UNIT 6:

SUPPLY CHAIN DRIVERS AND MATRICES

LH 4

IT Entrepreneurship and Supply Change Management

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Outline

- Drivers of supply Chain performance
- Framework for structuring Drivers
- Role of each cross functional drivers in competitive strategy and supply chain strategy with components
  - Facility
  - Inventory
  - Information
  - Transportation
  - Sourcing
  - Pricing
- Presentations on Role of MIS, ERP, ESS, EIS, AI, DSS in cross functional drivers performance.

Drivers - Introduction

- Entities / Factors that interact with each other and determine the Supply chain performance in terms of Responsiveness and Efficiency

- Ultimately define how strategic fit is achieved means how we make them working

Drivers of supply Chain performance

1) Facilities
2) Inventory
3) Transportation

Logistic Drivers

4) Information
5) Sourcing
6) Pricing

Cross-functional Drivers

The goal is to structure the drivers to achieve desired level of responsiveness at the lowest cost, thus improving SC performance

Drivers of supply Chain performance

1) Facilities

- Facility are the actual physical locations in the supply chain network.
- A place where inventory *is stored*, *manufactured or assembled*.
  - ***production sites*** and ***storage sites***
- Decisions on location, capacity, and flexibility of facilities have a significant impact on performance.

Drivers of supply Chain performance

Conti….

- Centralization of facilities uses economies of scale to increase supply chain efficiency(fewer locations and less inventory) usually at the expense of responsiveness (distance from customer).

Drivers of supply Chain performance

2) **Inventory** - how you should make and how much you should stock

- All of the raw materials, work in process (WIP),and finished goods within the supply chain.

- Inventory policies can dramatically alter a supply chain's efficiency and responsiveness

Drivers of supply Chain performance

3) **Transportation** – How and when to move a product. Modes and routes for moving inventory throughout the supply chain

- Faster transportation allows a supply chain to be more responsive but generally less efficient.
- Less than full truckloads allows a supply chain to be more responsive but generally less efficient.

Drivers of supply Chain performance

Conti.....

- Transportation can be used to support a firm's competitive strategy

- Customers may demand and be willing to pay for a high level of responsiveness

Drivers of supply Chain performance

4. Information –

- data and analysis regarding inventory, transportation, facilities throughout the supply chain
- Collect and share *data about customer demand, production schedules, and inventory levels.*
- potentially the biggest driver of supply chain performance
- High levels of responsiveness can be achieved when companies collect and share accurate and timely data generated by the operations of the other four drivers.

Drivers of supply Chain performance

- Effective use of information to increase coordination internally and with their supply chain partners so as to get optimal performance from the other five drivers will gain the most market share and be the most profitable.

Drivers of Supply Chain Performance

5. Sourcing: Is the set of business process required to purchase goods and services

- Basically means who is going to perform particular supply chain activates
  - (production; in house or outsource, warehouse, transportation)
- Managers first decide whether each task will be performed by a responsive or efficient source and then whether the source will be internal to the company or a third party
- E.g. Motorola outsourced from china improved efficiency but its responsiveness suffer due to long distance and started flying in some of its cell phone from china even though this choice increased transportation cost

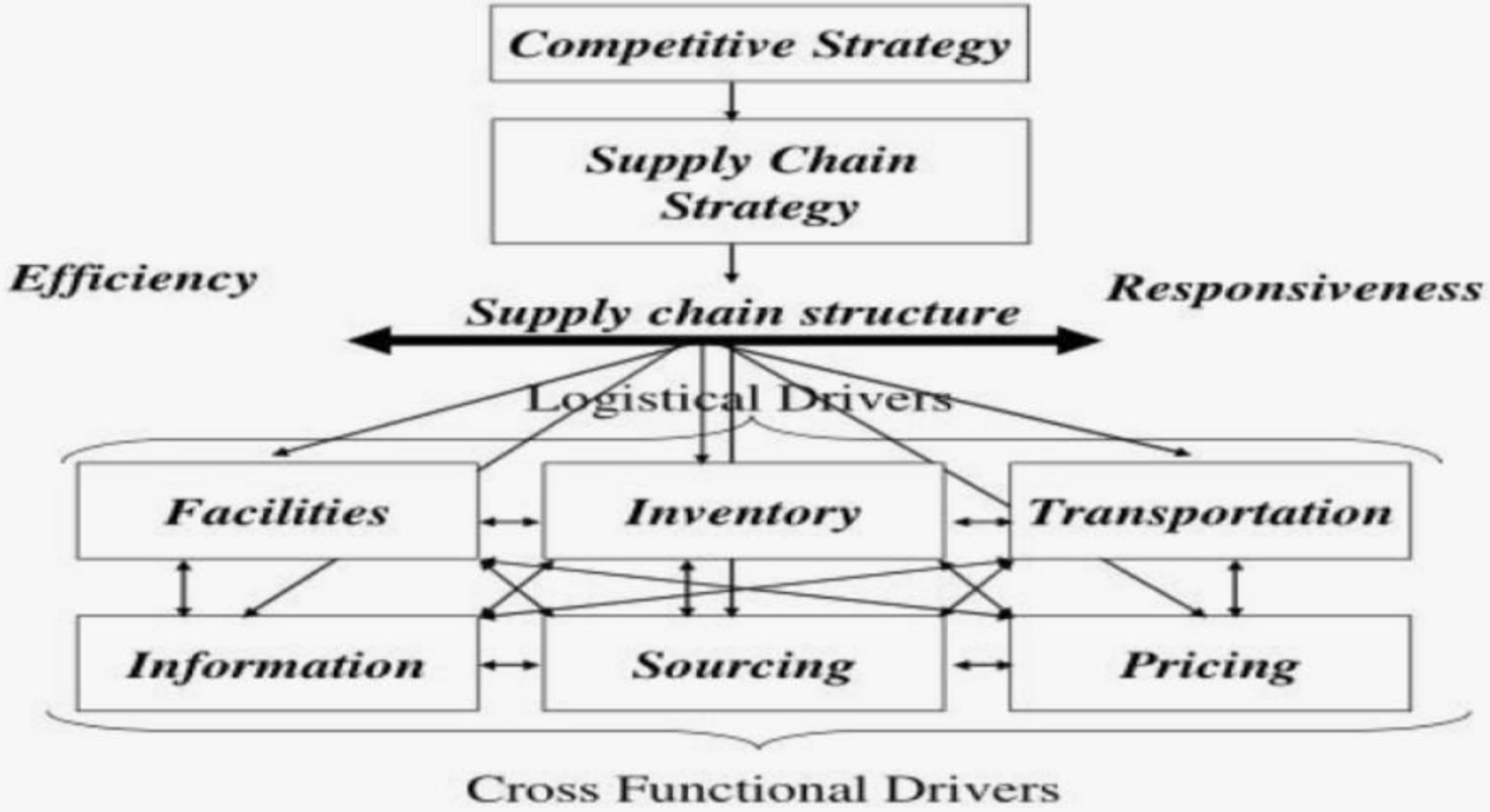
Drivers of Supply Chain Performance

6. Pricing:

- How much to charge to the customer for the goods and services
- ***Matching demand and supply*** (high demand and low demand such as tourism, electricity) and ***responsiveness and efficiency***; to filter your customer and decides on these two
- Differential pricing provides responsiveness to customers that value it and low cost to customers that do not value responsiveness as much
- Shapes the behavior of the customers regarding buying decisions

These drivers do not act independently but interact a lot and do have impact on supply chain performance. So, while designing an effective supply chain management company must take into account interactions among these drivers.

A Framework for Structuring Drivers



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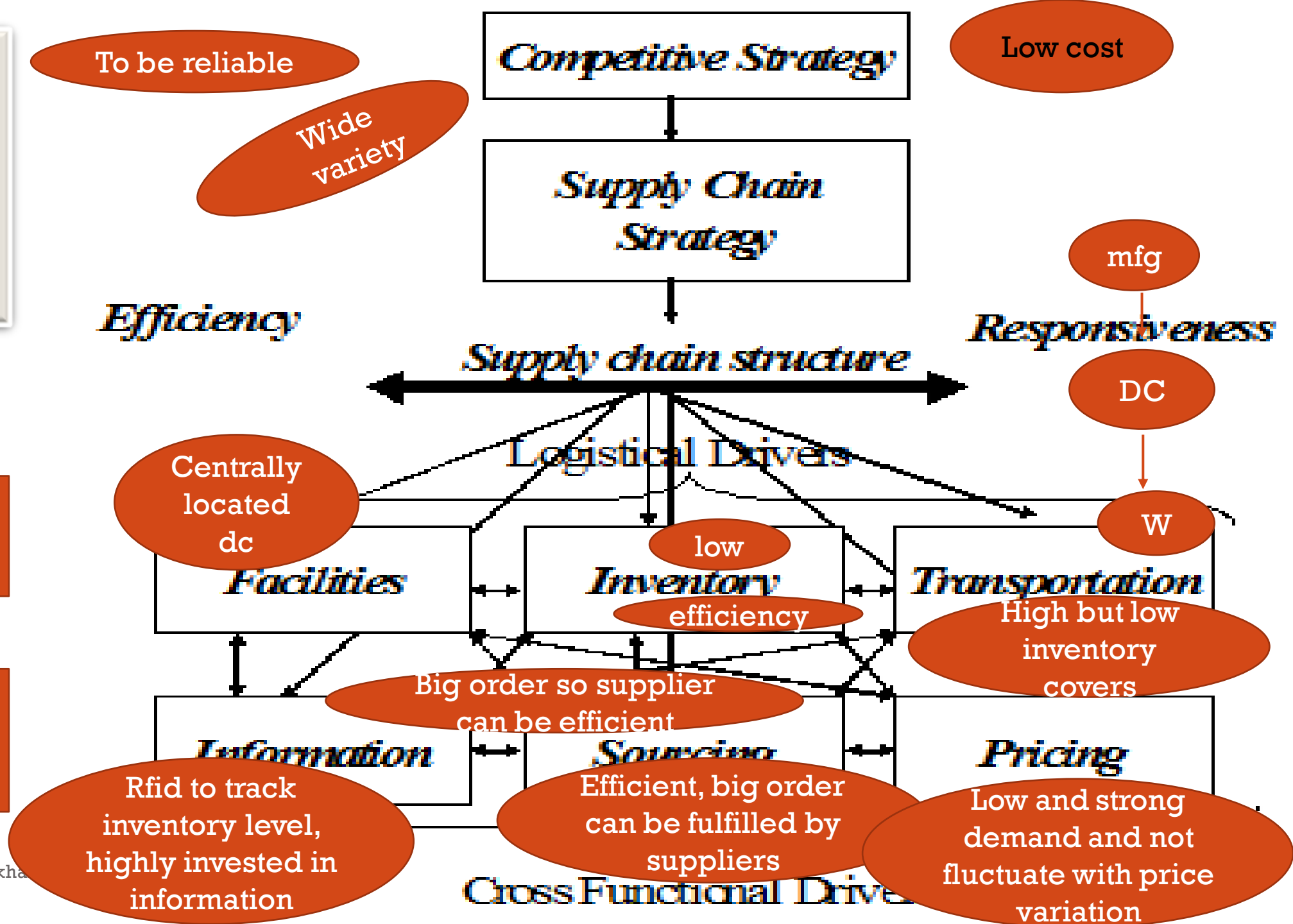
Framework for Structuring Drivers

- Goal of SCM
  - Balance between efficiency and responsiveness to achieve strategic fit
- There should be a proper combination of the drivers
  - They determine the overall supply chain profitability

Framework for Structuring Drivers

- Begins with the Competitive strategy
- Then we decide Supply chain strategy
  - Determines how the supply chain would perform with respect to efficiency and responsiveness
- Then, supply chain employs all its drivers to reach the performance level the supply chain strategy dictates.
  - Make adjustments within cross functional and logistical drivers

EXAMPLE; WALMART



Walmart - Example

- **Competitive strategy**
  - Be reliable
  - Be a low cost retailer
  - Wide variety of mass consumption goods

- **Supply Chain strategy**
  - Emphasize efficiency along with adequate level of responsiveness for product availability

Walmart - Example

- **Inventory (E)**
  - Makes the use of cross docking to achieve efficiency
    - Inventory stored at DCs and then to the stores, not at warehouses
- **Transportation (R)**
  - Runs its own fleet (own transportation service especially outbound)
  - Responsiveness is favored

Walmart - Example

- **Facility (E)**
  - Centrally located DCs within its network
  - Decreased number of facilities to increase efficiency
- **Information (R)**
  - Significant investment in IT
  - Feeding demand information to its suppliers accurately and promptly

Walmart - Example

- **Pricing (R)**
  - Maintain EDLP
  - To maintain steady demand, avoid fluctuations in demand

- **Sourcing (E)**
  - Feeds large orders to its suppliers
  - Works through economies of scale

Role of Each Drivers in Competitive Strategy and Supply Chain Strategy with Components

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Facilities

- Role in the supply chain
  - the "where" of the supply chain
  - manufacturing or storage (warehouses)
    - *Within a facility, inventory is either transformed into another state (mfg) or it is stored (warehouse)*
- Role in the competitive strategy
  - economies of scale (efficiency priority)= centralized location
  - larger number of smaller facilities (responsiveness priority)= decentralized/ multiple facilities
- Example 3.1: Toyota and Honda, mfg. facilities in every major market (end goal)

Components of Facilities Decisions

Role

- ***Flexible*** *or* ***dedicated*** *or combination of two (flexible improve responsiveness and increase cost)*
- *Decision on* ***Product focus*** *(more expertize/few variety) or* ***functional focus*** *(wide varieties of product)*
- *Cross docking or storage facilities*

Location

- *Centralization (efficiency) vs. Decentralization (responsiveness)*
- *Other factors to consider of local market (e.G., Macroeconomic factors, cost of workers, proximity to customer)*

Capacity

- *A large amount of excess capacity allows the facility to respond to wide swings in the demand placed on it*
- *Excess capacity, however, costs money and therefore can decrease efficiency and vice-versa*
- *Right amount of capacity to handle customer demand (not excess not less)*

Facilities

- ***Overall trade-off***: Responsiveness versus efficiency

Facilities-related Metrics

- **Capacity**:
  - measures max amount that can be processed in facility
- **Utilization;**
  - how often facilities been utilized
- **Processing/setup/down/idle time:**
  - measures the fraction of time that the facility was processing units, being setup to process units (making the process ready), unavailable because it was down, or idle because it has no units to process
- **Production cost per unit:**
- **Quality losses:**
  - fraction of prodn lost due to defects

Facilities-related Metrics

- **Theoretical flows/ cycle time of production:**
  - measured the time required to process a unit if there are absolutely no delays at any stage
- **Actual average flow/ cycle time:**
- **Product variety:**
  - no. of products processed
- **Volume contribution of top 20 percent SKUs and customers:**
  - Measures the fraction of total volume processed by facility that comes from the top 20% skus or customers. 80% of skus bring 20% of profit and 20% of customer may bring 80% of orders
- **Average production batch size**:
  - amount production in each prodn batch
- **Production service level:**
  - orders completed on time and in full

Inventory

- Role in the supply chain
- Role in the competitive strategy
- Components of inventory decisions
- Inventory-related metrics

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Inventory: Role in the Supply Chain

- Inventory exists because of a mismatch between supply and demand and it is intentional for the;
  - Economies of scale
  - Anticipation of future demand

- **Role in SCM**
  - Make product ready and available as soon as the demand arises
  - Reduce cost through economies of scale (large lot mfg)

- **Role in Competitive Strategy**
  - Larger Inventory: High responsiveness and high cost
  - Lower Inventory: Low responsiveness and high efficiency

Inventory: Role in Competitive Strategy

- If responsiveness is a **strategic** competitive priority, a firm can locate larger amounts of inventory closer to customers

- If cost is more important, inventory can be reduced to make the firm more efficient

Trade-off: Responsiveness vs. Efficiency

Components of Inventory Decisions

- **Cycle inventory**
  - Average amount of inventory used to satisfy demand between shipments
  - Depends on lot size, How much? How often?
  - (if order decreases then order size will increase)

- **Safety inventory**:
  - used for uncertain demand/ to counter uncertain demand
  - inventory held in case demand exceeds expectations
  - costs of carrying too much inventory versus cost of losing sales

- **Seasonal inventory**; e.g holiday season and tourism, mosquito (e.g. goodnight)
  - inventory built up to counter predictable variability in demand
  - cost of carrying additional inventory versus cost of flexible production

- **Level of product availability**:
  - fraction of demand that can be fulfilled by inventories
  - High product availability is for high responsiveness and fulfill high percentage of demand
  - Cost of inventory vs cost of product availability

Inventories-related metrics

- **Cash-to-cash cycle**:
  - inventories, accounts payable and receivable
- **Average inventory**;
  - average amount of inventories carried
- **Inventory turns**:
  - inventory turnover in a year
- **Products with more then a specified number of days of inventory:**
  - identifies the products for which the firm is carrying a high level of inventory and also identifies the oversupply or reason for high inventories e.g discount
- **Average replenishment batch size**:
  - measures average amount in each replenishment
- **Average safety inventory**:
  - measures average inventory on hand when a replenishment order arrives
- **Seasonal inventory**:
- **Fill rate**:
  - fraction of orders/ demand that were met on time from inventory
- **Fraction of time out of stock:**
  - fraction of time when firm had zero inventory
- **Obsolete inventory**: fraction of inventor older than a specified obsolescence date

Transportation

- Role in the supply chain
- Role in the competitive strategy
- Components of transportation decisions
- Transportation related metrics

Transportation: Role in the Supply Chain

- Moves the product between stages in the supply chain
- Impact on responsiveness and efficiency
- Faster transportation allows greater responsiveness but lower efficiency
- Also affects inventory and facilities location *(e.g low inventory if there is high speed mode of transportation is available, slower modes of transportation leads large no. of facilities)*

Transportation: Role in the Competitive Strategy

- If responsiveness is a strategic competitive priority, then faster transportation modes can provide greater responsiveness to customers who are willing to pay for it

- Can also use slower transportation modes for customers whose priority is price (cost)

- Can also consider both inventory and transportation to find the right balance

Transportation: Components of Transportation Decisions

- **1. Designing the transportation network**
  - Mode, location, and routes along which a product can be shipped
- **2. Mode of transportation**:
  - air, truck, rail, ship, pipeline, electronic transportation
  - vary in cost, speed, size of shipment, flexibility
- In-house or outsource
- **Overall trade-off**: Responsiveness versus efficiency

Transportation: Transportation-related Metrics

- **Average inbound transportation cost**: cost of products into a facility as a percentage of sales of COGS
- **Average incoming shipment size:** average no. of units or dollars in each incoming shipments at a facility
- **Average inbound transportation cost per shipment**: measures the average transportation cost of each incoming delivery
- **Average outbound transportation cost per shipment;** average c0st of sending out of facility to the customer
- **Average outbound shipment size:** average no. of units or dollars on each outbound shipment at facility
- **Average outbound transportation cost per shipment**: average cost of each outgoing delivery
- **Fraction transported by mode:** fraction of transportation (in units or dollars) using each mode of transportation

Information

- Role in the supply chain
- Role in the competitive strategy
- Components of information decisions
- Information-related metrics

Information: Role in the Supply Chain

- ***Helps to utilize SC assets***: and sc objective can be fulfilled using firm's fixed as well as current assets
- The connection between the various stages in the supply chain – allows **coordination** between stages
- ***Efficiency with desired level of responsiveness***
- ***Crucial to daily operation*** of each stage in a supply chain – e.g., production scheduling, inventory levels

Information: Role in the Competitive Strategy

- Allows supply chain to become more efficient and more responsive at the same time (reduces the need for a trade-off)
- by investment in IT improves visibility and enables better performance
- What information is most valuable? Can be used for decision making
  - Helps to customize products for customers
  - Understand demand better
  - Understand customer better

Information: Components of Information Decisions

- **Push versus pull : while designing sc processes, manager must determine whether these processes are part of push or pull phase in supply chai**
  - **push** for bulk production scheduling starts from demand forecast and make ready to supplier for using part types, quantities and delivery dates.
  - **Pull** systems requires actual demand information transmitted quickly throughout the supply chain) so that production and dist. of products relate the actual demand
- **Coordination and information sharing**: in such way that total profit can be maximized (e.g change in fashion; information)
- **Sales and operations planning**: it is process of creating overall supply chain plan (prodn and inventories) to meet anticipated level of demand

Components of Information Decisions

- **Enabling technologies**
  - **EDI**: facilitates the placement of instantaneous, paperless purchase orders with suppliers. Makes transaction faster and accurate
  - **Internet:** conveys much more information/ communication tool
  - **ERP systems**: real time information sharing within enterprise
    - Centralized server or data mgmt. system
  - **Supply Chain Management software**: SCM software the information in ERP system to provide analytical decision support in addition to the visibility of information. Makes aware what is going on and what to do
  - **RFID**: popular technology, enables tracking the products

Overall trade-off: Complexity vs value

- More information, more the complexity and cost (have to set up infrastructure)
- Value of information should be preserved
- How much information to deal with should be thought out in the beginning stage: *decide in the beginning to analyze how much complex or depth and wide*

Information related metrics

- **Forecast horizon**: how far demand forecast is made
- **Frequency of update**: how frequently each forecast is updated
- **Forecast error:** model of forecast may trigger error so that they need to come out with new model of forecasting
- **Seasonal factors**: extend to which average demand is a season is above or below the average in the year.
- **Variance from plan**: difference between plan and actual values related to production and inventories
- **Ratio of demand variability to order variability**: measures the standard deviation of incoming demand and supply orders placed. A ratio <1 potentially indicates the existence of bullwhip effect

Sourcing

- Role in the supply chain
- Role in the competitive strategy
- Components of sourcing decisions
- Sourcing-related metrics

Sourcing: Role in the Supply Chain

- Set of business process required to purchase goods and services from supplier
- Which party will do what processes
- In-house or Outsource: significant impact on performance

Sourcing: Role in the Competitive Strategy

- Sourcing decisions are crucial because they affect the level of efficiency and responsiveness in a supply chain

- In-house vs. outsource decisions- improving efficiency and responsiveness

Components of Sourcing Decisions

- **1. In-house versus outsource decisions**
- **2. Supplier evaluation and selection**: not only good one but no. of suppliers and deciding how performance will be evaluated
  - Negotiation
  - Auction
- **3. Procurement process**: must be with the goal of increasing supply chain surplus

Sourcing;
Overall trade-off: outsource vs in-house: increase the supply chain surplus

- Generally outsource is efficient and in house is responsive (as it is under-control of own)

- Better to opt for outsourcing only if it pushes SCM surplus by lowering costs

Sourcing-related metrics

- **Days payable outstanding:** average days between when sourcing made and paid
- **Average purchase price**
- **Range of purchase price**
- **Average purchase quantity**: average the average amount purchased per oder
- **Supply quality:** measures the quality of products supplied
- **Supply lead time**: average time between order is made and product arrival
- **Fraction of on-time deliveries:** measured the fraction of deliveries from the supplier that were on time
- **Supplier reliability:** measures the variability of the supplier's lead time as well as the delivered quantity relative to plan

Pricing

- Role in the supply chain
- Role in the competitive strategy
- Components of pricing decisions
- Pricing related metrics

Pricing: Role in the Supply Chain

- How much to charge to customer
- Discounting to attract customer
- Helps in shaping up the demand: Matching demand and supply

Pricing: Role in the Competitive Strategy

- Firms can utilize optimal pricing strategies to improve efficiency and responsiveness
- Low price and low product availability; vary prices by response times
- Example: Amazon

Components of Pricing Decisions

- **Pricing** and **economies of scale**:
  - Large lot size reduce production cost
  - bulk buying and reducing delivering/transportation cost
  - Should appropriately price

- **Everyday low pricing** versus **high-low pricing**:
  - high price for peak demand and vice-versa
  - e.g ntc pricing strategy; 10pm to 6am

- **Fixed price versus menu pricing**:
  - amozon menu pricing based on delivery time

Pricing

- **Overall trade-off:** stable price vs dynamic price
  - Decision should be made to increase the sc surplus

Pricing related metrics

- **Profit margin**
- **Days sales outstanding** : average time between when sale is made and when payment is received
- **Incremental fixed cost per order**: changeover costs at mfg plant or processing or transportation cost that are incurred independent of shipment size at a mail order form
- **Incremental variable cost per unit:** that vary with size of order
- **Average sale price:**
- **Average order size:** average quantity per order
- **Rang of sale price :** max and min price during specific time horizen
- **Range of periodic sales:** max and min qunatitiy sold per period (daily/weekly/monthly)

Considerations for Supply Chain Drivers

Driver	*Efficiency*	*Responsiveness*
Inventory	Cost of holding	Availability
Transportation	Consolidation	Speed
Facilities	Consolidation / Dedicated	Proximity / Flexibility
Information	What information is best suited for each objective	

Assignments:

Presentations on Role of MIS, ERP, ESS, EIS, AI, DSS in cross functional drivers performance.

Thank You!!

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