Drivers of Supply Chain

How to achieve

Efficiency  Responsiveness

Supply chain structure

1. Inventory
2. Transportation
3. Facilities

Logistical Drivers

4. Information
5. Sourcing
6. Pricing

Cross-Functional Drivers
1. Inventory

- **Convenience**: Cycle inventory
  - No customer buys eggs one by one
- **Unstable demand**: Seasonal inventory
  - Bathing suits
  - Xmas toys and computer sales
  - Rental car demand in Orlando
- **Randomness**: Safety inventory
  - 20% more syllabi than the class size were available in the first class
- **Pipeline** inventory
  - Work in process or transit
Little’s law

Long run averages = Expected values

\[ I = R \cdot T \]

remember from the units: # of units = (# of units/time)(time)

\( I = \) Pipeline inventory;
\( R = \) output per time = throughput;
\( T = \) delay time = flow time

Flow time? Thruput? Pipeline (work in process) Inventory?

Spend 1 minute 10/minute
2. Transportation

- Air
- Truck
- Rail
- Ship
- Pipeline
- Electronic
3. Facilities

◆ Production
  – **Flexible vs. Dedicated**
  – **Flexibility costs**
    » Production: Remember BMW: “a sports car disguised as a sedan”
    » Service: Can your instructor teach music as well as SCM?
    » Basketball: A playmaker who shoots well is rare.

◆ **Inventory-like operations**: Receiving, Prepackaging, Storing, Picking, Packaging, Sorting, Accumulating, Shipping
  – Receiving, Sorting, Storing, Packaging, Shipping is not trivial.
    » Blockbuster Distribution Center in McKinney.
  – Crossdocking: Wal-Mart
  – Job Lot Storage: Store full sets of fixtures separately for each process.
    » Need more space. Reticle storage in IBM semiconductor fabs.
4. Information

◆ Role in the supply chain
  – **Connector** between the various stages in the supply chain
    » **Integration to create synergies** is a central theme in supply chain management
  – **Crucial** to daily operation of each stage in a supply chain
    » E.g., production scheduling, inventory levels

◆ 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**)
  – Information technology
    » Andersen Windows is a wood window manufacturer whose customers can choose from a library of 50,000 designs or create their own. Customer orders automatically sent to the factory.
Characteristics of the Good Information

Information
- Accurate?
- Accessible?
- Up-to-date?
- In the Correct form?
  » If not, database restricts ability. How difficult is it to import data into SAP?
Quality of Information

- Information drives the decisions:
  - Good information means good decisions
- IT helps: MRP, ERP, SAP, EDI
- Relevant information?

How to use information?

"Tomorrow we learn the advantages of choosing rock instead of paper."
Information Technology in a Supply Chain: Legacy Systems
Information Technology in a Supply Chain: ERP Systems

Strategic

Planning

Operational

Supplier → Manufacturer → Distributor → Retailer → Customer

ERP

Potential ERP

Potential ERP

Information Technology in a Supply Chain: Analytical Applications

- Supplier
- Customer
- Retailer
- Distributor
- Manufacturer

**Strategic**

**Planning**

**Operational**

- Supplier Apps
- APS
- MES
- SCM
- Transport & Inventory Planning
- Transport execution & WMS
- CRM/SFA
- Dem Plan

**Supply Chain Management (SCM)**

**Applications**

**Transport Execution & WMS**

**Customer Relationship Management (CRM)/Sales Force Automation (SFA)**

**Supplier**  ➔  **Manufacturer**  ➔  **Distributor**  ➔  **Retailer**  ➔  **Customer**
ERP Systems

- Wider focus
- **Push** (MRP) versus **Pull** (demand information transmitted quickly throughout the supply chain)
- Real-time information
- Coordination and Information sharing

- Transactional IT
- Expensive and difficult to implement
  - About 25% of ERP installations are cancelled within a year
  - About 70% of ERP installations go over the budget
IT Push

IT investment ($B)

- 1965
- 1973
- 1981
- 1989
- 1997

IT investment ($B)
Supply Chain Software Push - See Top 100 under articles

EXHIBIT

Supply chain software is not a silver bullet

Change in inventory turns,¹ percent

<table>
<thead>
<tr>
<th>Year</th>
<th>High-performing adopters (top 1/3)</th>
<th>Average-performing adopters</th>
<th>Nonadopters</th>
<th>Low-performing adopters (bottom 1/3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>50</td>
<td>100</td>
<td>150</td>
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<td>1</td>
<td>100</td>
<td>200</td>
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<td>2</td>
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<td>250</td>
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<td>150</td>
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<tr>
<td>3</td>
<td>200</td>
<td>300</td>
<td>350</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>250</td>
<td>350</td>
<td>400</td>
<td>250</td>
</tr>
</tbody>
</table>

¹For 62 high-tech companies in Fortune 1000 (exhibit excludes 1 outlier) over the period 1995–2001; 22 invested in supply-chain-management (SCM) software at various times during period; inventory-turns analysis begins in 1995 for nonadopters.

²For those who adopted SCM software.

5. Sourcing

◆ Role in the supply chain
  – Set of processes required to purchase goods and services in a supply chain
  – Supplier selection, single vs. multiple suppliers, contract negotiation

◆ Role in the competitive strategy
  – Sourcing is crucial. It affects efficiency and responsiveness in a supply chain
  – In-house vs. outsource decisions- improving efficiency and responsiveness
    › TI: More than half of the revenue spent for sourcing.
    › Cisco sources: Low-end products (e.g. home routers) from China.

◆ Components of sourcing decisions
  – In-house versus outsource decisions
  – Supplier evaluation and selection
  – Procurement process:
    › Every department of a firm buy from suppliers independently, or all together.

◆ EDS to reduce the number of officers with purchasing authorization.
6. Pricing

◆ Role in the supply chain
  - Pricing determines the amount to charge customers in a supply chain
  - **Pricing strategies can be used to match demand and supply**
    » Price elasticity: Do you know yours?

◆ Role in the competitive strategy
  - Use pricing strategies to improve efficiency and responsiveness
  - Low price and low product availability; vary prices by response times
    » Amazon: Faster delivery is more expensive

◆ Components of pricing decisions
  - Pricing and economies of scale
  - Everyday low pricing versus high-low pricing
  - **Fixed price** versus **menu pricing**, depending on the product and services
    » Packaging, delivery location, time, customer pick up
    » Bundling products; products and services
## Considerations for Supply Chain Drivers

<table>
<thead>
<tr>
<th>Driver</th>
<th>Efficiency</th>
<th>Responsiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inventory</td>
<td>Cost of holding</td>
<td>Availability</td>
</tr>
<tr>
<td>2. Transportation</td>
<td>Consolidation</td>
<td>Speed</td>
</tr>
<tr>
<td>3. Facilities</td>
<td>Consolidation / Dedicated</td>
<td>Proximity / Flexibility</td>
</tr>
<tr>
<td>4. Information</td>
<td>Low cost/slow/no duplication</td>
<td>High cost/ streamlined/reliable</td>
</tr>
<tr>
<td>5. Sourcing</td>
<td>Low cost sources</td>
<td>Responsive sources</td>
</tr>
<tr>
<td>6. Pricing</td>
<td>Constant price</td>
<td>Low-high price</td>
</tr>
</tbody>
</table>
Major Obstacles to Achieving Fit: **Size**

1. **SC is big and fragmented**
   - Variety of products/services
   - Variety of distribution channels
     » Brick & Mortar vs. Online
     » Regular stores vs. Discount Outlets
   - Spoiled customer
   - Globalization
   - Multiple owners
     » Procurement, Production, Inventory, Marketing in a company
     » Manufacturer, Distributor, Retailer in a Supply Chain
   - Multiple objectives
Dealing with Multiple Owners / Local Optimization

- Information Coordination
  - Information sharing / Shyness / Legal and ethical issues

- Contractual Coordination
  - Mechanisms to align local objectives with global ones

- Coordination with (real) options
  - Rare in the practice; forward contracts vs. spot markets in sourcing

- Without coordination, misleading reliance on metrics:
  - Average safety inventory, Average incoming shipment size, Average purchase price of raw materials.

Local optimization and lack of global fit
Major obstacles to achieving fit: **Change**

◆ 2. **Instability** and **Randomness**:
  – Instability refers to knowing that there will be a change in the future and also knowing the amount of change.
  – Randomness refers to only knowing that there will be a change in the future but not knowing the amount of change.
  – Increasing product variety
  – Shrinking product life cycles
  – Customer fragmentation: Push for customization, segmentation
  – Fragmentation of Supply Chain ownership: Globalization

*Increasing implied uncertainty*
Common problems

◆ Lack of **relevant SCM metrics**: How to measure responsiveness?
  » How to measure efficiency, costs, worker performance, etc?

◆ Poor **inventory status information**
  » **Theft**: Major problem for furniture retailers.
  » **Transaction errors**: Retailers with inaccurate inventory records for 65% of SKUs
  » **Information delays**, dated information, incompatible info. systems
  » **Misplaced inventory**: 16% of items cannot be found at a major retailer
  » **Spoilage**: active ingredients in the products are losing their properties
  » **Product quality and yield**
  » **Lack of visibility in SCs**
    » Do you know the inventory your distribution centers hold?
    » Do you know the inventory your fellow retailer holds?
Common problems

◆ Poor delivery status information
  » Not knowing the order status

◆ Poor IT design
  » Unreliable, duplicate data
  » Security problems: too much or too little

◆ Ignoring uncertainties
  – “The flight from uncertainty and ambiguity is so motivated that we often create pseudocertainty.”

◆ Internal customer discrimination
  » Giving lower priority to internal customers than external customers

◆ Poor integration

◆ Elusive inventory costs
  » Accounting systems do not capture opportunity costs

◆ SC-insensitive product design
Summary

◆ Components
  » Logistical: Inventory, Transportation, Facilities
  » Cross-Functional: Information, Sourcing, Pricing

◆ Challenges
  » Obstacles: Size and Change
  » Common Problems