Chapter 2 Supply Chain Management

Supply-chain management seeks to synchronize a firm's functions and those of its suppliers to match the flow of materials, services, and information with customer demand. SCM has tremendous strategic implications, as it can be used to achieve important competitive priorities.

TEACHING TIP
Discuss how Nikon achieved significant results by redesigned supply chain. .

Note: Figure 2.1 Supply Chain Efficiency is the motivation for this chapter. The blue line is an efficiency curve which shows the trade-offs between costs and performance for the current supply chain design. It illustrates the best possible performance when the best in the industry are considered. The red dot indicates inefficient supply chain operations. The challenge is to move operations into the tinted area close to the curve. If new competitive innovations are developed the firm might be able to push the entire performance frontier outward as shown by the dashed red line.

A. Supply Chain Strategies

For a products or services to maximize its potential in the marketplace, managers must match supply chain design to the operational strategy of the firm and the characteristics of the product or service.

TEACHING TIP
It is important to discuss the theory that supply chains can be designed to achieve certain competitive priorities.

1. Linking firms to deliver value

- All the suppliers in a firm's supply chain play an integral role in its ability to meet its competitive priorities for the customer benefit bundle
- Tier 1 suppliers provide materials or services that are used directly by the firm, tier 2 suppliers supply tier 1 suppliers, and so on
- The performance of one firm determines the flow of services or products downstream to the next stage of the supply chain

2. Efficient versus responsive supply chains

   a. Efficient supply chains

      - Work best in environments where demand is highly predictable
      - The focus of the supply chain is on efficient flows of services and materials keeping inventories to a minimum

- The firm's competitive priorities are low-cost operations, consistent quality, and on-time delivery

b. Responsive supply chains
   - Designed to react quickly in order to hedge against uncertainties in demand
   - Work best when firms offer a great variety of services or products and demand predictability is low
   - New-service/product introduction is frequent
   - Typical competitive priorities are development speed, fast delivery times, customization, variety, volume flexibility, and top quality

3. Implementing the right design
   - The alignment with operational strategy and implementation for efficient and responsive supply chains is summarized in **Table 2.2**.

Table 2.2: Design Features of Efficient and Responsive Supply Chains

Factor	Efficient supply chains	Responsive supply chains
Operations strategy	Make-to-stock or standardized services or products; emphasize high volumes	Assemble-to-order, make-to-order, or customized services or products; emphasize variety
Inventory investment	Low; enable high inventory turns	As needed to enable fast delivery time, use modular components
Lead time	Shorten, but do not increase costs	Shorten aggressively
Supplier selection	Emphasize low prices, consistent quality, on-time delivery	Emphasize fast delivery time, customization, variety, volume flexibility, high performance design quality

4. Outsourcing processes

a. Break-even analysis for make-or-buy decisions
   - Break even quantity

$$Q = \frac{F_m - F_b}{c_b - c_m}$$

b. Outsourcing
   - Outsourcing is the act of a firm's paying suppliers and distributors to perform the required processes and provide needed services and materials
   - Advantages of outsourcing
     - Better quality and cost savings
     - Attractive if low volumes or specialized expertise is required
   - Offshoring Involves moving processes to another country
   - Pitfalls of outsourcing and offshoring
     - Overlooking major opportunities to fix existing processes

- Technology transfer
- Process integration

c. Vertical integration
   - Backward integration—toward the sources of raw materials, parts, and services through acquisitions
   - Forward integration—acquires more channels of distribution
   - Advantages of vertical integration
     - If a firm has the right skills, volume, and resources, then vertical integration allows the firm to perform processes at lower cost and higher quality than outsiders

TEACHING TIP
Discuss Example 2.1 the break-even analysis for the outsourcing decisions

B. Measures of Supply Chain Performance

Supply chain management involves managing the flow of materials that create inventories in the supply chain.

1. Forms of inventory
   - The three categories of inventories are:
     - raw materials (RM)
     - work-in-process (WIP)
     - finished goods (FG)
   - Manufacturers spend 60% of sales on purchased materials and services, and service providers spend as much as 40% so the management of materials flows is therefore important from a cost perspective alone

2. Inventory placement
   - Fundamental supply decision is where to keep inventories
   - Inventory pooling: keeping all finished goods inventory at the manufacturing plant and shipping directly to customer, reducing inventory and safety stock through the merging of variable demands from customers
   - Forward placement: putting the inventory close to the customer and enhancing fast delivery times and reducing transportation costs, may require duplicating stocking of the same item in several locations

3. Inventory measures
   - Average aggregate inventory value

     Average aggregate inventory value = $(N_a c_a) + (N_b c_b) +\_ \ldots \_+ (N_n c_n)$

     where:

N_a =_ Average quantity of materials, part, component, of product *a*
ca =_ Average cost per unit of materials, part, component, of product *a*
n _= Total number of materials, parts, components, and products

- Total value of all items held in inventory by a firm
- Expressed in dollar values because the sum of individual items in raw materials, work-in-process, and finished goods values can be determined
- It is an average because it usually represents the inventory investment over some period of time
- This tells managers how much of a firm's assets are tied up in inventory

- Weeks of supply
  - Measure obtained by dividing the average aggregate inventory value by sales by sales per week at cost
  - Formula expressed

$$\text{Weeks of supply} = \frac{\text{Average aggregate inventory value}}{\text{Weekly sales (at cost)}}$$

  - In some low-inventory operations, days or even hours are a better unit of time
- Inventory turnover

$$\textit{Inventory turnover} = \frac{\text{Annual Sales (at cost)}}{\text{Average aggregate inventory value}}$$

  - Measure obtained by dividing annual sales at cost by the average aggregate inventory level maintained during the year

TEACHING TIP
See solved problem at the end of the chapter for a detailed example of the three inventory measures

4. Process measures
   a. Four core processes discussed in Chapter 1 are translated into specific operating measures in Table 2.3

TEACHING TIP
Students do not have a difficult time with the weeks of supply or the inventory turns calculations, but they have a lot of difficulty understanding how these measures relate to typical financial measures they discuss in accounting or finance classes. Reserve some time to discuss the following measures and how they relate to the inventory measures. Review Figure 2.4 Inventory at successive stacking points.

5. Financial measures

a. Total revenue

- Increasing the percent of on-time deliveries to customers will increase total revenue because satisfied customers will buy more services and products

b. Cost of goods sold

- Being able to buy materials at a better price and process, or transform them more efficiently, will improve the firm's cost of goods sold, and ultimately net income

c. Selling, general, and administrative expenses

- Designing a supply chain with minimal capital investment can reduce overhead and depreciation charges

d. Cash flow

- The difference between flow of funds into and out of an organization
- Cash-to-Cash is the time lag between paying for services and materials needed to produce a service or product and receiving payment for it
- The shorter the time lag, the better the cash flow position of the firm because it needs less working capital
- The goal is to have a negative cash-to-cash situation, which is possible when the customer pays for service or product before the firm has to pay for the resources and material needed to produce it

e. Working capital

- Money used to finance ongoing operations
- Decreasing weeks of supply or increasing inventory turns reduces the working capital needed to finance inventories

f. Return on assets

- Can be increased by reducing costs of fixed investments such as warehouses and aggregate inventory investment
- Techniques for reducing inventory, transportation, and operating costs related to resource usage and scheduling are discusses in the chapter to follow

TEACHING TIP

Discuss Figure 2.5: How supply chain decisions can affect financial performance

C. Supplier Relationship Process

The supplier relationship focuses on the interaction of the firm and upstream suppliers and there are several important decision areas that can affect this relationship.

1. Sourcing

- Purchasing is in a good position to select suppliers for the supply chain

a. Selection

- Price
- Quality
- Delivery
- Green purchasing
  - Supplier with strong environmental impact

b. Supplier certification
   - Verify that potential suppliers have the capability to provide the materials or services the buying firm requires
   - Typically involves visits by cross-functional teams to do an in-depth evaluation of the supplier's processes

2. Design collaboration
   - Designing new services or products with key supplier's
   - Facilitates concurrent engineering, eliminating costly delays and mistakes
   - Early supplier involvement
     - Includes suppliers in the design phase
   - Pre-sourcing
     - Suppliers given significant, if not total, responsibility for the design of components or systems
   - Value analysis
     - Systematic effort to reduce the cost or improve the performance of products or services

3. Negotiation

a. Competitive orientation
   - A zero-sum game
   - The purpose is to drive costs down to the minimum level
   - Power in the supply chain relates to the purchasing clout a firm has

b. Cooperative orientation
   - A partnership between buyers and sellers
   - This orientation implies long-term commitments, joint work on quality, and buyer support of infrastructure
   - Typically, fewer suppliers are needed in this arrangement, e.g. sole sourcing

TEACHING TIP
Use the example of Sharp discussed in the beginning of Chapter 8.

   - Some firms use mixed strategy. Key is to use the approach that service the firm's competitive priorities best

4. Buying

- Discuss four approaches to e-purchasing
  a. Electronic data interchange (EDI)
     - A technology that enables the transmission of routine business documents over a computer network
  b. Catalogue hubs
     - Posting of a centralized online catalogue for pre-approved items
  c. Exchanges
     - An electronic marketplace where buying firms and selling firms come together
  d. Auctions
     - An exchange where firms place competitive bids for items
  e. Centralized versus localized buying
     - Centralized
       ⇒ Advantage of increases purchasing clout
       ⇒ Disadvantage is loss of control at the local level
     - Localized
       ⇒ Desirable for items unique to a particular facility
       ⇒ For purchases that must be closely meshed with production schedules
       ⇒ Advantage when the firm has major facilities in foreign countries because the managers there, often foreign nationals, have a much better understanding of the local culture than staff members at the home office

5. Information exchange

a. Radio frequency identification
   - A method for identifying items through the use of radio signals from a tag attached to an item (RFID)
   - Data from the tags can be transmitted wirelessly from one place to another through electronic product code (EPC) networks and the Internet, making it theoretically possible to uniquely identify every item a company produces and track it until the tag is destroyed

b. Vendor-managed inventories
   - An extreme application of the forward placement tactic where supplier locates inventories at the customer's facility
     - Inventories are on consignment and are paid for only when used
     - Key elements:
       - Collaborative effort
       - Cost savings
       - Customer service

        - Written agreement
    - Continuous replenishment, a VMI method in which the supplier monitors inventory at the customer and replenishes the stock as needed

D. Order Fulfillment Process

The order fulfillment process produces and delivers the product or service to the firm's customers.

1. Customer demand planning
    - CDP is a business-planning process that enables sales teams (and customers) to develop demand forecasts as input to service-planning processes, production and inventory planning, and revenue planning
2. Supply planning
    - The supply planning process takes the demand forecasts produced by CDP and the capacity available to generate a plan to meet the demand
3. Internal operations activities
    - Encompasses all of the tasks required to deliver a product or service to a customer.
    - These activities might be focused on addressing any of the competitive priorities, and might be done by either employees or customers
4. Logistics
    - A key aspect of order fulfillment is the logistics process, which delivers the product or service to the customer

    a. Ownership
        - The firm has the most control over the logistics process if it operates as a private carrier

    b. Facility location
        - Locating facilities in close proximity to suppliers and customers

    c. Shipment mode
        - The drivers for the selection of the mode of transportation should be the firm's competitive priorities

    d. Capacity
        - The performance of a logistics process is directly linked to its capacity and variability of demand

    e. Cross-docking
        - The packing of products on incoming shipments so that they can be easily sorted at intermediate warehouses and immediately transferred for outgoing shipment

E. Customer Relationship Process

1. Order placement process
    - Activities required to register the need for a product or service and to confirm the acceptance of the order
    - It is advantageous to make this process simple and fast
    - The internet assists firms with
        - Cost reduction
        - Revenue flow increase
        - Global access
        - Pricing flexibility
2. Customer service
    - Customers judge the firm on the basis of their experience with this process
    - Many firms have replaced humans with automated systems or outsourced service in an effort to reduce costs

F. Supply Chain Dynamics

Each firm is the supply chain depends on other firms for service, materials or information. So the actions of downstream supply chain members can indirectly affect the operations of upstream members, even several tiers away.

- Bullwhip effect: the phenomenon in supply chains whereby ordering patterns experience increasing variance as you proceed upstream in the chain

TEACHING TIP
Discuss supply chain tiers from Fig. 2.3.

- Upstream members (toward the lowest tier in the supply chain) must react to the demands placed on them by downstream members of the chain
- The slightest change in customer demand can ripple through the entire chain, each member receiving more variability in demands from the member immediately downstream

1. External causes
    - Volume changes
    - Service and product mix changes
    - Late deliveries
    - Underfilled shipments
2. Internal causes
    - Internally generated shortages
    - Order batching

- Engineering changes
- New service or product introductions
- Service or product promotions
- Information errors

3. Levers for improved supply chain performance
   - Problems caused by supply chain dynamics and options to improve
     - Sharing data: to facilitate planning at all levels in the supply chain share POS data and RFID tracking of inventory
     - Collaborative activities
     - Reduce replenishment lead times
     - Reduce order lot sizes
     - Ration short supplies
     - Use everyday low pricing (EDLP)
     - Be cooperative and trustworthy (to a point)