

SUPPLY CHAIN MANAGEMENT

1. Introduction to SCM

A supply chain is the complete system of organizations, people, activities, resources, and processes involved in producing a product or delivering a service from the supplier to the final customer. It starts with the procurement of raw materials, moves through manufacturing, storage, transportation, and distribution, and ends with the delivery of the finished product to the consumer. The main objective of a supply chain is to ensure that the right product reaches the right customer, at the right time, in the right quantity, and at the lowest possible cost while maintaining quality.

2. Supply Chain Umbrella

✓ **Procurement of Raw Material**

Procurement of raw materials refers to the process of identifying needs, selecting suppliers, negotiating terms, and purchasing the required raw materials necessary for production. It is the starting point of the supply chain and plays a crucial role in determining product quality, production continuity, and overall cost. Effective procurement ensures timely availability of materials at the right price and quality, reduces supply risks, maintains good supplier relationships, and supports smooth manufacturing operations. A strong procurement system helps organizations avoid shortages, control costs, and build a reliable and efficient supply chain from the very beginning.

✓ **Production & Quality Control**

Production and quality control represent the stage where raw materials are transformed into finished or semi-finished goods through manufacturing processes. Production focuses on efficient conversion of inputs into outputs using labor, machines, technology, and systems, while quality control ensures that the products meet predefined standards, specifications, and customer expectations. This stage is crucial for maintaining consistency, reducing defects, minimizing waste, and ensuring product reliability. Effective coordination between production and quality control improves operational efficiency, builds customer trust, reduces rework and returns, and strengthens the overall performance of the supply chain.

✓ **Inventory Management**

Inventory management refers to the systematic planning, controlling, and monitoring of raw materials, work-in-progress, and finished goods throughout the supply chain. Its main objective is to maintain optimal stock levels—avoiding both overstocking and stockouts. Efficient inventory management ensures smooth production, timely order fulfillment, cost control, and better cash flow. It helps businesses reduce storage costs, minimize wastage and obsolescence, and respond effectively to customer demand, making it a critical pillar of an efficient and responsive supply chain system.

✓ **Warehousing & Distribution**

Warehousing and distribution involve the storage, handling, and movement of goods from production units to markets and customers. Warehousing ensures safe, organized, and efficient storage of raw materials and finished products, while distribution focuses on delivering the right products to the right locations at the right time. Together, they support inventory control, faster order fulfillment, market reach, and customer satisfaction. An efficient warehousing and distribution system reduces delivery time, lowers transportation and handling costs, prevents damage and losses, and ensures smooth flow of goods across the supply chain.

✓ **Logistics & Transportation**

Logistics and transportation deal with the planning, coordination, and physical movement of goods, services, and information across different stages of the supply chain. Logistics includes route planning, packaging, material handling, documentation, and coordination, while transportation focuses on the actual movement of goods through road, rail, air, sea, or multimodal systems. This function ensures timely delivery, cost efficiency, and reliability in the supply process. Effective logistics and transportation improve speed, reduce delays, minimize losses, control costs, and play a vital role in connecting suppliers, manufacturers, distributors, and customers into one integrated supply chain network.

✓ **Order Management**

Order management refers to the complete process of receiving, processing, tracking, and fulfilling customer orders within the supply chain. It includes order entry, verification, inventory allocation, scheduling, invoicing, dispatch, and delivery coordination. Efficient order management ensures accuracy, speed, and transparency in the order cycle, leading to timely deliveries and customer satisfaction. It acts as a bridge between customer demand and supply chain operations, helping organizations manage demand effectively, reduce errors, improve service quality, and build long-term customer relationships.

✓ **Demand Planning & Forecasting**

Demand planning and forecasting involve estimating future customer demand using historical data, market trends, seasonal patterns, and business insights. This process helps organizations plan production, procurement, inventory, and distribution activities in advance. Accurate forecasting reduces uncertainty, prevents overproduction and shortages, optimizes resource utilization, and improves service levels. It enables businesses to align supply with demand, control costs, enhance customer satisfaction, and maintain stability and efficiency across the entire supply chain system.

✓ **Customer Service**

Customer service in the supply chain refers to all activities aimed at meeting and exceeding customer expectations before, during, and after the delivery of products or services. It includes order support, communication, complaint handling, returns management, after-sales service, and relationship management. Strong customer service ensures trust, satisfaction, and loyalty by providing timely responses, accurate information, and reliable solutions. It connects the supply chain to the end consumer, making it a critical factor in building brand reputation, repeat business, and long-term organizational success.

3. Basic Terms in Supply Chain

✓ **Lead Time**

Lead time is the total time taken from the initiation of a process to its completion in the supply chain. It commonly refers to the time between placing an order and receiving the product or material. Lead time includes procurement time, production time, processing time, and transportation time. Shorter lead times improve customer satisfaction, operational efficiency, and responsiveness, while longer lead times increase uncertainty, inventory costs, and the risk of delays. Managing lead time effectively helps businesses plan better, reduce disruptions, and maintain a smooth flow of goods across the supply chain.

✓ **Re-order Point**

Re-order point (ROP) is the inventory level at which a new order should be placed to replenish stock before it runs out. It ensures that there is enough inventory to meet demand during the lead time, preventing stockouts and production delays. The re-order point is calculated based on factors like average daily usage, lead time, and safety

stock. Properly managing the re-order point helps businesses maintain smooth operations, reduce emergency orders, control inventory costs, and meet customer demand consistently.

✓ **Safety Stock**

Safety stock is the extra inventory kept on hand to protect against uncertainties in demand or supply, such as sudden spikes in orders or delays from suppliers. It acts as a buffer to prevent stockouts and ensure continuous production or order fulfillment. The level of safety stock depends on factors like demand variability, lead time, and the criticality of the item. Maintaining an appropriate safety stock helps businesses avoid lost sales, maintain customer satisfaction, and ensure smooth operations across the supply chain.

✓ **Just In Time**

Just-in-Time (JIT) is an inventory management strategy where materials and products are produced or procured only as needed, minimizing stock levels and reducing holding costs. The goal is to receive goods just before they are required for production or sale, ensuring efficiency and reducing waste. JIT requires precise demand forecasting, strong supplier coordination, and reliable logistics. When implemented effectively, it lowers inventory costs, improves cash flow, enhances production efficiency, and increases responsiveness to customer demand.

✓ **Economic Order Quantity**

Economic Order Quantity (EOQ) is the optimal quantity of inventory a business should order to minimize the total cost of inventory, including ordering costs and holding costs. Ordering too frequently increases ordering costs, while ordering too much raises holding costs. EOQ helps balance these costs by determining the most cost-effective order size. Using EOQ improves inventory management, reduces waste, ensures smooth production, and supports efficient and economical supply chain operations.

4. **Supply Chain & ERP**

ERP (Enterprise Resource Planning) is a software system that integrates various business processes across departments into a single unified platform. In the context of the supply chain, ERP connects functions like procurement, production, inventory management, warehousing, logistics, order processing, and customer service. By doing this, it provides real-time visibility, streamlines operations, reduces manual errors, and improves decision-making. An ERP-enabled supply chain ensures that all departments and partners are working with the same accurate information, which enhances coordination, efficiency, and responsiveness. For example, when inventory levels drop, the ERP system can automatically alert procurement, adjust production schedules, and update customer order timelines, making the supply chain faster, cost-effective, and more reliable.

5. **From order punching to product delivery – A complete ERP workflow**

✓ **Order punching in ERP system**

Order punching in an ERP system is the process of entering customer orders into the software for processing. Typically, a salesperson brings the order from the customer, and this marks the starting point of the supply chain. All essential details such as customer information, product specifications, quantities, delivery dates, and payment terms are captured in the ERP system. Once entered, the order becomes visible to all relevant departments like inventory, production, and logistics, ensuring smooth coordination. Efficient order punching reduces errors, prevents delays, and sets the foundation for a seamless ERP-driven supply chain workflow.

✓ **Inventory check**

Inventory check is the next step in the ERP workflow after order punching. Once a customer order is entered, the ERP system automatically checks available stock levels to see if the required products are in inventory. This ensures that orders can be fulfilled without delays and highlights any shortages that may require procurement or production.

By providing real-time visibility of inventory, this step helps prevent stockouts, optimize inventory levels, and enables smooth coordination between procurement, production, and sales teams, keeping the supply chain efficient and responsive.

✓ **Procurement & Production**

After the inventory check, if the required stock is insufficient, the ERP system triggers procurement and production activities. Procurement, handled by the purchase department, involves sourcing and acquiring the necessary raw materials or products by identifying suppliers, requesting quotations, negotiating terms, issuing purchase orders, and tracking deliveries. Production then converts these raw materials into finished goods according to order requirements. The ERP system coordinates both procurement and production by sharing real-time information with suppliers, the production team, and inventory managers. This ensures timely availability of materials, efficient manufacturing, and seamless workflow, helping the supply chain meet customer orders on time while reducing delays and costs.

✓ **Warehouse processing & picking**

Once the products are ready, the ERP system moves the order to warehouse processing and picking. In this step, the warehouse team receives instructions from the ERP system to locate, pick, and prepare the ordered items for shipment. Warehouse processing ensures that products are checked for quality, properly packed, and organized. Picking specifically refers to the process of selecting the exact items and quantities required for each order from the warehouse shelves. It involves verifying the product codes, checking inventory locations, and ensuring accuracy to prevent mistakes or shortages. Efficient picking reduces errors, speeds up order fulfillment, and ensures that the correct products are delivered to customers on time, maintaining a smooth and reliable supply chain.

✓ **Logistics & Shipment**

After warehouse processing and picking, the ERP system directs the order to logistics and shipment. This stage involves planning, coordinating, and executing the movement of goods from the warehouse to the customer. Logistics includes selecting the appropriate transport mode, route planning, managing carriers, and handling documentation, while shipment focuses on the physical delivery of products to the customer. The ERP system tracks the shipment in real time, provides updates to the sales and customer service teams, and ensures timely and accurate delivery. Efficient logistics and shipment reduce delays, minimize transportation costs, prevent damages, and ensure that customer orders reach their destination safely and on schedule, completing the supply chain workflow.

✓ **Last mile delivery**

Last mile delivery is the final step in the supply chain where the product reaches the customer's doorstep. After logistics and shipment, the ERP system ensures that delivery details, addresses, and schedules are communicated to the delivery team. This stage focuses on speed, accuracy, and customer experience, as it directly impacts satisfaction and brand reputation. Efficient last mile delivery minimizes delays, prevents errors, and allows real-time tracking for customers. By integrating this step into the ERP system, businesses can ensure timely, reliable, and transparent delivery, completing the end-to-end supply chain process from order punching to product delivery.

✓ **Service & customer feedback**

After the product is delivered, the ERP workflow includes service and customer feedback. This stage involves handling after-sales support, addressing complaints, managing returns or replacements, and gathering customer feedback on product quality, delivery experience, and overall satisfaction. The ERP system tracks all interactions, enabling quick resolution of issues and maintaining a record for future reference. Collecting and analyzing feedback helps businesses improve processes, enhance product quality, and strengthen customer relationships. Integrating service and feedback into the ERP ensures a continuous loop of improvement, making the supply chain more responsive and customer-centric.

6. The 2021 Suez Canal Blockage

The Suez Canal is one of the most important global trade routes, connecting Asia, Europe, and Africa. Nearly a large portion of world trade passes through this canal every day, including oil, gas, raw materials, food items, and manufactured goods. Due to its strategic importance, any disruption in the Suez Canal directly affects global trade, logistics, and supply chains. Businesses and countries depend heavily on this route for timely and cost-effective transportation of goods.

In March 2021, a massive container ship named Ever Given got stuck diagonally in the Suez Canal due to strong winds and poor visibility conditions. This accident completely blocked the canal, preventing ships from passing through in both directions. As a result, hundreds of cargo ships were stranded, creating a traffic jam in one of the busiest shipping routes in the world. The blockage lasted for several days and required large-scale rescue and engineering operations to clear the canal.

The blockage caused severe disruptions in global supply chains. Deliveries of raw materials, fuel, food products, and finished goods were delayed across multiple countries. Manufacturing units faced shortages of inputs, retailers experienced stockouts, and exporters and importers suffered financial losses. The incident showed how fragile and interconnected global supply chains are, where a single disruption point can affect the entire global trade system. Industries such as oil and gas, automobile, FMCG, electronics, pharmaceuticals, and retail were heavily affected. Production schedules were disturbed, delivery commitments were missed, and transportation costs increased due to route diversions. Small businesses suffered due to delayed supplies, while large corporations faced operational and financial disruptions. The incident impacted business planning, customer satisfaction, and profitability across sectors.

Shipping companies had to reroute vessels around the Cape of Good Hope, which increased travel time, fuel consumption, and transportation costs. Ports became congested, schedules collapsed, and global shipping timelines were disturbed. International trade flows slowed down, affecting imports, exports, and global distribution networks. The blockage highlighted the risks of over-dependence on single trade routes.

The crisis highlighted the importance of technology and ERP systems in managing supply chain disruptions. Companies using ERP systems could track shipments, manage inventory levels, communicate with suppliers and customers, and re-plan operations quickly. Real-time data visibility helped organizations respond faster to disruptions, re-route shipments, adjust production plans, and manage customer expectations more effectively.

The incident exposed several weaknesses in global supply chains, such as lack of route diversification, over-reliance on single logistics corridors, low buffer inventories, weak risk planning, and limited contingency strategies. Many organizations were unprepared for such a large-scale disruption, showing the absence of strong supply chain resilience planning.

The Suez Canal blockage taught important lessons such as the need for diversified transport routes, strong risk management systems, better demand forecasting, safety stock planning, supplier diversification, and digital integration. Companies realized the importance of building flexible and resilient supply chains that can handle unexpected disruptions. Students learn that supply chains are global, interconnected, and vulnerable to disruptions. The case study helps them understand the importance of logistics planning, risk management, ERP systems, and supply chain integration. It also highlights how real-world events directly impact business operations, trade, and economies. The 2021 Suez Canal blockage is a powerful example of how a single event can disrupt the global supply chain system. It demonstrated the importance of resilient supply chain design, digital integration, and strategic planning. This case study shows that modern supply chains must focus not only on efficiency but also on flexibility, risk management, and adaptability to survive global disruptions.

7. Strategic Decision Making – Transport

Strategic decision-making in the transport of finished products involves choosing the most effective, reliable, and cost-efficient methods to deliver goods from production units to customers or markets. These decisions include selecting transport modes (road, rail, air, sea, or multimodal), choosing logistics partners, route planning, delivery timelines, warehousing locations, and distribution networks. Businesses must balance factors such as cost, speed, safety, reliability, customer expectations, and risk management while planning transportation strategies. Effective transport decisions help reduce delivery time, control logistics costs, improve customer satisfaction, and ensure product safety. Strategic planning also includes backup routes, alternative transport options, and risk diversification to handle disruptions such as strikes, natural disasters, or route blockages. By integrating transport planning with ERP systems and supply chain data, organizations can make informed decisions, optimize distribution, improve responsiveness, and build a resilient and efficient supply chain for finished product delivery.

Four modes of transport are: -

✓ Roadways

Roadways should be selected as a transport mode when flexibility, speed, and door-to-door delivery are required. It is most suitable for short to medium distances, last-mile delivery, and regional distribution. Road transport is ideal for frequent deliveries, smaller shipment sizes, and time-sensitive or perishable goods. It is also preferred when destinations are not directly connected by rail, ports, or airports. From a cost perspective, road transport is generally economical for short distances and local distribution, but becomes more expensive for long-distance or bulk transportation due to higher fuel, toll, and maintenance costs. Businesses therefore choose roadways when speed, accessibility, and delivery convenience are more important than long-distance cost efficiency.

✓ Railways

Railways should be selected as a transport mode when large volumes of goods need to be moved over long distances in a cost-effective and reliable manner. Rail transport is ideal for bulk commodities such as coal, cement, steel, grains, fertilizers, and heavy industrial goods. It is suitable when delivery timelines are planned in advance and flexibility of routes is not a major requirement. From a cost perspective, railways are more economical than road transport for long-distance and bulk transportation due to lower fuel consumption per unit and lower operating costs. Although rail lacks door-to-door delivery and requires last-mile connectivity through road transport, it is preferred when cost efficiency, capacity, and sustainability are key priorities in finished product transportation.

✓ Airways

Airways should be selected as a transport mode when speed and urgency are the top priorities. Air transport is ideal for high-value, low-volume, lightweight, and time-sensitive goods such as medicines, medical equipment, electronics, luxury products, important documents, and perishable items. It is preferred when delivery deadlines are critical, international delivery is required quickly, or market responsiveness is essential. From a cost perspective, air transport is the most expensive mode of transportation due to high fuel, handling, and operational costs. Therefore, businesses choose airways only when the value of time, product urgency, and customer expectations justify the high transportation cost, making it a strategic choice rather than a cost-saving option.

✓ Waterways

Waterways should be selected as a transport mode when large volumes of goods need to be transported over long distances at the lowest possible cost. Water transport is ideal for bulk commodities such as crude oil, coal, iron ore, grains, fertilizers, machinery, and heavy industrial goods. It is most suitable for international trade and intercontinental

