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Supply Chain Drivers and Metrics

PowerPoint presentation to accompany
Chopra and Meindl Supply Chain Management, 5e

Learning Objectives

1. Identify the major drivers of supply chain performance.
2. Discuss the role of each driver in creating strategic fit between the supply chain strategy and the competitive strategy.
3. Define the key metrics that track the performance of the supply chain in terms of each driver.
4. Describe key financial measures of firm performance.

Drivers of Supply Chain Performance

- Facilities
  - The physical locations in the supply chain network where product is stored, assembled, or fabricated
- Inventory
  - All raw materials, work in process, and finished goods within a supply chain
- Transportation
  - Moving inventory from point to point in the supply chain

Drivers of Supply Chain Performance

- Information
  - Data and analysis concerning facilities, inventory, transportation, costs, prices and customers throughout the supply chain
- Sourcing
  - Who will perform a particular supply chain activity
- Pricing
  - How much a firm will charge for the goods and services that it makes available in the supply chain

A Framework for Structuring Drivers

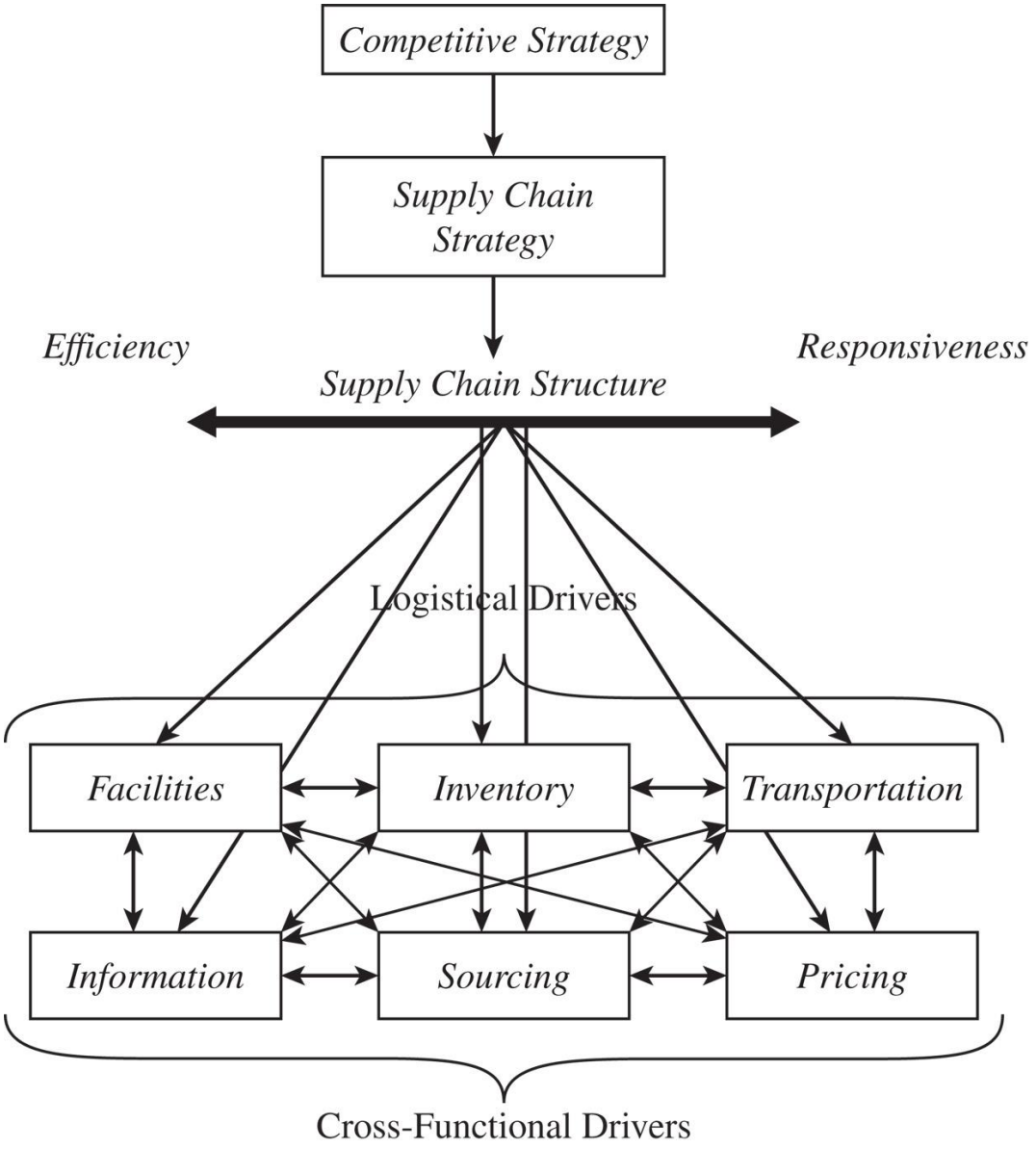


Figure 3-1

Facilities

- Role in the supply chain
  - The “where” of the supply chain
  - Manufacturing or storage (warehouses)
- Role in the competitive strategy
  - Economies of scale (efficiency priority)
  - Larger number of smaller facilities (responsiveness priority)

Facilities

- Components of facilities decisions
  - **Role**
    - Flexible, dedicated, or a combination of the two
    - Product focus or a functional focus
  - **Location**
    - Where a company will locate its facilities
    - Centralize/decentralize, macroeconomic factors, quality of workers, cost of workers and facility, availability of infrastructure, proximity to customers, location of other facilities, tax effects

Facilities

- Components of facilities decisions
  - **Capacity**
    - A facility's capacity to perform its intended function or functions
    - Excess capacity – responsive, costly
    - Little excess capacity – more efficient, less responsive

Facilities

- Components of facilities decisions
  - **Facility-related metrics**
    - Capacity
    - Utilization
    - Processing/setup/down/idle time
    - Production cost per unit
    - Quality losses
    - Theoretical flow/cycle time of production
    - Actual average flow/cycle time

Facilities

- **Overall trade-off: Responsiveness versus efficiency**
  - Cost of the number, location, capacity, and type of facilities (efficiency) and the level of responsiveness
  - Increasing the number of facilities increases facility and inventory costs but decreases transportation costs and reduces response time
  - Increasing the flexibility or capacity of a facility increases facility costs but decreases inventory costs and response time

Inventory

- **Role in the Supply Chain**
  - Mismatch between supply and demand
  - Satisfy demand
  - Exploit economies of scale
  - Impacts assets, costs, responsiveness, material flow time

Inventory

- *Material flow time,* the time that elapses between the point at which material enters the supply chain to the point at which it exits
- *Throughput,* the rate at which sales occur
- Little's law

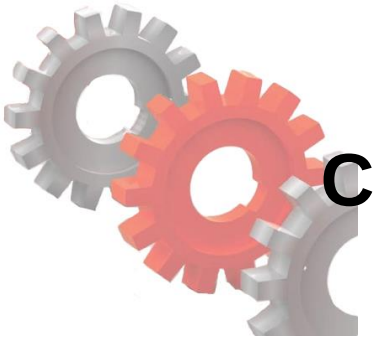
$$I = DT$$

where

I = flow time, T = throughput, D = demand

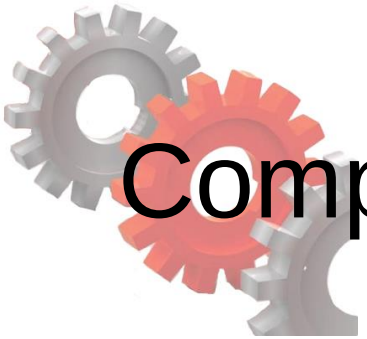
Inventory

- **Role in Competitive Strategy**
  - Form, location, and quantity of inventory allow a supply chain to range from being very low cost to very responsive
  - Objective is to have right form, location, and quantity of inventory that provides the right level of responsiveness at the lowest possible cost



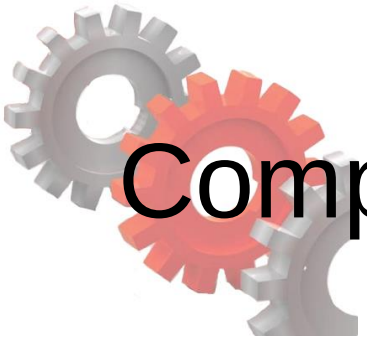
Components of Inventory Decisions

- **Cycle inventory**
  - Average amount of inventory used to satisfy demand between shipments
  - Function of lot size decisions
- **Safety inventory**
  - Inventory held in case demand exceeds expectations
  - Costs of carrying too much inventory versus cost of losing sales



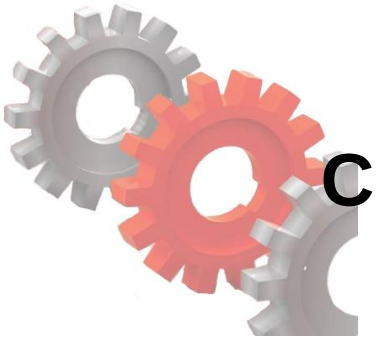
Components of Inventory Decisions

- **Seasonal inventory**
  - Inventory built up to counter predictable variability in demand
  - Cost of carrying additional inventory versus cost of flexible production
- ***Level of product availability***
  - The fraction of demand that is served on time from product held in inventory
  - Trade off between customer service and cost



Components of Inventory Decisions

- **Inventory-related metrics**
  - Cash-to-cash cycle time
  - Average inventory
  - Inventory turns
  - Products with more than a specified number of days of inventory
  - Average replenishment batch size



Components of Inventory Decisions

- **Inventory-related metrics**
  - Average safety inventory
  - Seasonal inventory
  - Fill rate
  - Fraction of time out of stock
  - Obsolete inventory

Inventory

- **Overall trade-off: Responsiveness versus efficiency**
  - Increasing inventory generally makes the supply chain more responsive
  - A higher level of inventory facilitates a reduction in production and transportation costs because of improved economies of scale
  - Inventory holding costs increase

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

Transportation

- **Role in the Competitive Strategy**
  - Allows a firm to adjust the location of its facilities and inventory to find the right balance between responsiveness and efficiency
- **Components of Transportation Decisions**
  - **Design of transportation network**
    - Modes, locations, and routes
    - Direct or with intermediate consolidation points
    - One or multiple supply or demand points in a single run

Transportation

- **Choice of transportation mode**
  - Air, truck, rail, sea, and pipeline
  - Information goods via the Internet
  - Different speed, size of shipments, cost of shipping and flexibility

Transportation

- **Transportation-related metrics**
  - Average inbound transportation cost
  - Average income shipment size
  - Average inbound transportation cost per shipment
  - Average outbound transportation cost
  - Average outbound shipment size
  - Average outbound transportation cost per shipment
  - Fraction transported by mode

Transportation

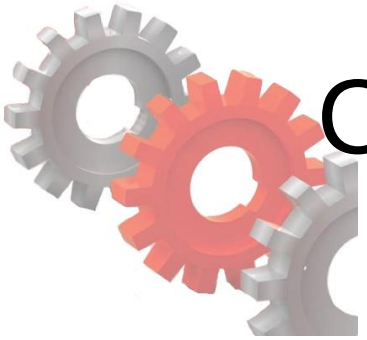
- **Overall trade-off: Responsiveness versus efficiency**
  - The cost of transporting a given product (efficiency) and the speed with which that product is transported (responsiveness)
  - Using fast modes of transport raises responsiveness and transportation cost but lowers the inventory holding cost

Information

- **Role in the Supply Chain**
  - Improve the utilization of supply chain assets and the coordination of supply chain flows to increase responsiveness and reduce cost
  - Information is a key driver that can be used to provide higher responsiveness while simultaneously improving efficiency

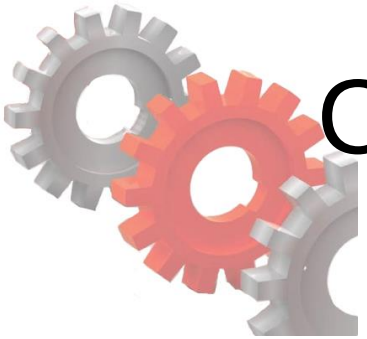
Information

- **Role in the Competitive Strategy**
  - Right information can help a supply chain better meet customer needs at lower cost
  - Improves visibility of transactions and coordination of decisions across the supply chain
  - Share the minimum amount of information required to achieve coordination



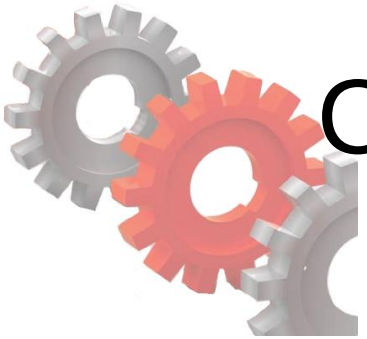
Components of Information Decisions

- **Push versus Pull**
  - Different information requirements and uses
- **Coordination and information sharing**
  - *Supply chain coordination,* all stages of a supply chain work towards the objective of maximizing total supply chain profitability based on shared information
- ***Sales and operations planning*** (S&OP)
  - The process of creating an overall supply plan (production and inventories) to meet the anticipated level of demand (sales)



Components of Information Decisions

- **Enabling technologies**
  1. Electronic data interchange (EDI)
  2. The Internet
  3. Enterprise resource planning (ERP) systems
  4. Supply chain management (SCM) software
  5. Radio frequency identification (RFID)



Components of Information Decisions

- **Information-related metrics**
  - Forecast horizon
  - Frequency update
  - Forecast error
  - Seasonal factors
  - Variance from plan
  - Ratio of demand variability to order variability

Information

- **Overall trade-off: Complexity versus value**
  - Good information helps a firm improve both efficiency and responsiveness
  - More information is not always better
  - More information increases complexity and cost of both infrastructure and analysis exponentially while marginal value diminishes
  - Evaluate the minimum information required to accomplish the desired objectives

Sourcing

- **Role in the Supply Chain**
  - Set of business processes required to purchase goods and services
  - Will tasks be performed by a source internal to the company or a third party?
  - Globalization creates more sourcing options with both considerable opportunity and potential risk

Sourcing

- **Role in the Competitive Strategy**
  - Sourcing decisions are crucial because they affect the level of efficiency and responsiveness in a supply chain
  - Outsource to responsive third parties if it is too expensive to develop their own
  - Keep responsive process in-house to maintain control

Components of Sourcing Decisions

- **In-house or outsource**
  - Perform a task in-house or outsource it to a third party
- **Supplier selection**
  - Number of suppliers, evaluation and selection criteria, direct negotiations or auction
- **Procurement**
  - The supplier sends products in response to customer orders

Components of Sourcing Decisions

- **Sourcing-related metrics**
  - Days payable outstanding
  - Average purchase price
  - Range of purchase price
  - Average purchase quantity
  - Supply quality
  - Supply lead time
  - Fraction of on-time deliveries
  - Supplier reliability

Sourcing

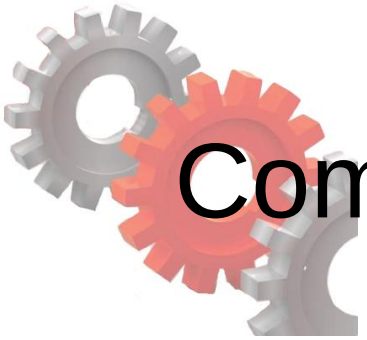
- **Overall trade-off: Increase the supply chain surplus**
  - Increase the size of the total surplus to be shared across the supply chain
  - Impact of sourcing on sales, service, production costs, inventory costs, transportation costs and information cost
  - Outsource if it raises the supply chain surplus more than the firm can on its own
  - Keep function in-house if the third party cannot increase the supply chain surplus or if the outsourcing risk is significant

Pricing

- **Role in the Supply Chain**
  - Pricing determines the amount to charge customers for goods and services
  - Affects the supply chain level of responsiveness required and the demand profile the supply chain attempts to serve
  - Pricing strategies can be used to match demand and supply

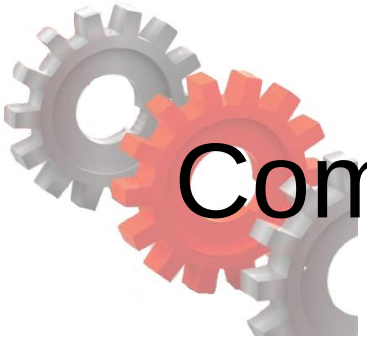
Pricing

- **Role in the Competitive Strategy**
  - Firms can utilize optimal pricing strategies to improve efficiency and responsiveness
  - Pricing strategies vary to meet different customer responsiveness requirements



Components of Pricing Decisions

- **Pricing and economies of scale**
  - The provider of the activity must decide how to price it appropriately to reflect these economies of scale
- **Everyday low pricing versus high-low pricing**
  - Different pricing strategies lead to different demand profiles that the supply chain must serve



Components of Pricing Decisions

- **Fixed price versus menu pricing**
  - If marginal supply chain costs or the value to the customer vary significantly along some attribute like response time or delivery location, it is often effective to have a pricing menu
  - Can lead to customer behavior that has a negative impact on profits

Components of Pricing Decisions

- Pricing-related metrics
  - Profit margin
  - Days sales outstanding
  - Incremental fixed cost per order
  - Incremental variable cost per unit
  - Average sale price
  - Average order size
  - Range of sale price
  - Range of periodic sales

Pricing

- **Overall trade-off: Increase firm profits**
  - Understand of the cost structure of performing a supply chain activity and the value this activity brings to the supply chain
  - Strategy may support efficiency in the supply chain, lower supply chain costs, defend market share, or steal market share
  - Differential pricing may be used to attract customers with varying needs
  - Strategy should help either increase revenues or shrink costs or preferably both