

Operations and Supply Chain Management

① a Explain the four types of Forecasting methods?

→ ① Qualitative Forecasting:

- These methods are primarily subjective and rely on human judgment.
- They are most appropriate when little historical data are available or when experts have market intelligence that may affect the forecast.
- Such methods may also be necessary to forecast demand several years into the future in a new industry.

② Time series Forecasting

- These methods use historical demand to make a forecast.
- They are based on the assumption that past demand history is a good indicator of future demand.
- These methods are most appropriate when the basic demand pattern does not vary significantly from one year to the next.
- These are the simplest methods to implement and can serve as a good starting point for a demand forecast.

③ Causal Forecasting

- These methods assume that the demand forecast is highly correlated with certain factors in the environment.
- This method finds this correlation between demand and environmental factors and uses estimates of what environmental factors will be to forecast future demand.
- Companies can thus use causal methods to determine the impact of price promotions on demand.

④ Simulation Forecasting

These methods imitate the consumer choices that give rise to demand to arrive at a forecast.

→ Using simulation, a firm can combine time series and causal methods to answer such questions as: what will be the impact of a price reduction? what will be the impact of a competitor opening a store nearby? Airlines simulate customer buying behaviour to forecast demand for higher fare seats when there are no seats available at the lower fares.

- b) Explain impact of globalization on supply chain networks. Briefly explain the risk management in global supply chains?

✳ Impact of globalization:-

- Globalization offers companies opportunities to simultaneously grow revenues and decrease costs.
- In its 2008 annual report, P&G reported that more than a one third of the company sales growth was from developing markets with a profit margin that was comparable to developed market margins.
- Apparel and consumer electronics are two areas in which globalization has offered significant cost reduction opportunities. Consumer electronics focuses on small, lightweight, high-value items that are relatively easy and inexpensive to ship.
- One must keep in mind, that the opportunities from globalization are often accompanied by significant additional risk.
- The only constant in global supply chain management seems to be uncertainty.

✳ Risk management in global supply chain:-

- Global supply chains today are subject to more risk factors than localized supply chains of the past.
- These result risks include supply disturbance, supply delays, demand fluctuations, price fluctuations and exchange rate fluctuations.
- Good network design can play a significant role in mitigating supply chain risk.

- An excellent example is the difference in impact on Nokia and Ericsson when a plant owned by Royal Philips Electronics, located in Mexico, caught fire in March 2000.
- Global supply chain generally uses a combination of mitigation strategies along with financial strategies to protect uncovered risks.
- This strategy focused on efficiency and low cost may concentrate global production in a few low-cost countries.
- It is important to keep in mind that any risk mitigation strategy is not always "in the money".

②

- a) Explain any two common CPFR scenarios. What are the obstacles to coordination in a supply chain?

* CPFR scenarios:-

① Retail Event collaboration

- In many retail environments, such as supermarkets, promotions and other retail events have a significant impact on demand.
- Details of the event such as timing, duration, Price Point, advertising and display tactics are shared.
- As the event unfolds, sales are monitored to identify any changes or expectations, which are resolved through an iterative process between the two parties.

② DC Replenishment collaboration

- DC Replenishment collaboration is the most common form of collaboration observed in practice and also the simplest to implement
- The result is a reduction in production cost at the manufacturer and a reduction of inventory and stockouts at the retailer
- As a result it is often the best scenario with which to start collaboration

* Obstacles to coordination:

→ Any factor that leads to either local optimization by different stages of the supply chain is an obstacle to co-ordination

i) Incentive obstacles - occurs in situations when incentives offered to different stages lead to actions that increase variability

ii) Information processing obstacles - occur when demand information is distorted leading to increase variability in orders

iii) Operational obstacles - occurs when actions taken in the course of placing and filling orders lead to an increase in variability.

iv) Pricing obstacles: These arise when pricing policies for a product lead to an increase in variability of orders placed

v) Behavioural obstacles: Are problems in learning within organizations that contribute to information distortion.

b) Explain lack of supply chain coordination and the bullwhip effect

→ Supply chain (management) coordination improves if all stages of the chain take actions that are aligned and increase total supply chain surplus.

→ Different stages of a supply chain may have conflicting objectives if each stage has a different owner.

→ Information is distorted as it moves across the supply chain because complete information is not shared between stages

→ Firms produce different models with several options for each model.

→ One outcome of the lack of supply chain co-ordination is the bullwhip effect; in which fluctuations in orders increase as they move up the supply chain from retailers to wholesalers to manufacturers to suppliers

→ This effect distorts demand information within the supply chain, with each stage having a different estimate of what demand looks like.

→ HP also found that the fluctuations in orders increased significantly as they moved from the dealers up supply chain to the printer division to the integrated circuit division.

→ A similar phenomenon over a longer time frame, has been observed in several industries that are quite prone to "boom and bust" cycles.

3) a) Explain tailored transportation?

→ Tailored transportation is the use of different transportation networks and modes based on customer and product characteristics.

→ Product vary in size and value, and customers vary in the quantity purchased, responsiveness required, uncertainty of the orders and distance from company branches and DCs.

① Tailored transportation by customer density and distance

→ Firms must consider customer identity and distance from warehouse when designing transportation networks.

→ Customer density and distance should also be considered when firms decide on the degree of temporal aggregation to use when supplying customers.

→ To lower transportation costs, firms should use a higher degree of temporal aggregation and aim for somewhat lower responsiveness when serving areas with a low customer density.

② Tailored transportation by size of customers

→ Firms must consider customer size and location when designing transportation networks. When using milk runs, a shipper incurs 2 types of costs

- * Transportation cost based on total route distance

- * Delivery cost based on no of deliveries.

→ The transportation cost is same whether going to large/small customer

- Firms can position customers into large, medium, small based on demand ^{at} each
- ③ Tailored transportation by product demand and value.
- The degree of inventory aggregation and the modes of transportation used in a supply chain network should vary with the demand and value of a product.
- For high-demand products with low value, all inventories should be disaggregated and held close to the customer to reduce transportation costs.
- For low-demand, high value products, all inventories should be aggregated to save on inventory costs.

b) what is the role of IT in transportation? explain risk management in transportation?

④ IT in transportation:

- The complexity and scale of transportation makes it an excellent area within the supply chain for the use of IT systems.
- The use of software to determine transportation routes has been the most common IT application in transportation.
- Software takes the location of customers, shipment size, desired delivery times, information on the transportation infrastructure & vehicle capacity as inputs.
- These inputs are formulated into an optimization problem whose solution is a set of routings and a packing list for each vehicle that minimize costs while meeting delivery constraints & vehicle load optimization software helps improve fleet utilization.
- IT also comes into play in the use of GPS for tracking real time locations of vehicles and electronic notification of impending arrivals.
- Availability of current location info ^{also} allows for real time dynamic optimization of transportation routes and deliveries.

* Risk management in transportation

- There are three main types of risk to consider when transporting a shipment between two nodes on the network:

① The risk that the shipment is delayed

- Delay arises either because of congestion along links such as roads or nodes such as ports and airports.
- Congestion delays can be mitigated by designing a network with multiple routes to the destination and changing routes in real-time based on congestion and through the use of congestion pricing by the owners.
- Delay may occur / arise because of the limited availability of transportation or infrastructure capacity.
- These delays can be mitigated by owning some transportation capacity / by signing long term contracts for transportation capacity with the third party.

② The risk that the shipment does not reach its destination because intermediate nodes or links are disrupted by external forces.

- Disruption at transportation links may occur because of natural events such as hurricanes / human made events such as terrorism.
- Alternative routings were useless as mitigation strategies in this case because no alternative route was available.
- For such disruption sources the only option is to decrease probability of disruption.

③ The risk of hazardous material

- Hazardous material can be harmful when people and environment are exposed.
- The goal of risk mitigation is to minimize the probability of exposures in the event of exposure to minimize the impact.
- Mitigation strategies include using modified containers and low risk transportation modes, selecting routes with low accident probability.