

SCM UNIT – 01

Factors of operational manager in supply chain management

Operational managers play a critical role in supply chain management, and their decisions can significantly impact the performance of the entire supply chain. Some of the factors that operational managers must consider in supply chain management include:

1. **Capacity planning:** Operational managers must ensure that the capacity of each stage in the supply chain is aligned with demand. This requires careful planning and coordination to avoid bottlenecks and excess inventory.
2. **Inventory management:** Operational managers must optimize inventory levels to meet customer demand while minimizing costs. This involves managing inventory levels across the entire supply chain, from raw materials to finished goods.
3. **Production planning:** Operational managers must ensure that production is aligned with demand, and that production processes are efficient and cost-effective.
4. **Quality management:** Operational managers must maintain quality standards throughout the supply chain. This involves setting quality standards, monitoring performance, and taking corrective action when necessary.
5. **Logistics management:** Operational managers must manage transportation, warehousing, and distribution activities to ensure that products are delivered to customers on time and at the lowest possible cost.
6. **Supplier management:** Operational managers must select and manage suppliers to ensure that they provide the required quality, delivery, and cost performance.
7. **Information management:** Operational managers must ensure that accurate and timely information is available to all parties in the supply chain. This involves managing information flows and using technology to improve communication and collaboration.
8. **Risk management:** Operational managers must identify and manage risks throughout the supply chain. This includes identifying potential disruptions and developing contingency plans to mitigate their impact.

Overall, operational managers play a critical role in managing the day-to-day activities of the supply chain, and their decisions can significantly impact the performance of the entire system.

Role of an operational manager in supply chain management

The operational manager plays a crucial role in supply chain management. They are responsible for overseeing the day-to-day activities involved in the production, distribution, and delivery of goods and services, and ensuring that they are executed in an efficient and effective manner. Here are some specific roles and responsibilities of an operational manager in supply chain management:

1. **Planning and forecasting:** The operational manager is responsible for developing and implementing production and inventory plans based on market demand forecasts and sales projections. They use their knowledge of the supply chain to identify potential bottlenecks and develop contingency plans to ensure that the supply chain can continue to operate smoothly.
2. **Inventory management:** The operational manager oversees the management of inventory levels to ensure that they are at the appropriate levels to meet customer demand. They also manage inventory costs by minimizing stockouts, reducing excess inventory, and optimizing inventory turnover.
3. **Logistics and transportation management:** The operational manager oversees the movement of goods and materials from suppliers to production facilities and from production facilities to customers. They ensure that logistics and transportation are carried out efficiently and that costs are minimized.
4. **Quality control:** The operational manager is responsible for maintaining quality standards in the production process. They develop quality control procedures, conduct inspections, and make sure that quality standards are met throughout the supply chain.
5. **Risk management:** The operational manager is responsible for identifying potential risks in the supply chain and developing strategies to mitigate them. They also monitor risk factors such as supplier performance, demand fluctuations, and changes in regulations or trade policies.
6. **Continuous improvement:** The operational manager is responsible for driving continuous improvement initiatives across the supply chain. They identify opportunities for improvement and implement changes to increase efficiency, reduce costs, and improve customer satisfaction.

Overall, the operational manager plays a critical role in ensuring that the supply chain operates effectively and efficiently, and that customer needs are met. They are responsible for overseeing key aspects of the supply chain, including planning, logistics, quality control, and risk management, and are constantly seeking opportunities for improvement to drive business success.

Explain the history of operational management in supply chain management

The history of operational management in supply chain management can be traced back to the early 20th century when companies began to adopt scientific management principles to improve efficiency in their operations. This approach emphasized the use of data and scientific methods to optimize production processes and reduce waste.

In the 1950s and 1960s, the concept of logistics management emerged, which focused on managing the movement of goods and materials from suppliers to customers. This approach emphasized the importance of efficient transportation and distribution and laid the foundation for modern supply chain management practices.

In the 1980s and 1990s, advances in technology and globalization led to the emergence of supply chain management as a distinct discipline. Companies began to recognize the importance of managing the entire supply chain, from sourcing raw materials to delivering finished products to customers. This led to the development of new tools and techniques, such as enterprise resource planning (ERP) systems, supply chain optimization software, and collaborative planning, forecasting, and replenishment (CPFR) processes.

Since the turn of the millennium, supply chain management has continued to evolve, driven by advances in technology and changing customer expectations. One major trend has been the increasing importance of sustainability and social responsibility in supply chain management. Companies are now expected to manage their supply chains ethically and sustainably and to minimize their environmental impact.

Another major trend has been the increasing use of data and analytics to drive supply chain optimization. Companies are now able to collect and analyze vast amounts of data on their supply chain operations, allowing them to identify inefficiencies and opportunities for improvement.

Overall, the history of operational management in supply chain management has been one of continuous evolution and improvement, driven by changing market conditions and technological advancements. Today, supply chain management is a critical function for companies across all industries, and plays a key role in their ability to compete and succeed in a rapidly changing global marketplace.

Types of manufacturing systems

There are several types of manufacturing systems that can be used in supply chain management, each with its own advantages and disadvantages. Some of the most common manufacturing systems include:

It is classified into 2 forms they are:

1: Intermittent Production

- * Job Production
- * Batch Production

2: Continuous Production

- * Mass Production
- * Process Production.

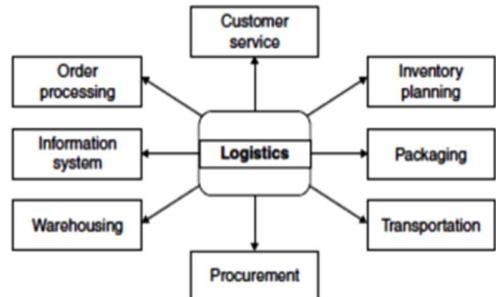
1. **Job Production:** This type of manufacturing system is characterized by the production of customized, low-volume products. Job shops are usually highly flexible, with the ability to produce a wide range of products and accommodate changes in production requirements quickly. However, they are typically less efficient than other types of manufacturing systems due to the need for customization and setup times.
2. **Batch Production:** In this type of manufacturing system, products are produced in small batches, with each batch consisting of a specified number of identical items. Batch production is more efficient than job shop production but less efficient than other types of manufacturing systems due to the need for setup times and the potential for overproduction.
3. **Mass Production:** This type of manufacturing system is similar to continuous flow production, but typically involves the production of a smaller range of products in larger quantities. Mass production is highly efficient but less flexible than other types of manufacturing systems.
4. **Process Production:** The volume of production is very high, therefore this method is used for manufacturing those items whose demand is continuous and high
- 5.

SCM UNIT – 02

ROLE OF LOGISTICS IN SUPPLY CHAIN:

According to the Council of Supply Chain Management Professionals

- Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.
- Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities.
- Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers.



Logistical components of supply chains:

Information: Information helps track the status of items and all supply chain processes, informing business decisions at each step.

Storage: Storage is the practice of holding supplies in the right quantity and right location. Businesses must strike a balance between demand and supply to prevent overstock and out-of-stock situations.

Warehousing: This component controls the day-to-day warehouse operations, such as receiving, put-away, picking, packing, shipping and receiving.

Material handling: Material handling can refer to the limited movement of items within a building or a delivery vehicle. Others extend the definition to include the storage, security and transfer of goods throughout the manufacturing, distribution and delivery processes.

Packaging: Proper packaging ensures items arrive undamaged and ship for the lowest possible cost.

Unitization: Unitization makes items efficient to arrange, transport and store. Unitization methods also ensure that material handling equipment can move items efficiently and without damaging them. The cube is one of the easiest units to store and shift, so it's a popular type of unitization.

DATA FLOW - CLOUD COMPUTING - BUSINESS INTELLIGENCE - DATA SCIENCE - LEARNING - MACHINES - VISION

Inventory control: Inventory control incorporates storage and warehousing techniques to optimize the types and amount of stock held and where Companies can use inventory management formulas to better calculate demand.

Transportation: This component is responsible for moving goods along the supply chain to the next node or directly to the customer. Transportation modes include cars, trains, trucks, planes and ships.

Supply chain links

A supply chain is a network of organizations, individuals, activities, information, and resources involved in the creation and delivery of a product or service from the supplier to the end customer. The supply chain links include:

1. **Suppliers:** These are the organizations or individuals that provide raw materials, components, or services that are needed to create a product or service.
2. **Manufacturers:** These are the organizations that transform raw materials and components into finished products.
3. **Distributors:** These are the organizations that handle the transportation and storage of finished products and deliver them to retailers, wholesalers, or directly to customers.
4. **Retailers:** These are the organizations that sell products directly to end customers through physical stores or online channels.
5. **Customers:** These are the end users or consumers who purchase and use the products or services.
6. **Transportation providers:** These are the organizations that provide transportation services to move products and materials from one location to another.
7. **Warehousing and storage providers:** These are the organizations that provide storage and handling services for products and materials.
8. **Information technology providers:** These are the organizations that provide software and technology solutions to manage and optimize supply chain operations.
9. **Service providers:** These are the organizations that provide specialized services, such as packaging, labeling, and quality control, to support the supply chain.

Supply chain flows

In supply chain management, there are four primary flows that occur within a supply chain network. These flows include:

1. **Product flow:** The product flow refers to the physical movement of goods and materials from suppliers to manufacturers, manufacturers to distributors, and distributors to customers. This includes the transportation, storage, and handling of products as they move through the supply chain.
2. **Information flow:** The information flow refers to the communication of data and information between various entities in the supply chain. This includes data about customer orders, production schedules, inventory levels, transportation schedules, and other relevant information. Effective management of the

information flow is essential to optimize supply chain operations and ensure the timely delivery of products.

3. **Financial flow:** The financial flow refers to the transfer of payments and funds between entities in the supply chain. This includes payments to suppliers, invoices from manufacturers and distributors, and payments from customers. Effective management of the financial flow is essential to maintain cash flow and ensure financial stability within the supply chain.
4. **Reverse flow:** The reverse flow refers to the movement of products or materials back up the supply chain. This can include returns, repairs, or recycling of products. Effective management of the reverse flow is essential to minimize waste and optimize the use of resources within the supply chain.

PULL & PUSH SUPPLY CHAINS:

Source: tulip.co

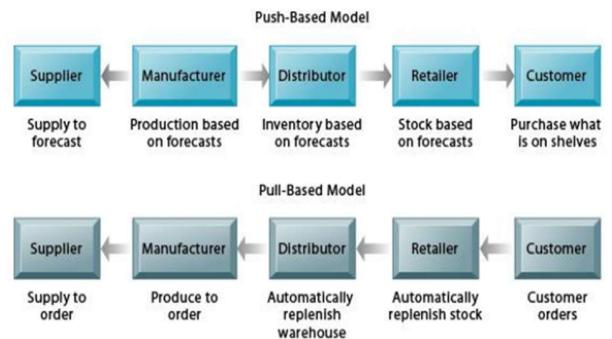
Push System:

Push-model Supply Chain is one where projected demand determines what enters the process.

Ex: Umbrellas get pushed to retailers a month before the raining season starts.

Warm jackets get pushed to clothing retailers as winter seasons start

- Companies have predictability in their Supply Chains since they already know what and when will come – long before it arrives.
- To plan production to meet their needs.



Pull System:

A Pull-model Supply Chain strategy is related to the just-in-time school of Inventory Management that minimises stock on hand, focusing on last-second deliveries.

Ex: An industry that operates under this strategy is a direct computer seller that waits until it receives an order actually to build a custom computer for the consumer.

- Products enter the Supply Chain when customer demand justifies it.
- Companies avoid the cost of carrying inventory that may not sell.

The need for two different SC strategies depends on the product and its lifecycle. A Push-driven approach is needed for new products with strong consumer loyalty to manage scarcity, fair allocation and priorities, such as Retail priorities, key accounts, or wholesale requirements. And a Pull demand-driven strategy for other products with less brand loyalty. It must be accomplished over a three level of the Supply Chain with Retailers, which can include carrier-owned stores, but also include distributors, franchised stores and e-commerce.

There are more challenges associated to these strategies, including seasonality peaks, lifecycle, short productions, high-demand volatility, or the use of new technology like Machine Learning and Artificial Intelligence, and the operation of a multichannel network; tools that synchronise all data, replenishment, demand sensor, inventory, orders, processes, to guarantee customer service.

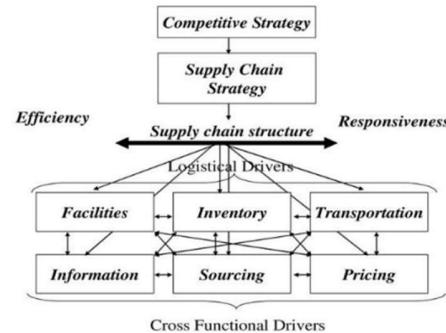
SUPPLY CHAIN - DRIVERS & METRICS:

DRIVERS:

- (1) Facilities
- (2) Inventory
- (3) Transportation
- (4) Information
- (5) Sourcing
- (6) Pricing

Facilities

- Places where inventory is stored, assembled, or fabricated
- Production sites and storage sites
- Decisions regarding location, capacity and flexibilities of facility have a significant impact on SC performance



Inventory

- Raw materials, WIP (work in progress), finished goods within a supply chain
- Changes in inventory policies can dramatically alter the efficiency and responsiveness of a SC

Transportation

- Moving inventory from point to point in a supply chain
- Combinations of transportation modes and routes can affect the performance of SC

Information

- Data and analysis regarding inventory, transportation, facilities throughout the supply chain
- potentially the biggest driver of supply chain performance
- This driver allows the management with the better opportunity to make the SC more responsive and efficient

Sourcing

- Distinguish the functions a firm performs and functions that are outsourced

Pricing: Price associated with goods and services provided by a firm to the supply chain

Supply chain metrics:

Inventory Turnover: Inventory turnover measures how quickly a company is selling and replacing its inventory. It is calculated by dividing the cost of goods sold by the average inventory value. A high inventory turnover indicates efficient inventory management and faster product cycles.

Order Cycle Time: Order cycle time measures the time it takes from when an order is placed to when it is delivered to the customer. It includes order processing time, production time, and transportation time. A shorter order cycle time indicates faster order fulfillment and improved customer satisfaction.

Perfect Order Fulfillment: Perfect order fulfillment measures the percentage of orders that are delivered to customers without errors or delays. It includes factors such as on-time delivery, complete and accurate order processing, and damage-free shipments. A higher perfect order fulfillment rate indicates better supply chain performance and customer satisfaction.

Supply Chain Costs: Supply chain costs measure the total cost of all supply chain activities, including procurement, production, transportation, and warehousing. It

includes both direct and indirect costs, such as labor, equipment, and inventory carrying costs. Lower supply chain costs indicate better supply chain efficiency and profitability.

Supplier Performance: Supplier performance metrics measure the performance of suppliers in terms of delivery times, product quality, and responsiveness. It includes factors such as on-time delivery, defect rates, and lead times. A high supplier performance score indicates better supplier relationships and improved supply chain reliability.

Cash-to-Cash Cycle Time: Cash-to-cash cycle time measures the time it takes from when a company pays its suppliers to when it receives payment from its customers. It includes factors such as production lead times, payment terms, and accounts receivable collection times. A shorter cash-to-cash cycle time indicates improved cash flow and financial performance.

Online Sales and the Distribution Network in the Supply Chain:

Online sales and distribution network:

<https://phantran.net/online-sales-and-the-distribution-network-in-the-supply-chain/>

RESPONSE TIME TO CUSTOMERS

When selling physical products that cannot be downloaded, customer requests take longer to fulfill through online sales than in a retail store because of the shipping time involved. Thus, customers who require a short response time may not use the Internet to order a product. There is no such delay, however, for information goods. The Internet has facilitated almost instantaneous access to movies, music, and books in digital form.

PRODUCT VARIETY

A company selling online finds it easier to offer a larger selection of products than a **bricks-and-mortar store**. For example, Walmart.com offers a much larger selection of products than Walmart stores do. Offering the same selection at a store would require a huge location with a correspondingly large amount of inventory.

The term "brick-and-mortar" refers to a traditional street-side business that offers products and services to its customers face-to-face in an office or store that the business owns or rents.

PRODUCT AVAILABILITY

By aggregating its inventory, a company selling online improves product availability. Better information on customer preferences also allows firms selling online to improve availability.

CUSTOMER EXPERIENCE

Online sales affect customer experience in terms of access, customization, and convenience. Unlike most retail stores that are open only during business hours, the Internet allows a customer to place an order at any convenient time. The Internet offers an opportunity to create a personalized buying experience for each customer. For example,

FASTER TIME TO MARKET

A firm can introduce a new product much more quickly online as compared with doing so via physical channels. A firm that sells electronics through physical channels must produce enough units to stock the shelves at its distributors and retailers before it starts to see revenue from the new product. A firm selling online, in contrast, makes a new product available online as soon as the first unit is ready to be produced. This is evident at Walmart.com, where larger new TVs go on sale well before they are sold at Walmart stores.

ORDER VISIBILITY

The Internet makes it possible to provide visibility of order status. From a customer's perspective, it is crucial to provide this visibility because an online order has no physical equivalent to a customer shopping for an item at a retail store.

RETURNABILITY

The proportion of returns is also likely to be much higher for online orders because customers are unable to touch and feel the product before their purchase. Going online thus increases the cost of reverse flows.

DIRECT SALES TO CUSTOMERS

The Internet allows manufacturers and other members of the supply chain that do not have direct contact with customers in traditional channels to get customer feedback and build a relationship with the customer.

INFORMATION

An online seller can share demand information throughout its supply chain to improve visibility. The Internet may also be used to share planning and forecasting information within the supply chain, further improving coordination. This helps reduce overall supply chain costs and better match supply and demand.

A company selling online incurs additional information costs, however, to build and maintain the information infrastructure.

Factors Influencing Network Design Decisions:

Source: <https://phantran.net/>

- Strategic
- Technological
- Macroeconomic
- Political
- Infrastructure
- Competitive
- Logistics and facility costs.



The screenshot shows the homepage of Binance Academy. At the top, there's a navigation bar with links like Home, India, World, Cities, Opinion, Sports, Entertainment, Premium, Videos, Explained, Audio, Epapers, and Sign In. Below the navigation is a large banner for 'BINANCE ACADEMY' featuring a Bitcoin logo and some charts. To the right of the banner, it says 'Join millions of students from around the world already learning on Binance Academy'. There's also a 'Binance Academy' link and an 'Open' button. At the bottom left, there's a 'MUST READ' section with a link to 'Lata Mangeshkar death: Towards the end, video calls with doctor's 8-year-old'. On the bottom right, there are social media icons for Facebook, Twitter, LinkedIn, and YouTube.

Mass production of iPhones to shift from China to India, says Foxconn's chairman

India has become the fastest growing smartphone market in the world, while China stagnates and Apple loses share to local competitors.



1. Strategic Factors

A firm's competitive strategy has a significant impact on network design decisions within the supply chain. Firms that focus on cost leadership tend to find the lowest cost location for their manufacturing facilities, even if that means locating far from the markets they serve.

Ex: Electronic manufacturing service providers such as Foxconn and Flextronics have been successful in providing low-cost electronics assembly by locating their factories in low-cost countries such as China.

In contrast, firms that focus on responsiveness tend to locate facilities closer to the market and may select a high-cost location if this choice allows the firm to react quickly to changing market needs.

Ex: Zara, the Spanish apparel manufacturer, has production facilities in Europe as well as Asia. Its production facilities in **Asia** focus on low cost and produce primarily standardized, low-value products that sell in large amounts. The **European** facilities focus on being responsive and produce primarily trendy designs whose demand is unpredictable. This combination of facilities allows Zara to produce a wide variety of products in the most profitable manner.



2. Technological Factors

Characteristics of available production technologies have a significant impact on network design decisions. If production technology displays significant economies of scale, a few high-capacity locations are most effective. This is the case in the manufacture of computer chips, for which factories require a large investment and the output is relatively inexpensive to transport. As a result, most semiconductor companies build a few high-capacity facilities.

In contrast, if facilities have lower fixed costs, many local facilities are preferred because this helps lower transportation costs. For example, bottling plants for Coca-Cola do not have a high fixed cost. To reduce transportation costs, Coca-Cola sets up many bottling plants all over the world, each serving its local market.

3. Macroeconomic Factors

Macroeconomic factors include taxes, tariffs, tax incentives, exchange rates, and shipping costs that are not internal to an individual firm

4. Infrastructure Factors

The availability of good infrastructure is an important prerequisite to locating a facility in a given area. Poor infrastructure adds to the cost of doing business from a given location. In the 1990s, global companies located their factories in China near Shanghai, Tianjin, or Guangzhou—even though these locations did not have the lowest labor or land costs—because these locations had good infrastructure. Key infrastructure elements to be considered during network design include availability of sites and labor, proximity to transportation terminals, rail service, proximity to airports and seaports, highway access, congestion, and local utilities.

5. Competitive Factors

Companies must consider competitors' strategy, size, and location when designing their supply chain networks. A fundamental decision firms make is whether to locate their facilities close to or far from competitors. The form of competition and factors such as raw material or labor availability influence this decision.

Ex: Retail stores tend to locate close to each other because doing so increases overall demand, thus benefiting all parties. By locating together in a mall, competing retail stores make it more convenient for customers, who need drive to only one location to find everything they are looking for. This increases the total number of customers who visit the mall, increasing demand for all stores located there.

6. Customer Response Time and Local Presence

Customers are unlikely to come to a convenience store if they have to travel a long distance to get there. It is thus best for a convenience store chain to have many stores distributed in an area, so most people have a convenience store close to them.

Ex: (i) A coffee shop is likely to attract customers who live or work nearby.
(ii) Grainger is a leading provider of top-quality industrial supplies worldwide.
Grainger uses about 400 facilities all over the United States to provide same-day delivery to many of its customers.



7. Logistics and Facility Costs

Logistics and facility costs incurred within a supply chain change as the number of facilities, their location, and capacity allocation change. Companies must consider inventory, transportation, and facility costs when designing their supply chain networks. Inventory and facility costs increase as the number of facilities in a supply chain increases. Transportation costs decrease as the number of facilities increases. Total logistics costs are the sum of the inventory, transportation, and facility costs.

The supply chain network design is also influenced by the transformation occurring at each facility. When there is a significant reduction in material weight or volume as a result of processing, it may be better to locate facilities closer to the supply source rather than the customer.

SCM UNIT -03

How has Globalization impact to supply chain management?

Supply chain management: In commerce, supply chain management, the management of the flow of goods and services, involves the movement and storage of raw materials, of work-in-process inventory, and of finished goods from point of origin to point of consumption. It's the broad range of activities required to plan, control and execute a product's flow, from acquiring raw materials and production through distribution to the final customer, in the most streamlined and cost-effective way possible.

With the advent of globalization, managing supply chain activities has become more complex. Today a company operating in the United States may have its manufacturing facilities in China, Mexico or Taiwan and its customers throughout the world. Many companies in order to manage its global operations may outsource their supply chain activities to third-party organizations around the globe. Outsourcing reduces the supply chain operating cost but when not managed effectively proves otherwise.

2

Globalization has dramatically changed how manufacturers operate, offering an opportunity to reach new customers in new markets while at the same time exposing firms to greater competition. Meanwhile, raw materials and supplier relationships must now be managed on a global scale. Just as there are benefits and costs of globalization, there are similar pros and cons of a global supply chain. In particular, companies need to manage the related risks.

The Four Driving Forces of the Globalization Process:

- a) Global Market Forces
- b) Technological Forces
- c) Global Cost Forces
- d) Political and Macroeconomic Forces

Benefits of a Globalized Supply Chain:

1. **Expanded sourcing opportunities:** A world market offers businesses opportunities to secure a diverse selection of workers, materials, and products. This larger selection of goods and services often means the opportunity to select higher-quality or lower-cost options.
2. **The opportunity to reach new customers in new markets:** Just as globalization offers more materials and laborers, it also offers new customers in new locations with new needs.
3. **More room to grow:** New technologies and a shrinking globe mean that it is easier for companies to grow generally: to produce more, offer more, and sell more. Expanding borders also means expanding businesses and corporations.
4. **More opportunities to save money:** Globalization's biggest benefit is that increases options: options for source materials, options for workers, and options for transportation. More options mean more chances to save on spending and increase profits.

Impact of Uncertainty in Network in supply chain management

Uncertainty in the network can have a significant impact on supply chain management. Uncertainty can arise from various sources, such as demand volatility, supply disruption, changes in regulations, or unforeseen events such as natural disasters. Here are some of the impacts of uncertainty in the network on supply chain management:

1. **Disruptions to the flow of goods and information:** Uncertainty can lead to disruptions in the flow of goods and information across the supply chain network. This can result in delays, increased costs, and decreased customer satisfaction.
2. **Increased inventory holding costs:** Uncertainty can lead to higher inventory holding costs as companies try to mitigate the risks of supply chain disruptions. This can tie up working capital, reduce profitability, and increase the risk of obsolescence.
3. **Increased lead times:** Uncertainty can lead to longer lead times, as companies may need to source materials or products from alternative suppliers or transport them through less efficient routes.
4. **Reduced efficiency:** Uncertainty can reduce the efficiency of supply chain operations, leading to increased costs and reduced competitiveness. For example, companies may have to expedite shipments, use premium transportation services, or hold excess inventory to meet customer demand.
5. **Decreased flexibility:** Uncertainty can decrease the flexibility of supply chain operations, making it more difficult for companies to respond to changes in demand or supply. This can lead to lost sales, reduced customer satisfaction, and decreased market share.

Role of Information Technology in Forecasting:

A supply chain is a network of companies, people, functions, information, and resources who are involved in moving the product from the supplier to the customer.

Data is pivotal to the execution of the supply chain, primarily because it provides the base on which the supply chain managers can take decisions.

Information technology provides the tools which can pick up relevant information, break it down for proper analysis and execute on it for optimum performance of the supply chain.

1. Integrated & Coordinated Supply Chain - A supply chain can only work efficiently when it is properly integrated and well-coordinated. IT performs this crucial task by bringing in multiple technologies and combining them in the best possible manner to optimise all possible scenarios of the supply chain. These technologies make the collection of even the most basic data possible. In turn, this allows precise and detailed data analysis possible on the Business Intelligence (BI) side.

2. Increased Productivity - Smooth flow of information, new technologies and effective communication increases the productivity of all entities in the supply chain. It is like a trigger action which starts at one end and continues down the line until the action is (in this case the product movement) complete. Instead of going back and forth, IT provides the link that passes the requisite information continuously.

3. Cost Reduction - IT permits optimum utilisation of resources and assets. Old data is used to study the trends and technology is used to analyse it for improving performance. When resources are used optimally they result in cost reduction. In a supply chain, the role of IT becomes more prominent because it has to make all the parties use their respective resources in the most cost-efficient manner. When IT is used as it should be there is a dramatic fall in overall expenses.

4. Product Improvement - IT consists of tools and applications which can be used to gain early awareness. In a market where the customer wants something new regularly, the product will either have to evolve or it will go out of demand. To stay in business, you will have to introduce product improvement at all levels. The kind and extent of product improvement can be validated with the help of IT.

5. Supply Chain Visibility - Information makes the entire supply chain visible to the managers. The manner in which the information flows from one collaborator to the other and the impact it has on others is used by the managers in making strategic decisions.

17.1 THE ROLE OF IT IN A SUPPLY CHAIN

Information is a key supply chain driver because it serves as the glue that allows the other supply chain drivers to work together with the goal of creating an integrated, coordinated supply chain. Information is crucial to supply chain performance because it provides the foundation on which supply chain processes execute transactions and managers make decisions. Without information, a manager cannot know what customers want, how much inventory is in stock, and when more product should be produced or shipped. In short, information provides supply chain visibility, allowing managers to make decisions to improve the supply chain's performance.

IT consists of the hardware, software, and people throughout a supply chain that gather, analyze, and execute upon information. IT serves as the eyes and ears (and sometimes a portion of the brain) of management in a supply chain, capturing and analyzing the information necessary to make a good decision. For instance, an IT system at a PC manufacturer may show the finished goods inventory at different stages of the supply chain and also provide the optimal production plan and level of inventory based on demand and supply information.

Using IT systems to capture and analyze information can have a significant impact on a firm's performance. For example, a major manufacturer of computer workstations and servers found that most of its information on

customer demand was not being used to set production schedules and inventory levels. The manufacturing group lacked this demand information, which essentially forced it to make inventory and production decisions blindly. By installing a supply chain software system, the company was able to gather and analyze demand data to produce recommended stocking levels. Using the IT system enabled the company to cut its inventory in half, because managers could now make decisions based on customer demand information rather than manufacturing's educated guesses. Large impacts like this underscore the importance of IT as a driver of supply chain performance.

Availability and analysis of information to drive decision making is a key to the success of a supply chain. Companies that have built their success on the availability and analysis of information include Seven-Eleven Japan, Walmart, Amazon, UPS, and Netflix. To support effective supply chain decisions, information must have the following characteristics:

1. **Information must be accurate.** Without information that gives a true picture of the state of the supply chain, it is difficult to make good decisions. That is not to say that all information must be 100 percent correct, but rather that the data available paint a picture that is at least directionally correct.
2. **Information must be accessible in a timely manner.** Accurate information often exists, but by the time it is available, it is either out of date or it is not in an accessible form. To make good decisions, a manager needs to have up-to-date information that is easily accessible.
3. **Information must be of the right kind.** Decision makers need information that they can use. Often companies have large amounts of data that are not helpful in making a decision. Companies must think about what information should be recorded so that valuable resources are not wasted collecting meaningless data while important data go unrecorded.
4. **Information must be shared.** A supply chain can be effective only if all its stakeholders share a common view of the information that they use to make business decisions. Different information with different stakeholders results in misaligned action plans that hurt supply chain performance.

Information is used when making a wide variety of decisions about each supply chain driver, as discussed next.

1. **Facility.** Determining the location, capacity, and schedules of a facility requires information on the trade-offs among efficiency and flexibility, demand, exchange rates, taxes, and so on (see Chapters 4, 5, and 6). Walmart's suppliers use the demand information from Walmart's stores to set their production schedules. Walmart uses demand information to determine where to place its new stores and cross-docking facilities.
2. **Inventory.** Setting optimal inventory policies requires information that includes demand patterns, cost of carrying inventory, costs of stocking out, and costs of ordering (see Chapters 11, 12, and 13). For example, Walmart collects detailed demand, cost, margin, and supplier information to make these inventory policy decisions.
3. **Transportation.** Deciding on transportation networks, routings, modes, shipments, and vendors requires information about costs, customer locations, and shipment sizes to make good decisions (see Chapter 14). Walmart uses information to tightly integrate its operations with those of its suppliers. This integration allows Walmart to implement cross-docking in its transportation network, saving on both inventory and transportation costs.
4. **Sourcing.** Information on product margins, prices, quality, delivery lead times, and so on, are all important in making sourcing decisions. Given sourcing deals with inter-enterprise transactions, a wide range of transactional information must be recorded in order to execute operations, even once sourcing decisions have been made.
5. **Pricing and revenue management.** To set pricing policies, one needs information on demand, both its volume and various customer segments' willingness to pay, and on

many supply issues, such as the product margin, lead time, and availability. Using this information, firms can make intelligent pricing decisions to improve their supply chain profitability.

In summary, information is crucial to making good supply chain decisions at all three levels of decision making (strategy, planning, and operations) and in each of the other supply chain drivers (facilities, inventory, transportation, sourcing, and pricing). IT enables not only the gathering of these data to create supply chain visibility, but also the analysis of these data so that the supply chain decisions made will maximize profitability.

The five steps of global supply chain risk management:

- 1. Risk Identification**
- 2. Risk Assessment and Evaluation**
- 3. Selection of Risk Management Strategies**
- 4. Implementation of Risk Management Strategies**
- 5. Mitigation of Supply Chain Risks**

(As all you are aware of these points so just elaborate it)

*Demand forecasting problems in pdf module 3

SCM UNIT – 04

CO-ORDINATION IN SUPPLY CHAIN:

- Coordination implies actions by various agents in the supply chain that are aimed at an increase in total supply chain profits.
- Channel coordination (or supply chain coordination) aims at improving supply chain performance by aligning the plans and the objectives of individual enterprises. It usually focuses on inventory management and ordering decisions in distributed inter-company settings.
- Managing demand and supply at maximum efficiency requires coordination among supply chain stakeholders.
- To optimally balance demand and supply, there must be visibility of true demand across all links in the supply chain from consumers to the upstream chain.
- Information sharing is a key component to gain visibility.
- Synchronization has a significant effect on performance in every aspect of the chain including manufacturing, procurement, distribution, and customers.
- Companies that adopt collaborative approach tend to increase visibility across the network, allowing them to minimize variability than those who do not.

CPFR:

2. Collaborative Planning, Forecasting and Replenishment (CPFR)

CPFR is a business practice that combines the intelligence of multiple trading partners in the planning and fulfilment of customer demand.

CPFR has the following features:

- Information systems for capturing and transferring POS, inventory, and other demand & supply information between trading partners.

- Formalized sales forecasting and order forecasting processes.
- Formalized exception handling processes.
- Feedback systems to monitor and improve supply chain performance.

CPFR in essence is the integration of all the entities in the supply chain where relevant and critical information from all sources collected within the supply chain are shared with all partners. Transparency is the key driver in CPFR.

3. Principles of CPFR

CPFR processes depend on the comparison of data: comparing one organization's plans with another; comparing a new version of one organization's plans with a previous plan; or comparing a plan to actual results. In other words, CPFR manages by exception—it addresses variances, whether plan-to-plan or plan-to-actual.

CPFR creates a win-win scenario, tying the buyer and seller together so that their goals are compatible. By competing as one, the buyer and seller form a value chain that will come out ahead of other buyers and sellers who are still caught up in price negotiations.

4. CPFR Process Model

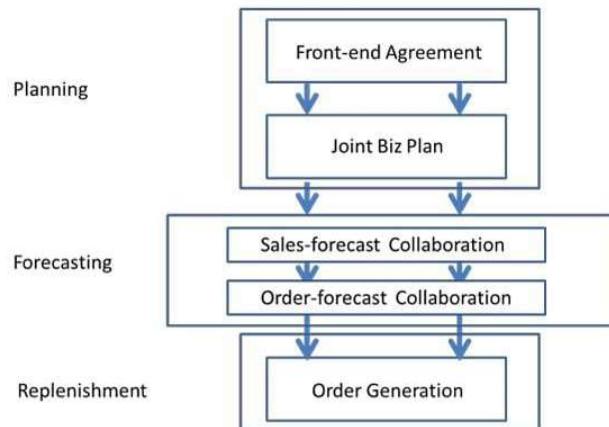


Figure 8-1: CPFR Model
(After J.D.Edwards White paper, 2003)

The model as shown in Figure 8-1 is a simplified version of the 9-step model. The model comprises:

- Develop Front End Agreement
- Create the Joint Business Plan
- Create the Sales Forecast
- Identify Exceptions for Sales Forecast
- Resolve/Collaborate on Exception Items
- Create Order Forecast
- Identify Exceptions for Order Forecast
- Resolve/Collaborate on Exception Items
- Order Generation

The CPFR model enables significant scope and depth of collaboration across supply chains.

3

CPFR involves a number of business processes integrated between a number of supply chain partners eg between a retailer and a supermarket. There is usually a few lead partners who select those processes where CPFR is adopted.

There is data exchange between the partners and include suppliers taking responsibility for replenishment on behalf of their customer.

Synchronized forecasting is also involved in CPFR. The individual information systems are coordinated for planning and replenishment purposes.

From the data of actual consumer demand extracted from POS, product development, marketing plans, production planning and transport planning are seamlessly integrated with forecasts.

4.1 Planning Phase

In the planning phase, there are 2 stages:

- **Front-end Agreement**

The parties involved establish the guidelines and rules for the collaborative relationship.

The agreement includes a common basis for co-operation, trust and availability of competency resources. All parties are bound to make available and ready these competencies and resources for the system to work.

The Business Intelligence modules allow partners to define and measure specific KPIs.

The agreement also includes mechanism to handle disagreements and differences.

- **Joint Business Plan**

The parties involved create a business plan that takes into account their individual corporate strategies and defined category roles, objectives and tactics.

This includes product types, minimum order quantities, lead time and order frequency.

The business plan becomes the communication tool among the supply chain partners.

The front-end agreement should produce a long-term pact spanning the life of the business. Obviously, an enormous amount of information will flow between partners. These are:

- Who should get what?
- When?
- Where?
- How much should they get?

4.2 Forecasting Phase

The stages are:

- **Sales-forecast**

Retailer point-of-sales data, causal information and information on planned events are used by one party to create an initial sales forecast.

This forecast is then communicated to the other party and used as a baseline for the creation of an order forecast.

- **Identify exceptions for sales forecast**

Items that fall outside the sales forecast constraints set in the front-end agreement are identified.

The criteria for exceptions are stated in the Front-end Agreement.

Examples of such items are seasonal products.

- **Resolve / collaborate on exception items**

Exceptions are easily identified and messages are sent to reconcile unusual items.

Each contributor (partner, supplier, and customer) becomes an integral part of the real-time collaborative process. The final enterprise forecast is the combination of the most accurate and timely information available.

The parties negotiate and produce an adjusted forecast.

- **Create order forecast**

The order forecast relies on point-of-sale (POS) data, causal information, and inventory strategies to generate a specific forecast that supports the shared sales forecast.

- **Identify exceptions for order forecast**

Items that fall outside the order forecast constraints set jointly by the parties involved are identified.

- **Resolve / collaborate on exception items**

The parties negotiate (if necessary) to produce an adjusted order forecast.

4.3 Replenishment Phase

The single stage is:

- **Order Generation**

The final step in the CPFR process is generating the order and promising the delivery.

The order forecast is translated into a firm order by one of the parties involved.

The essence of maintaining positive relationships with partners and customers is to deliver on promises.

5. Benefits of CPFR

- **Improved customer service through better forecasting techniques**

More reliable forecasting allows a more effective way to anticipate consumer demand across the entire supply chain and therefore allow the business to plan production capacity accordingly. Risks for stock-outs are reduced which improves customer fulfillment orders which thereby increases revenue, delivery and improved customer service.

- **Lower Inventories for higher profits**

Accurate predictions of demand as mentioned before will reduce stock-outs and provide a more efficient understanding of production needs. Safety stock inventory for over production would be reduced which decreases carrying costs, storage space and potential spoilage/obsolescence.

Additionally, there is improved material flow and release of working capital that can be used in other areas of the production instead of being tied up in inventory.

- **Improved ROI on Technology investment**

Effective CPFR technology solutions benefit both manufacturers and retailers from reduced overhead costs because several inefficiencies are eliminated, i.e., antiquated manual processes, custom integrations of different partner IT systems and information searching of multiple sources/systems.

- **Improved relationships between trading partners**

Develop when collaboration takes place. Trading partners gain a better understanding of respective businesses by regularly exchanging information and establishing direct communication on channels and create a win-win situation.

- **Cost reduction**

Will occur when production schedule and agreed forecasts are aligned.

Costs are reduced by decreasing set-up times, effort duplication and variations. There is also efficient production capacity utilization since planning information is more reliable.

6. Issues with CPFR

CPFR may be a simple concept however turning it into practice is a difficult task.

Since it involves collaboration with several trading partners, cultural challenges with each organization are realized and requires an across the board buy-in.

A change in business processes is required, along with an inward focus to develop a broad multi-enterprise view. Several challenges faced by organizations implementing CPFR are:

- Selection of CPFR partners – trading partners who wish to collaborate with each other need to assess the potential relationship according to anticipated, realistic benefits, pertinent to common business goals, organizations and cultural issues.
- Senior Management Buy In – senior management must sponsor each of the trading partners and get involvement from necessary resources, e.g. Human resources, technical infrastructure, time and project budget etc.
- Confidentiality – Sharing sensitive data reinforces the need to define rules around confidentiality.
- Cultural Change – Internal and external collaboration requires a mindset of change and capable to be flexible in adapting a collaborative approach.

7. Conclusion

Forecast made in isolation tend to be inaccurate. Collaborative planning, forecasting, and replenishment are an approach in which companies work together to develop mutually agreeable plans and take responsibility for their actions.

The objectives of CPFR is to optimize the supply chain by generating a consensus demand forecast, delivering the right product at the right time to the right location, reducing inventories, avoiding stock outs, and improving customer services.

CPFR is a great concept that has revolutionized business practices by integrating the organization with its trade partners more effectively to realize mutual benefits. Buyers benefit from reduced prices, better forecasting, collaborative relationships to get better service levels and synchronized operations.

There is a longer term collaboration which the two businesses can share risks and rewards. CPFR models require commitment, true collaboration and executive buy-in from both sides.

Bullwhip effect

The Bullwhip Effect is a phenomenon that occurs in supply chain management where small changes in customer demand can lead to a significant increase in the variability of demand upstream in the supply chain. This effect is named after the characteristic shape of a bullwhip, where a small movement of the handle can result in a much larger movement of the whip's end.

The Bullwhip Effect can be caused by a variety of factors, including:

1. **Forecasting Inaccuracies:** Inaccurate forecasting can lead to overproduction or underproduction, which can lead to changes in customer demand and variability in the supply chain.
2. **Order Batching:** When retailers or distributors place large orders at infrequent intervals, it can lead to variability in the upstream supply chain as manufacturers must try to anticipate future demand.
3. **Price Fluctuations:** Changes in prices or promotions can lead to changes in demand, which can cause variability in the supply chain.
4. **Gaming:** Suppliers may adjust their order quantities to protect against future price increases or shortages, which can lead to increased variability in the supply chain.

The Bullwhip Effect can have several negative consequences for supply chain management, including:

1. **Increased Costs:** Variability in the supply chain can lead to increased inventory, transportation, and production costs.
2. **Decreased Customer Service:** Variability can lead to stockouts and longer lead times, which can negatively impact customer service.
3. **Decreased Efficiency:** Variability can lead to underutilized production capacity and increased setup times, which can decrease efficiency.

To mitigate the Bullwhip Effect, companies can implement several strategies, including:

1. **Improving Forecasting Accuracy:** Improving forecasting accuracy can help reduce variability in the supply chain.
2. **Reducing Order Batching:** Reducing the size and frequency of orders can help reduce variability in the supply chain.
3. **Improving Communication:** Improving communication among supply chain partners can help reduce variability by providing better visibility into demand and inventory levels.
4. **Implementing Collaborative Planning:** Collaborative planning among supply chain partners can help reduce variability by aligning production and inventory levels with actual demand.

Collaborative initiatives:

Vendor Managed Inventory (VMI)

Vendor Managed Inventory (VMI) is a supply chain management strategy where the supplier or vendor of a product takes responsibility for managing the inventory levels of that product in the customer's warehouse or store. The supplier monitors the inventory levels of the customer and initiates replenishment of products when necessary. VMI is a collaborative approach to inventory management that aims to reduce costs, increase efficiency, and improve customer satisfaction.

In VMI, the vendor uses real-time data provided by the customer, such as point-of-sale data, to track inventory levels and demand patterns. Based on this data, the vendor initiates replenishment of products to ensure that the customer has the right amount of inventory at all times. This approach helps to reduce the lead time and the need for the customer to carry excess inventory, thereby reducing inventory carrying costs.

Some of the benefits of VMI in supply chain management include:

1. **Reduced inventory holding costs:** With VMI, the supplier takes responsibility for managing inventory levels, thereby reducing the customer's inventory holding costs.
2. **Increased efficiency:** By using real-time data to track inventory levels and demand patterns, VMI improves the efficiency of the supply chain, ensuring that the right products are available at the right time.
3. **Improved customer satisfaction:** VMI helps to ensure that the customer always has the right amount of inventory, reducing the risk of stockouts and improving customer satisfaction.
4. **Improved communication and collaboration:** VMI requires close collaboration between the supplier and the customer, leading to improved communication and a better understanding of each other's needs and requirements.
5. **Reduced lead time:** By monitoring inventory levels in real-time and initiating replenishment when necessary, VMI helps to reduce lead time and ensure timely delivery of products.

2. ECR, CR, & QR:

ECR (Efficient Consumer Response):

Strategy to increase the level of services to consumers through close cooperation among retailers, wholesalers, and manufacturers.

Key Elements:

1. **Efficient assortment** – Product offerings should be rationalized to better meet customer needs and improve supply chain performance
2. **Efficient product introductions** – New products should be introduced in response to real customer needs, and only after the impact on supply chain performance has been considered.

-
3. **Efficient promotions** – Prices should be kept as stable as possible. The supply chain impact of promotions and market specials should be carefully considered.

CR (Continuous Replenishment)

- It's a supply chain strategy in which frequent replenishment (**restoration**) takes place from the supplier to the retailer/distributor in order to maintain better flow in supply chain and minimize bullwhip effect.
- Decision of quantity and time to replenish lies with supplier and not the retailer.
- Need agreement between supplier and retailer.
- In order to implement CR, the supplier needs to set an objective i.e., fill rate etc.
- Supplier needs to implement IT systems to establish real time flow of information in the supplier chain about sales. Ex.: Distribution center withdrawals, Retailer's point of sales etc.
- These data are important to predict normal sales and deviations in demand, based on which inventory level is decided.
- The system itself suggests how much to replenish time to time. The associated benefits of CR are reduced inventory, reduced stock out, minimization of bullwhip effect, improved customer service, reduced administration cost and enhanced perception value in trading partner.

QR (Quick Response)

QR is a management concept created to increase consumer satisfaction and survive increasing competition from new competitors. It intends to shorten the lead time from receiving an order to delivery of the products and increase the cash flow.

The QR (Quick Response) system, a production and distribution system for quick response to the market, was developed for the U.S. textile industry to survive the global competition with low-cost foreign companies.

SCM UNIT – 05

Safety stock/Safety inventory/buffer stock:

Safety stock (also called buffer stock) is a term used by supply chain managers to describe a level of extra stock that is maintained to mitigate the risk of stock-outs (shortfall in raw material or packaging) due to uncertainties in supply and demand. Adequate safety stock levels permit business operations to proceed according to their plans. Safety stock is held when there is uncertainty in demand, supply, or manufacturing yield; it serves as insurance against stock-outs.

Reasons for maintaining safety stock:

1. Safety stock protects against unforeseen variations in supply and/or demand

To compensate for forecast inaccuracies (only in case demand is bigger than the forecast)

Its purpose is to prevent disruptions in manufacturing or deliveries

Avoid stockouts to keep customer service and satisfaction levels high

Many companies look at their own demand fluctuations and assume that there is not enough consistency to predict future variability. They then fall back on trial and error or rule-based approaches such as holding a certain number of weeks of historical average demand – for example, 4 weeks of cycle stock and 2 weeks of safety stock.

Unfortunately, rules-based approaches tend to be a ‘one size fits’ all approach to inventory management. This means, by definition, that the rule will deliver the right amount of inventory for some items, too much inventory for other items, and too little inventory to meet service levels for other items.

As a result, managers get inventory imbalances that result in excessive inventory costs, impeded cash flow, and poor and/or inconsistent service levels all at the same time. In addition, rules-based approaches are only sensitive to changes in demand.

Ways to Calculate Safety Stock:

Fixed safety stock: Companies can set a fixed level of safety stock for their goods. This number may be based on the judgment of the operations manager or on assumed stock-level calculations. It's often set on an aggregated level and not on the individual item. This method may lead to high inventory costs or stock-outs since demand is not always constant or similar for all the items in the group for which the aggregation is done.

Time-based calculation: Time-based safety stock level is used to calculate the stock required over a fixed period. In addition to the cycle stock, usually, a percentage or a week's average sales is added. This method also has a drawback, particularly when items are slow-moving, as there is no connection to lead time. It can result in a large amount of unnecessary capital tied up in safety stock, which becomes excess stock sitting in warehouses.

Statistical calculation: The mathematical approach, which uses mathematical theories of probability, imposes order and regularity on aggregates of more or less disparate elements. Different statistical calculations are presented in the literature and they will provide better results than the fixed and time-based safety stock calculations. Keep in mind that different mathematical methods are more or less difficult to implement, both manually and in your software solution.

Rule-based approaches are proven to be less than effective in determining optimal inventory levels for many operations. A sound, mathematical approach to safety stock calculations will not only justify the required inventory levels to business leaders, but also balance the conflicting goals of maximizing customer service and minimizing inventory cost.

Transportation role in scm:

Transportation plays a critical role in supply chain management as it is the physical movement of goods from one location to another. Transportation is an integral component of the supply chain process and impacts the cost, speed, and quality of delivering products to customers.

The following are some of the key roles of transportation in supply chain management:

Product movement: Transportation is responsible for moving products from one point to another within the supply chain. This includes the movement of raw materials, finished goods, and work in progress. Transportation ensures that products reach their destination on time, in the right quantity, and in good condition.

Customer satisfaction: Transportation plays a key role in meeting customer expectations for timely and accurate delivery of products. Effective transportation ensures that the right products are delivered to the right customers at the right time, which is critical for maintaining customer satisfaction and loyalty.

Inventory management: Transportation can help companies manage their inventory levels by ensuring that products are delivered to the right location at the right time. This helps companies to avoid stockouts, minimize inventory holding costs, and reduce the risk of obsolescence.

Cost management: Transportation costs can be a significant portion of a company's supply chain costs. Effective transportation management can help companies optimize their transportation costs by selecting the most cost-effective modes of transportation, optimizing route planning, and minimizing the number of empty miles.

Risk management: Transportation also plays a key role in managing supply chain risks. Effective transportation management can help companies minimize the risk of product damage, theft, and loss during transportation.