What is a Supply Chain?

- Supply chain is a term that describes how organizations (suppliers, manufacturers, distributors, and customers) are linked together.

What is Supply Chain Management?

- Supply-chain management is a total system approach to managing the entire flow of information, materials, and services from raw-material suppliers through factories and warehouses to the end customer.

Formulas for Measuring Supply-Chain Performance

- One of the most commonly used measures in all of operations management is “Inventory Turnover”:

\[
\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average aggregate inventory value}}
\]

- In situations where distribution inventory is dominant, “Weeks of Supply” is preferred and measures how many weeks’ worth of inventory is in the system at a particular time:

\[
\text{Weeks of supply} = \frac{\text{Average aggregate inventory value}}{\text{Cost of goods sold}} \times 52 \text{ weeks}
\]
Example of Measuring Supply-Chain Performance

Suppose a company's new annual report claims their costs of goods sold for the year is $160 million and their total average inventory (production materials + work-in-process) is worth $35 million. This company normally has an inventory turn ratio of 10. What is this year's Inventory Turnover ratio? What does it mean?

Inventory turnover = \( \frac{\text{Cost of goods sold}}{\text{Average aggregate inventory value}} \)

\[ = \frac{160}{35} \]

\[ = 4.57 \text{ turns per year} \]

Since the company's normal inventory turnover ration is 10, a drop to 4.57 means that the inventory is not turning over as quickly as it had in the past. Without knowing the industry average of turns for this company it is not possible to comment on how they are competitively doing in the industry, but they now have more inventory relative to their cost of goods sold than before.

Bullwhip Effect

The magnification of variability in orders in the supply-chain

- A lot of retailers each with little variability in their orders...
- ...can lead to greater variability for a fewer number of wholesalers, and...
- ...can lead to even greater variability for a single manufacturer.

Hau Lee’s Concepts of Supply Chain Management

- Hau Lee’s approach to supply chain (SC) is one of aligning SC’s with the uncertainties revolving around the supply process side of the SC
- A stable supply process has mature technologies
- An evolving supply process has rapidly changing technologies
Hau Lee’s Concepts of Supply Chain Management (Continue)

Types of SC’s

**Efficient SC’s**
- Aimed at creating the highest cost efficiency

**Risk-Hedging SC’s**
- Aimed at pooling and sharing resources in a supply chain so that the risks in supply disruption can be shared

**Responsive SC’s**
- Aimed at being responsive and flexible to the changing and diverse needs of the customers

**Agile SC’s**
- Aimed at being responsive and flexible to customer needs, while the risks of supply shortages or disruptions are hedged by pooling inventory and other capacity resources

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Hau Lee’s SC Uncertainty Framework

**Demand Uncertainty**
- Low (Functional Product)
  - Efficient SC
    - Basic Appeals, Grocery, Food, Most Commodities
  - Risk-Hedging SC
    - Some Power, Some Food Produce, Precious Metals
  - Agile SC
    - M-commerce, Telecom, High-end Servers, Semiconductor
- High (Innovative Product)
  - Responsive SC
    - Fashion Appeals, Computers, Pop Music, Toys

**Supply Uncertainty**
- Low (Stable Process)
- High (Evolving Process)

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What is Outsourcing?

**Outsourcing** is defined as the act of moving a firm’s **internal** activities and decision responsibility to **outside providers**

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Reasons to Outsource

- Organizationally-driven
- Improvement-driven
- Financially-driven
- Revenue-driven
- Cost-driven
- Employee-driven
Value Density

- **Value density** is defined as the value of an item per pound of weight.
- It is used as an important measure when deciding where items should be stocked geographically and how they should be shipped.

Mass Customization

- **Mass customization** is a term used to describe the ability of a company to deliver **highly customized** products and services to different customers.
- The key to mass customization is effectively **postponing** the tasks of differentiating a product for a specific customer **until the latest possible point** in the supply-chain network.

Mass Customization: Principles

- A product should be designed so it consists of **independent modules** that can be assembled into different forms of the product **easily and inexpensively**.
- Manufacturing and service processes should be designed so that they consist of independent modules that can be moved or rearranged easily to support different distribution network designs.
- The supply network should be:
  - Cost-effective
  - Take orders and deliver quickly.

Industrial Practice

- Logistic: American Presidents Line (DVD)
Question Bowl

A typical supply chain would include which of the following?

a. Suppliers
b. Manufacturers
c. Distribution
d. All of the above
e. None of the above

Answer: d. All of the above

Question Bowl

The supply chain measure of “Inventory Turnover” is which of the following ratios?

a. Avg. inventory value/total costs
b. Costs of goods sold/Avg. aggregate inventory value
c. Total costs of goods/Avg. costs of goods
d. Weeks worth of inventory/No. of weeks
e. None of the above

Answer: b. Costs of goods sold/Avg. aggregate inventory value

Question Bowl

If the “cost of goods sold” for a company is $1,000,000 and the “average aggregate inventory value” is $25,000, which of the following is the “inventory turnover”?  

a. 10
b. 25
c. 40
d. 50
e. None of the above

Answer: c. 40 (1,000,000/25,000=40)

Question Bowl

If the “cost of goods sold” for a company is $250,000 and the “average aggregate inventory value” is $5,000, which of the following is the “inventory turnover”?  

a. 10
b. 25
c. 40
d. 50
e. None of the above

Answer: d. 50 (250,000/5,000=50)
If the “cost of goods sold” for a company is $1,000,000 and the “average aggregate inventory value” is $50,000, which of the following is the “weeks of supply” measure for supply chain performance?

a. 1 week
b. 2.6 weeks
c. 20 weeks
d. 30 weeks
e. None of the above

Answer: b. 2.6 \((50,000/1,000,000) \times 52 = 2.6\)

Which of the following refers to the phenomenon of increasing variability as we move from the customer to the producer in the supply chain?

a. Continuous replenishing
b. Stable supply process
c. Evolving supply process
d. Agile supply chains
e. None of the above

Answer: e. None of the above (The correct term is “Bullwhip effect”.)

Which of the following are reasons why an organization should use “outsourcing” as a supply chain strategy?

a. Reduces investment in assets
b. Turns fixed costs into variable costs
c. Gives employees a stronger career
d. All of the above
e. None of the above

Answer: d. All of the above

Which of the following “transportation modes” provides flexibility in delivery, timing and at reasonable rates for small quantities and over short distances?

a. Rail
b. Highway (trucking)
c. Water
d. Pipeline
e. Air

Answer: b. Highway (trucking)