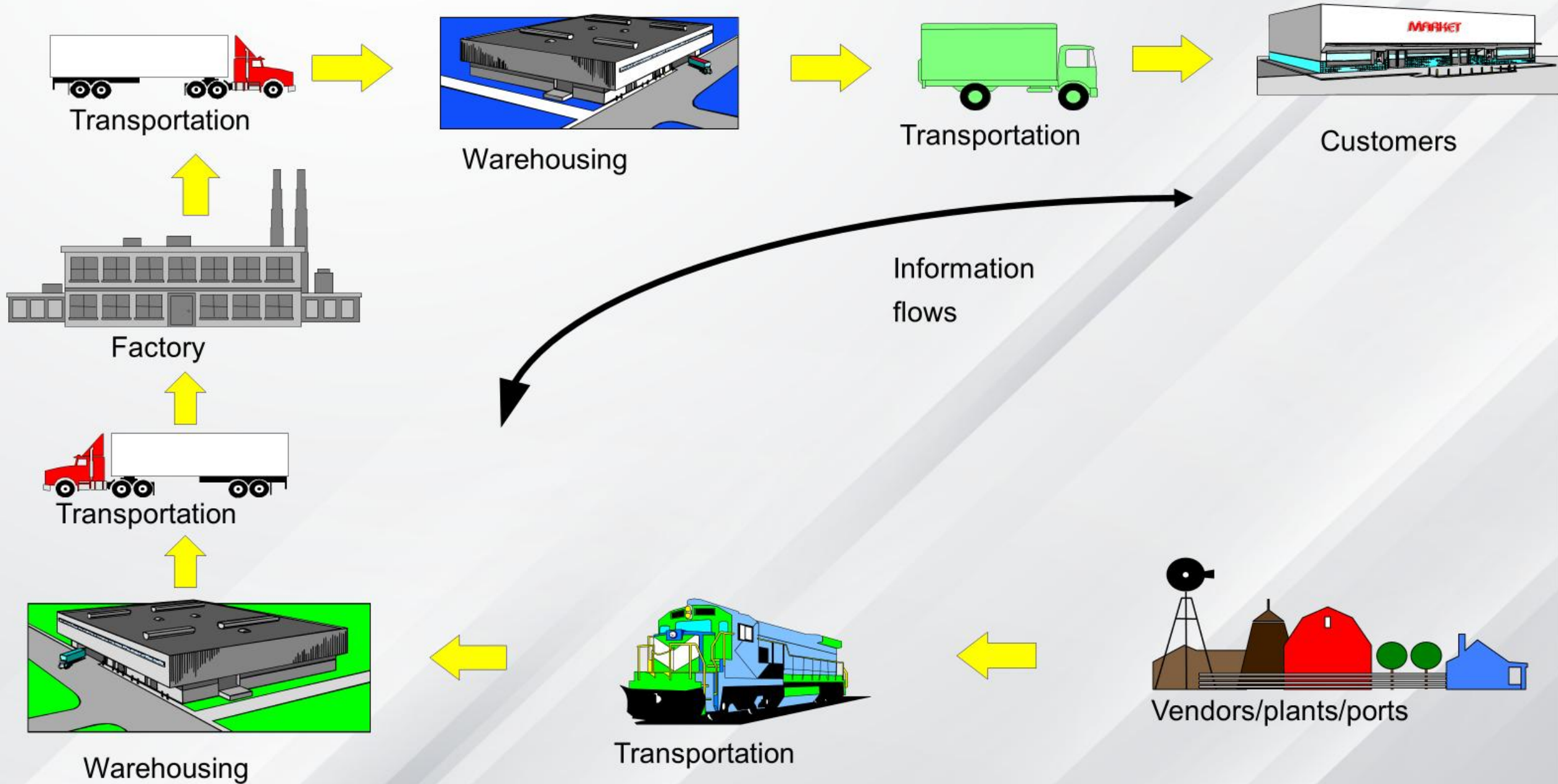


**Customer**

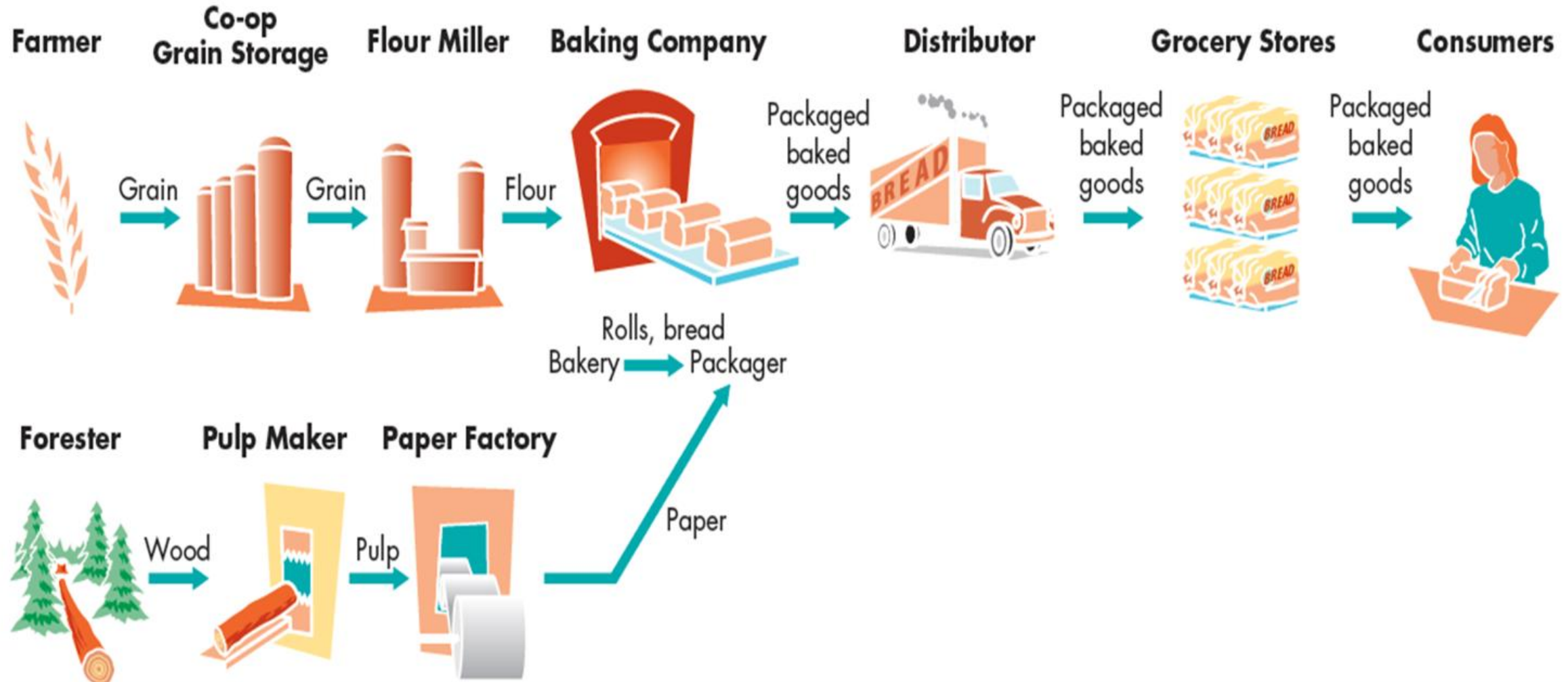


**Distribution**

# The Immediate Supply Chain for an Individual Firm



# SUPPLY CHAIN FOR BAKED GOODS



- ❑ **Supply Chain Management (SCM) Goals**
- ❑ **Efficiency:** Minimize costs and maximize productivity
- ❑ **Reliability:** Ensure consistent quality and delivery
- ❑ **Resilience:** Adapt to disruptions and risks
- ❑ **Sustainability:** Reduce environmental impact
- ❑ **Customer Satisfaction:** Meet demand and expectations

## ❑ **Key Components**

- ❑ **Supply**: Raw materials or inputs
- ❑ **Manufacturing**: Production process
- ❑ **Distribution**: Logistics, transportation, and warehousing
- ❑ **Retail**: Sales and customer service
- ❑ **Reverse Logistics**: Returns, recycling, and waste management

## ❑ Supply Chain Types

- ❑ **Just-In-Time (JIT):** Producing and delivering just in time
- ❑ **Just-In-Case (JIC):** Maintaining inventory for potential demand
- ❑ **Hybrid:** Combining JIT and JIC approaches
- ❑ **Agile:** Responding quickly to changing demand
- ❑ **Lean:** Eliminating waste and optimizing processes

## ❑ **Technologies Used**

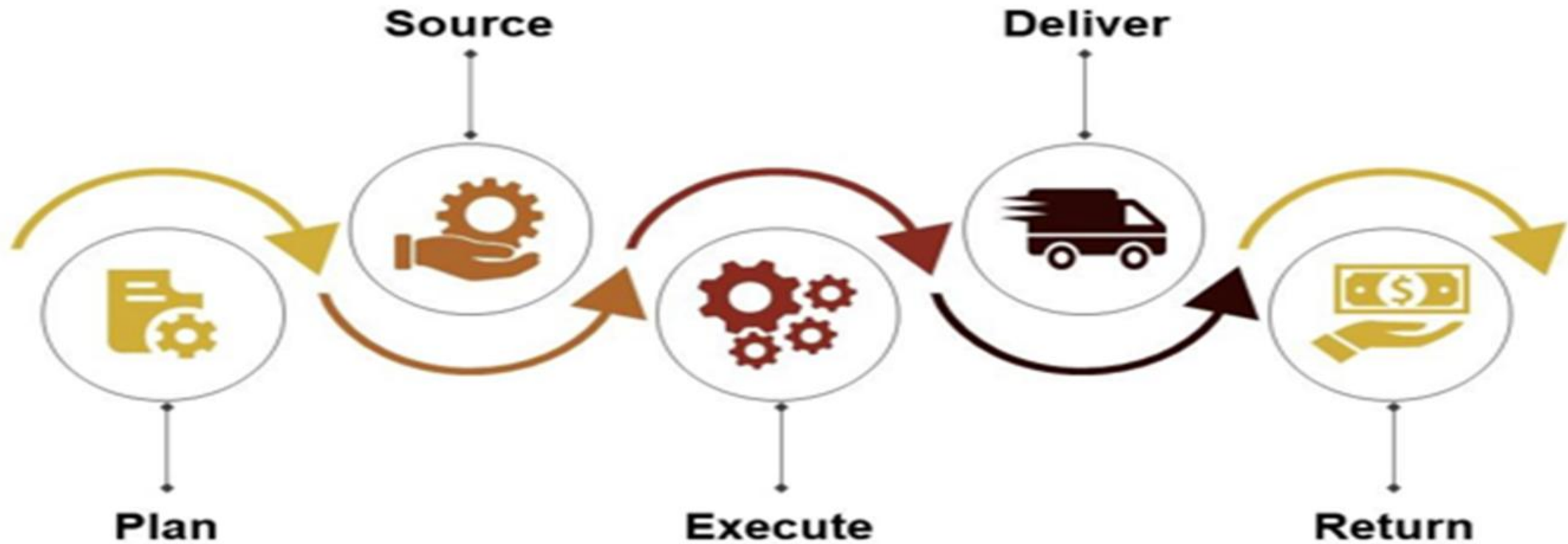
- ❑ **Enterprise Resource Planning (ERP):** Integrated software
- ❑ **Supply Chain Visibility (SCV):** Real-time monitoring
- ❑ **Internet of Things (IoT):** Connected devices
- ❑ **Artificial Intelligence (AI):** Predictive analytics
- ❑ **Blockchain:** Secure, transparent transactions
- ❑ **Cloud computing:** Scalable, flexible infrastructure.
- ❑ **Radio-frequency identification (RFID):** Inventory tracking.

## ❑ **SCM Techniques**

- ❑ **Just-In-Time (JIT):** Producing and delivering just in time.
- ❑ **Total Quality Management (TQM):** Ensuring quality throughout.
- ❑ **Lean management:** Eliminating waste.
- ❑ **Six Sigma:** Data-driven quality improvement.
- ❑ **Agile supply chain:** Responding quickly to changes.

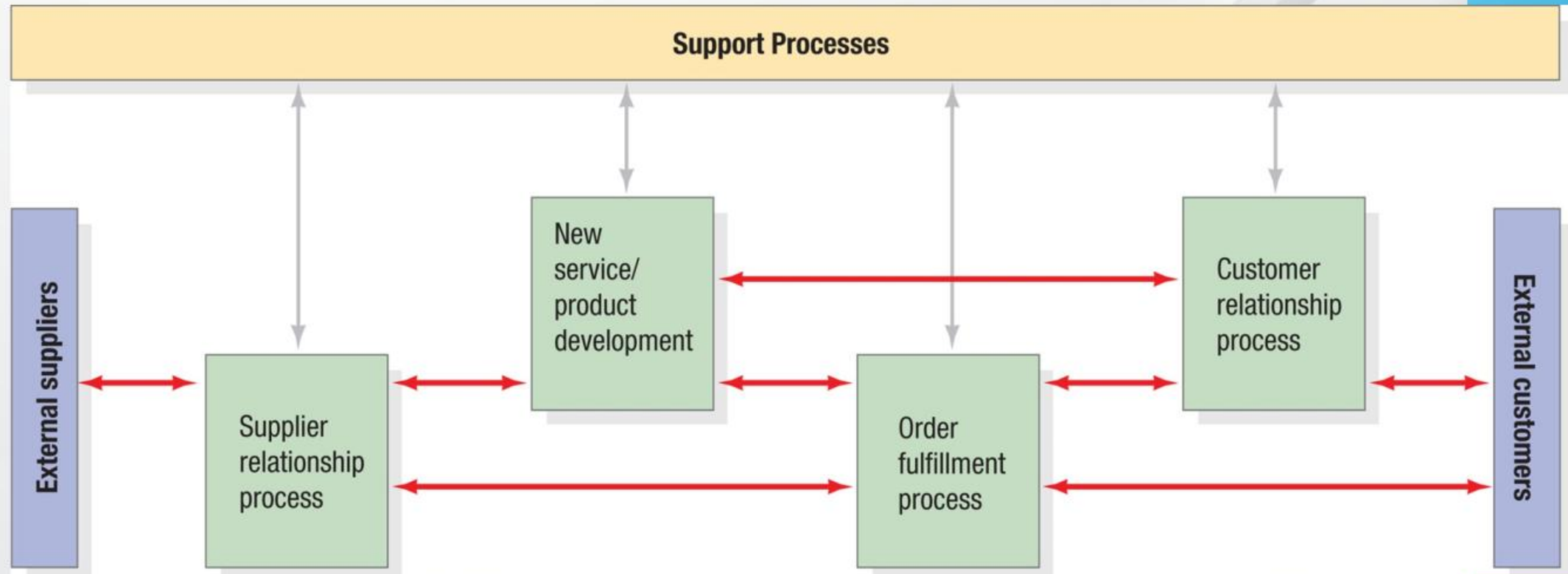
- ❑ **Benefits of Effective SCM**
- ❑ **Improved customer satisfaction**
- ❑ **Increased efficiency**
- ❑ **Reduced costs**
- ❑ **Enhanced competitiveness**
- ❑ **Better risk management**
- ❑ **Improved sustainability**
- ❑ **Increased transparency**

# Supply Chain Structure



# Supply Chain Structure

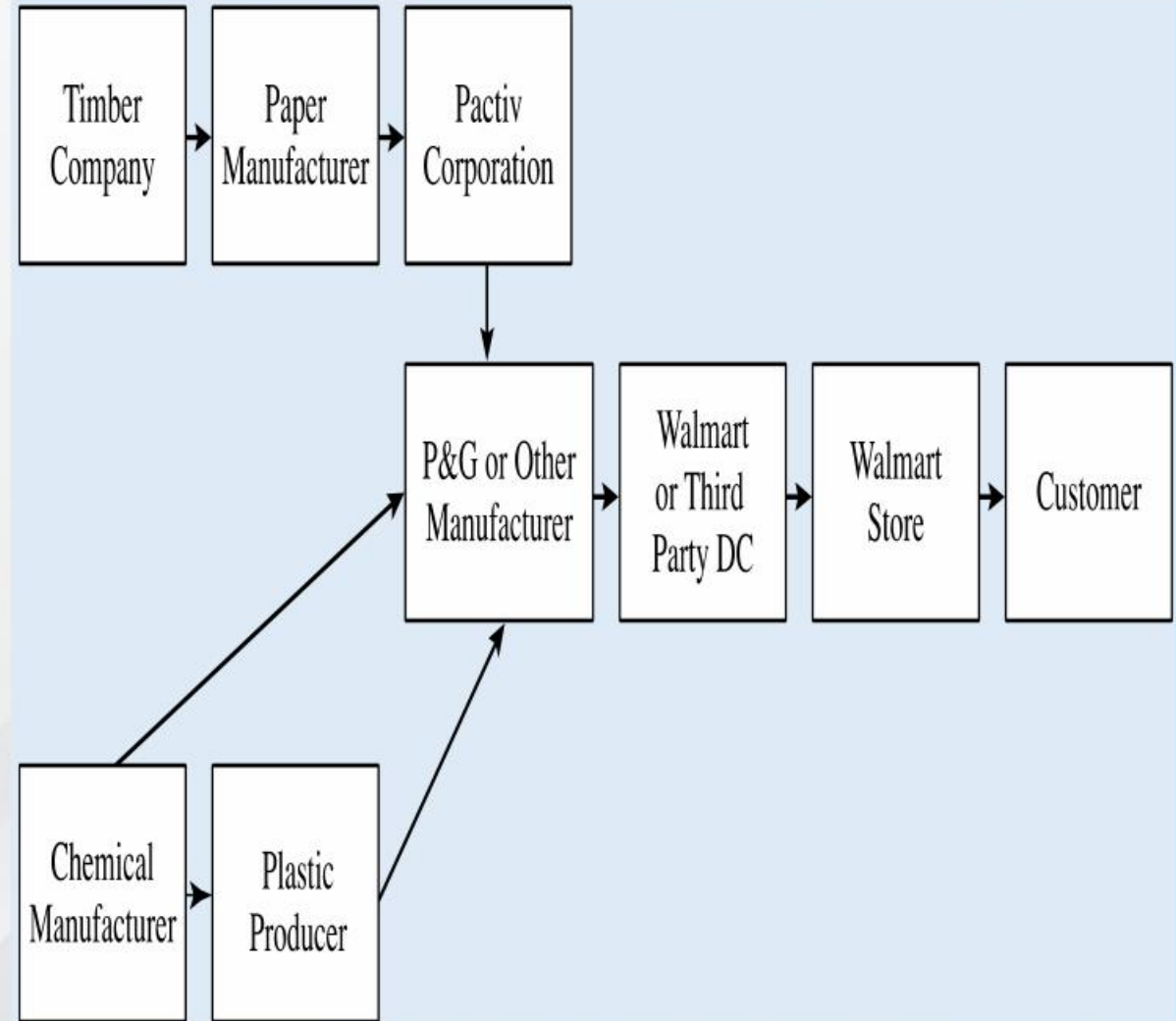
**Each activity in a process should add value to the preceding activities;  
waste and unnecessary cost should be eliminated.**



# What is Supply Chain Management

**P&G** manufacturing plant receives raw materials from a variety of suppliers.

**For example**, the packaging material may come from Tenneco packaging, while Tenneco receives raw materials to manufacture the packaging from other suppliers.



## Importance of Supply Chain Decisions

- ❑ Maximize overall value generated.
- ❑ Supply Chain Surplus = Customer Value – Supply Chain Cost.
- ❑ Example: a customer purchases a router from Amazon for \$100 (revenue).
- ❑ Supply chain costs include (information, storage, transportation, produce components, assembly, etc.)
- ❑ The difference between \$100 and the sum of all of these costs is the supply chain profit.
- ❑ Supply chain profitability is the total profit to be shared across all stages of the supply chain.

- ❑ **Dell**, \$56B in **2006**, by adopting new supply chain strategies to \$102.301 B in **2023**, \$88.425 B in **2024**. \$95.567 B in **2025**.
- ❑ **Wal-Mart**, \$1B sales in **1980** jumped to \$ 648 B in **2024**. \$681 B in **2025**.
- ❑ **Boeing**'s annual revenue, \$101B in **2018** to \$73.293 B in **2024**, \$80.75 B in **2025**
- ❑ **Apple**, \$65 B in **2010** to \$391 B in **2024**, \$ 416 B in **2025**.
- ❑ **Amazon**'s annual revenue, \$ 34 B in **2010** to \$ 637 B in **2024**, \$ 702 B in **2025**.

## Importance of Supply Chain Decisions

- ❑ There is a close connection between the design and management of supply chain flows (product, information, and funds) and the success of a supply chain.
- ❑ **Wal-Mart, Dell Computer, and Seven-Eleven Japan** are examples of companies that have built their success on superior design, planning, and operation of their supply chain.

## Importance of Supply Chain Decisions

- ❑ **Wal-Mart** has been a leader in using supply chain design, planning, and operation to achieve success.
- ❑ From its beginning, the company invested heavily in transportation and information infrastructure to facilitate the effective flow of goods and information.
- ❑ **Wal-Mart** designed its supply chain with clusters of stores around distribution centers to facilitate frequent replenishment at its retail stores in a cost-effective manner. Frequent replenishment allows stores to match supply and demand more effectively than the competition.

# Decision Phases in a Supply Chain

- ❑ **Supply chain strategy or design**

- How to structure the supply chain over the next several years

- ❑ **Supply chain planning**

- Decisions over the next quarter or year

- ❑ **Supply chain operation**

- Daily or weekly operational decisions

- ❑ **Decisions about the configuration of the supply chain, allocation of resources, and what processes each stage will perform.**
- ❑ **Strategic supply chain decisions**
  - Outsource supply chain functions
  - Locations and capacities of facilities
  - Products to be made or stored at various locations
  - Modes of transportation
  - Information systems
- ❑ **Supply chain design must support strategic objectives**
  - Supply chain design decisions are long-term and expensive to reverse – must take into account market uncertainty

**For decisions made during this phase,**

- The time frame considered is a quarter to a year. Therefore,
- The supply chain's configuration determined in the strategic phase is fixed.
- The goal of planning is to maximize the supply chain surplus that can be generated over the planning horizon

- ❑ Definition of a set of policies that govern short-term operations.
- ❑ Fixed by the supply configuration from the strategic phase.
- ❑ The goal is to maximize supply chain surplus given established constraints.
- ❑ Starts with a forecast of demand in the coming year.

## ☐ **Planning decisions:**

- ☐ Which markets will be supplied from which locations
- ☐ Planned buildup of inventories
- ☐ Subcontracting
- ☐ Inventory policies
- ☐ Timing and size of market promotions
- ☐ Must consider demand uncertainty, exchange rates, and competition over the time horizon in planning decisions

- ☐ The time horizon is weekly or daily
- ☐ Decisions regarding individual customer orders
- ☐ Supply chain configuration is fixed, and planning policies are defined
- ☐ The goal is to handle incoming customer orders as effectively as possible
- ☐ Allocate orders to inventory or production, set order due dates, generate pick lists at a warehouse, allocate an order to a particular shipment, set delivery schedules, place replenishment orders
- ☐ Much less uncertainty (short time horizon)

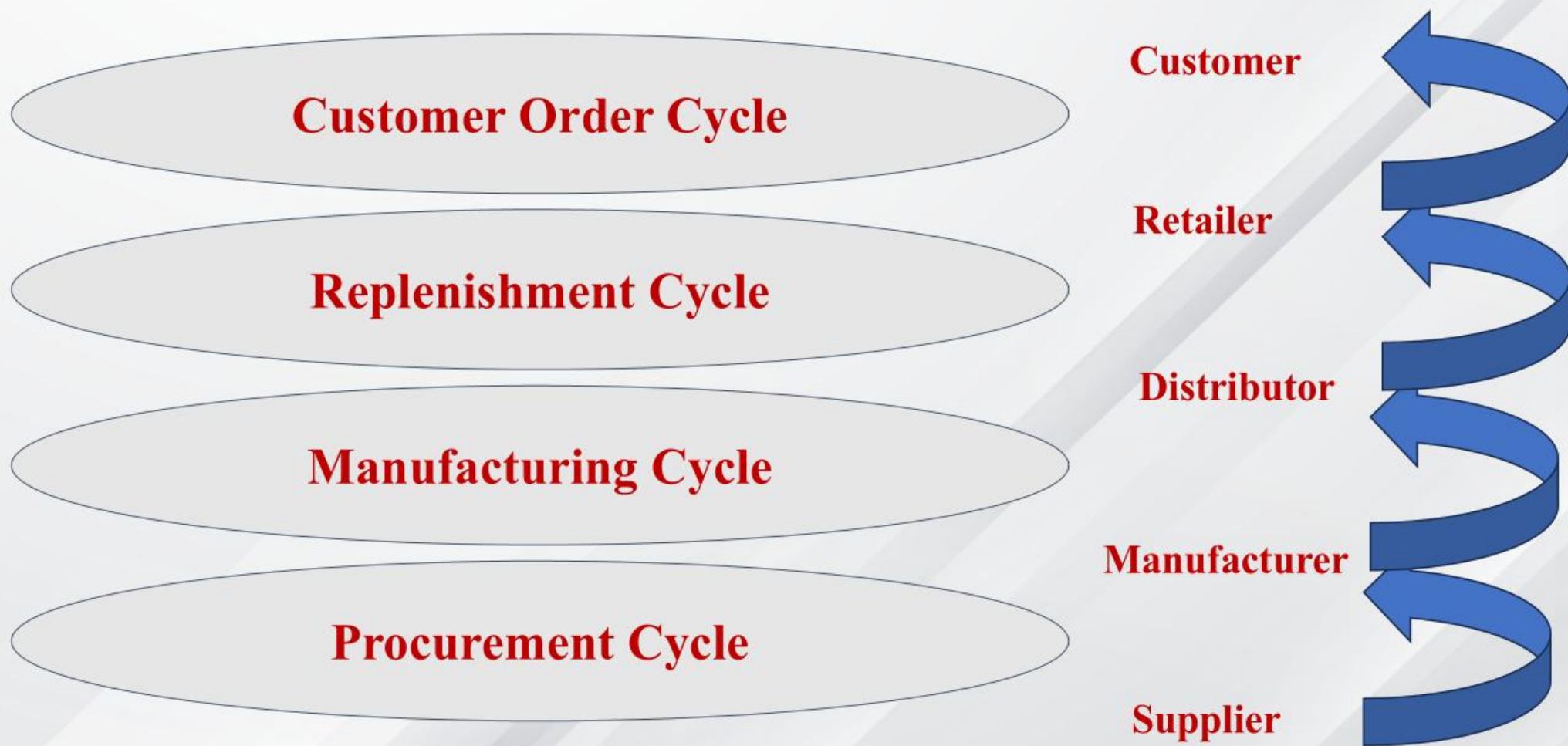
## Process Views of a Supply Chain

- ☐ A supply chain is a sequence of processes and flows that take place within and between different stages and combine to fill a customer's need for a product.
- ☐ There are **two** different ways to view the processes performed in a supply chain.
- ☐ **Cycle View**
- ☐ **Push/Pull View**

- ❑ **Cycle View:**

- ❑ The processes in a supply chain are divided into a series of cycles; each performed at the interface between two successive stages of the supply chain.
- ❑ Given the five stages of a supply chain, all supply chain processes can be broken down into the following four process cycles,
  - ❑ **Customer order cycle**
  - ❑ **Replenishment cycle**
  - ❑ **Manufacturing cycle**
  - ❑ **Procurement cycle**

## Cycle View of Supply Chain Processes



- ❑ **Customer order cycle**

All the processes directly involved in receiving and filling a customer order

- ❑ **Replenishment cycle**

All the processes involved in replenishing retailer inventory

- ❑ **Manufacturing cycle**

All processes involved in generating the product that will fill the customer, retailer and distributor orders. It is driven by the actual orders placed with the manufacturer, forecasts for expected future demand, and the current product availability in the manufacturer's finished-product warehouse.

- ❑ **Procurement cycle**

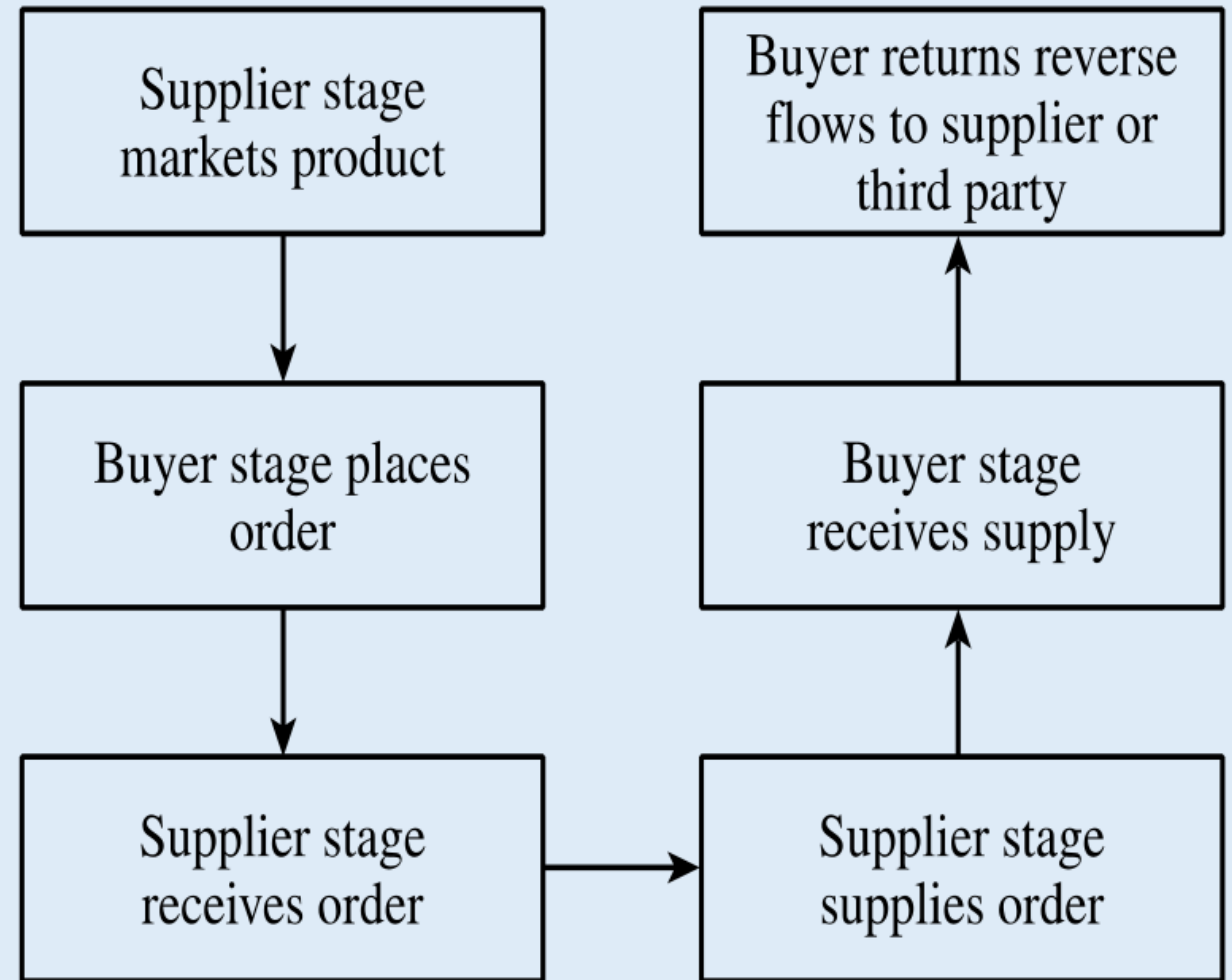
All the processes necessary to ensure that materials are available for manufacturing to occur according to schedule.

- ❑ Each cycle occurs at the interface between two successive stages of the supply chain.
- ❑ Not every supply chain will have all four cycles clearly separated. For example, a grocery supply chain in which a retailer stocks finished goods inventories and places replenishment orders with a distributor is likely to have all four cycles separated.
- ❑ Dell, in contrast, bypasses the retailer and distributor when it sells servers directly to customers (**Direct Channel**).

## Cycle View of Supply Chain Processes

Each cycle consists of six sub processes as shown:

- ❑ Each cycle starts with the supplier marketing the product to customers.
- ❑ A buyer then places an order that is received by the supplier.
- ❑ The supplier supplies the order, which is received by the buyer.
- ❑ The buyer may return some of the product or other recycled material to the supplier or a third party. The cycle of activities then begins all over again.



## ❑ **Push/Pull View:**

The processes in a supply chain are divided into two categories, depending on whether they are executed in response to a customer order or in anticipation of customer orders.

**Pull processes** are initiated by a customer order, whereas **Push processes** are initiated and performed in anticipation of customer orders.

- ❑ **Pull**: execution is initiated in response to a customer order (reactive).
- **Dell** assembles its computers to order and therefore, all processes except for those involved in the procurement cycle are “pull”.

## Push/Pull View of Supply Chain Processes

- ❑ **Push:** execution is initiated in anticipation of customer orders (speculative).
- **Compaq:** All processes except for those involved in the customer order cycle are of “push” type.

Supply chain processes discussed in the two views can be classified into

**1. Customer Relationship Management (CRM):**

All processes at the interface between the firm and its customers.

**2. Internal Supply Chain Management (ISCM):**

All processes that are internal to the firm.

**3. Supplier Relationship Management (SRM):**

All processes at the interface between the firm and its suppliers.

## Supply Chain Macro Processes

The **three** macro processes manage the flow of information, products, and funds required to generate, receive, and fulfill a customer request.

- **The CRM macro process** aims to generate customer demand and facilitate the placement and tracking of orders.
- **The ISCM macro process** aims to fulfill the demand generated by the CRM process in a timely manner and at the lowest possible cost.
- **The SRM macro process** aims to arrange for and manage supply sources for various goods and services.

## Supply Chain Macro Processes

Supplier

Firm

Customer

|     |      |     |
|-----|------|-----|
| SRM | ISCM | CRM |
|-----|------|-----|

- Source
- Negotiate
- Buy
- Design Collaboration
- Supply Collaboration

- Strategic Planning
- Demand Planning
- Supply Planning
- Fulfillment
- Field Service

- Market
- Price
- Sell
- Call Center
- Order Management

- **AI optimizes inventory management** . This is done by analyzing sales data, supply chain dynamics, and external variables to maintain ideal stock.
- **Demand forecasting**. AI-powered demand forecasting enables companies to predict future demand for products with high accuracy by analyzing a wide range of data sources.
- **Improved warehouse efficiency**. AI, specifically ML models, helps lay out warehouses more efficiently by being able to evaluate the quantity of materials
- **More-timely deliveries**. Manufacturers that assemble products via complex supply chains are especially dependent on timely and well-coordinated deliveries .
- **AI can help make supply chains more sustainable** by optimizing routes and reducing carbon emissions through smart logistics.

## Summary of Learning Objectives

Chapter

01

- 1-Discuss the goal of a supply chain and explain the impact of supply chain decisions on the success of a firm.
- 2-Identify the three key supply chain decision phases and explain the significance of each one.
- 3-Describe the cycle and push/pull views of a supply chain.
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# Thank You