

IE375 Fall 2020

Supply Chain Management

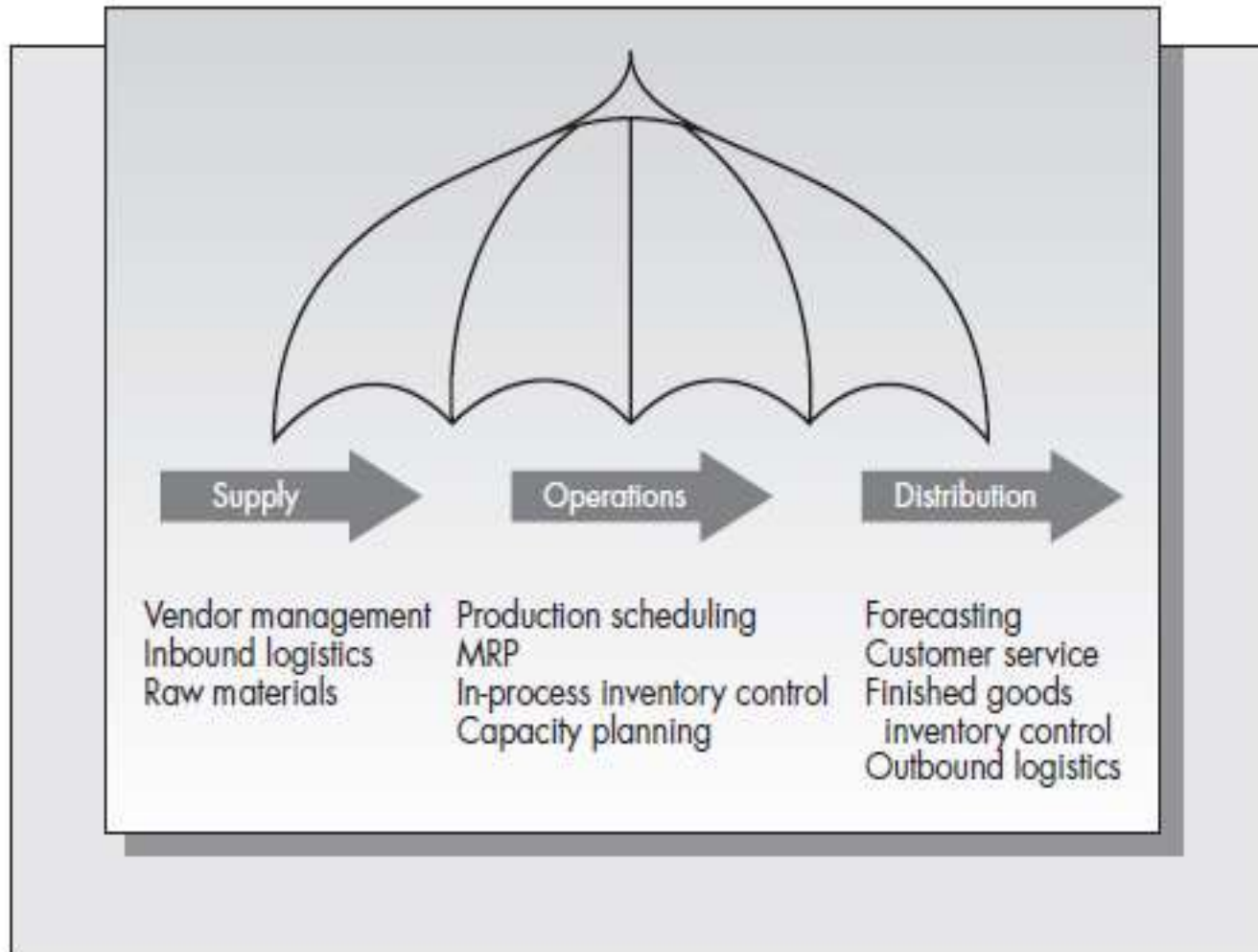
(Both Editions, Chapter 6)

Slides are taken from Nahmias and Olsen 7th Edition
Instructor's Resources with some changes

What is Supply Chain Management?

- *Supply Chain management deals with the control of materials, information, and financial flows in a network consisting of suppliers, manufacturers, distributors, and customers (Stanford Supply Chain Forum Website.)*

The Supply Chain Umbrella



Why So Much Interest in Supply Chain Management?

- **Independent decisions of the entities**
- Considers the broad, integrated, view of materials management from purchasing through distribution
 - As manufacturing becomes more efficient (or is outsourced), companies look for ways to reduce costs
- Several significant success stories. Efficient SCM gives Walmart, HP, others, an important edge
- The huge growth of interest in the web has spawned web-based models for supply chains: from “dot com” retailers to B2B business models

Trends in Supply Chain Management

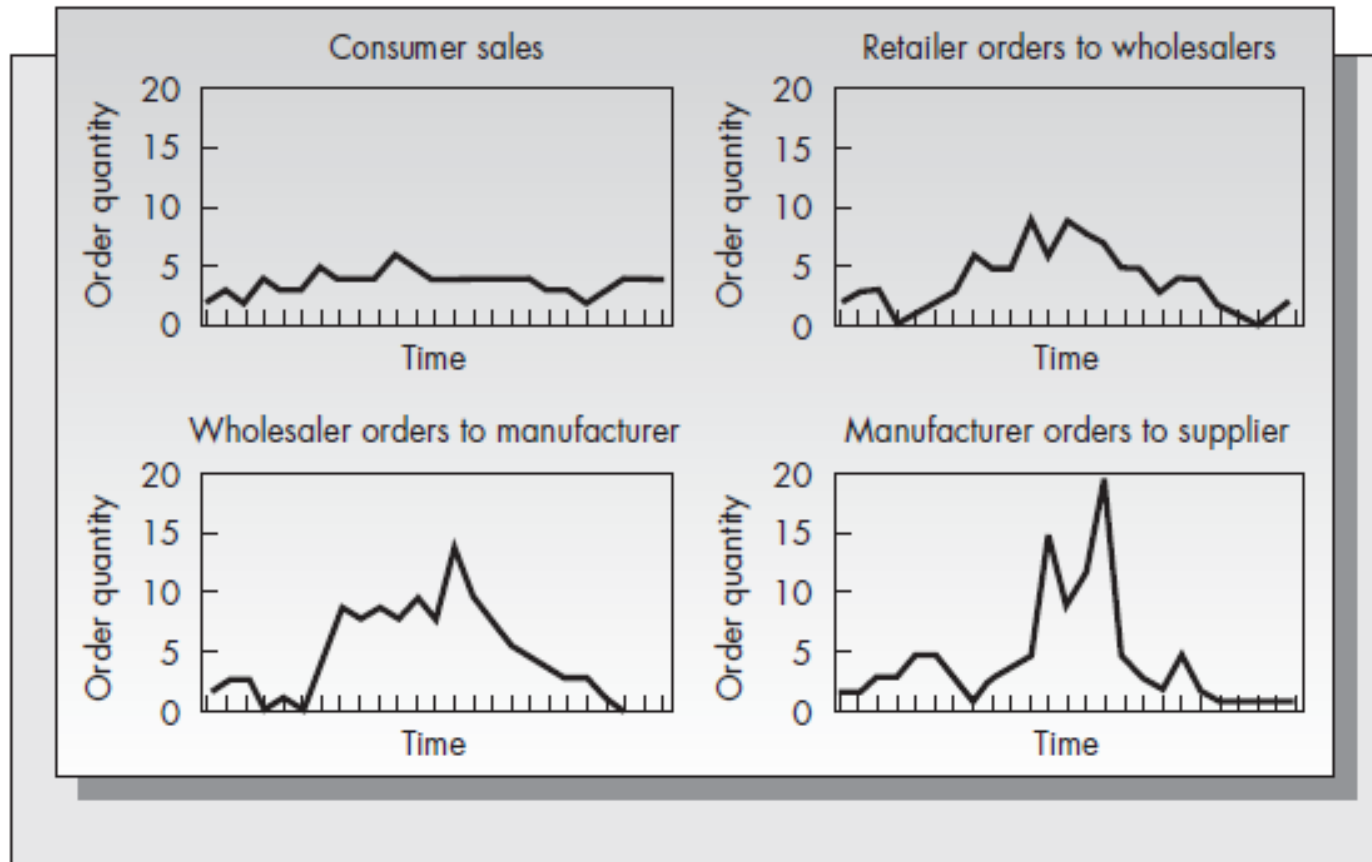
- Outsourcing of the logistics function +
Outsourcing of manufacturing
- Moving towards more web-based transactions systems
- Improving the information flows along the entire chain

Analytical Methods to Support SCM Implementation

- Successful supply chain management relies on information, analytics, and aligned incentives
- Analytical methods include:
 - The transportation problem and more general network formulations for describing flow of goods in a complex system
 - Inventory management and demand forecasting models such as those discussed in this course + more
 - Analytical methods for determining delivery routes for product distribution.

Information Transfer in Supply Chains

The Bullwhip Effect: Increasing Variability of Orders up the Supply Chain



Source: H. L. Lee, P. Padmanabhan, and S. Whang, 1997.

Primary Causes of Bullwhip Effect

- Demand forecasting updating
- Order batching
- Price fluctuations
- Shortage gaming

➤ Example: Vendor Managed Inventory

- Ford, Barilla
- Use of sales data directly to decide on delivery sizes (as opposed to allowing distributors to independently decide on order sizes)

Scale:Supply Chain – Classical Problem

Transportation Problem

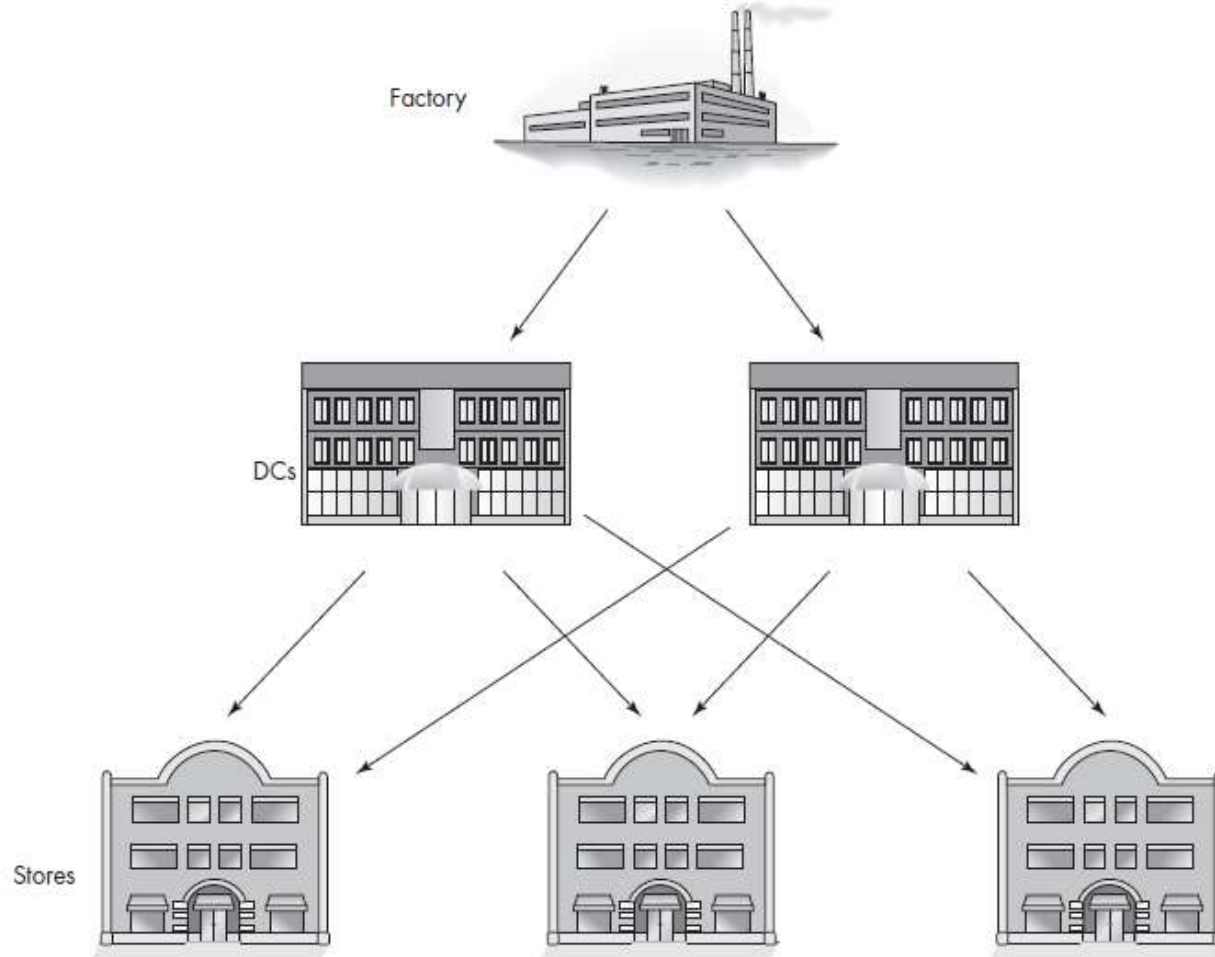
- A mathematical model for optimally scheduling the flow of goods from production facilities to distribution centers
- A fixed amount of product must be transported from a group of sources (plants) to a group of sinks (warehouses)
- The unit cost of transporting from each source to each sink is assumed to be known
- The goal is to find the optimal flow paths and the amounts to be shipped on those paths to minimize the total cost of all shipments

Scale:Supply Chain – Classical Problem

Risk Pooling

- Inventory/location pooling.
- Product pooling and postponement.
- Capacity pooling.

Example: Inventory/location pooling. Multi-level Distribution Systems



Example: Inventory/location pooling.

Multi-level Distribution Systems

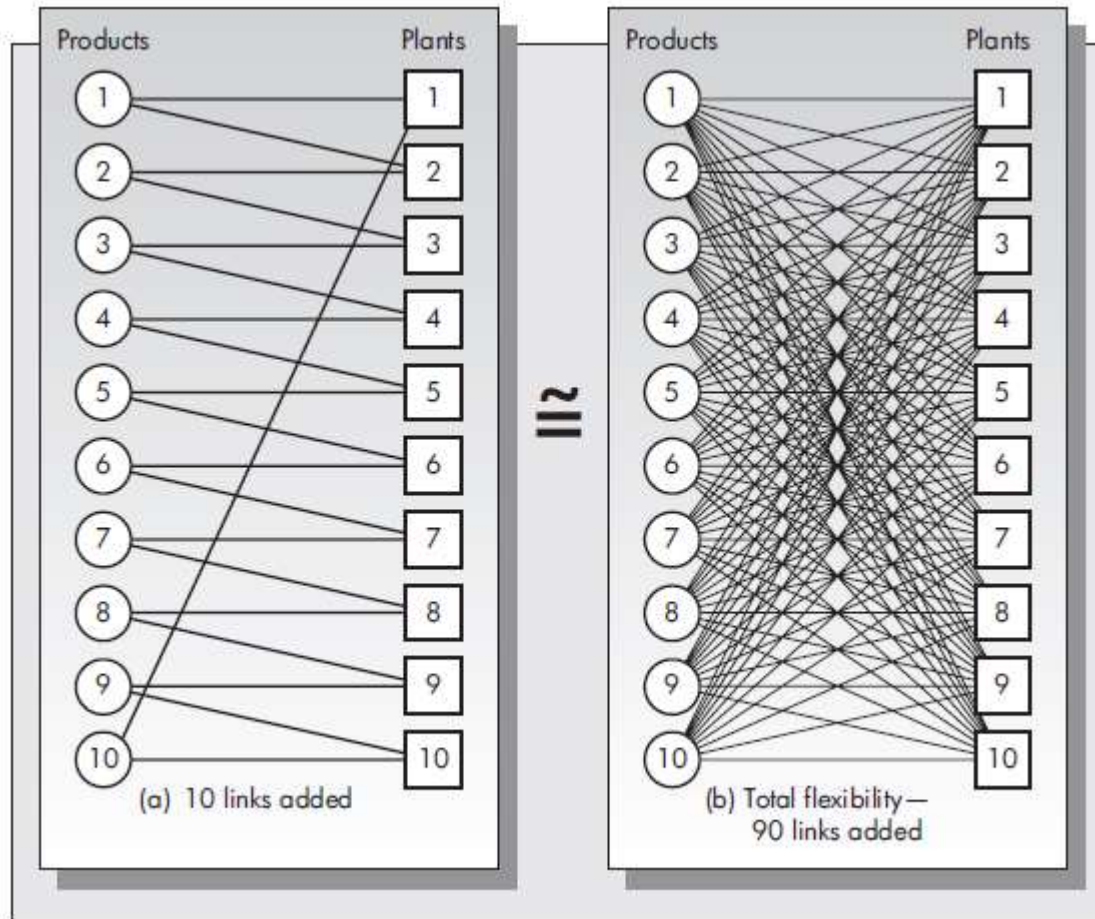
Advantages

- Risk pooling
- Distribution centres that can be designed to meet local needs
- Economies of scale in storage and movement of goods
- Faster response time

Example: Postponement in Supply Chains

- Several companies have been able to cut costs and improve service by postponing the final configuration of the product until the latest possible point in the supply chain. Examples:
 - Benetton producing “grey stock”
 - Hewlett Packard printer configuration
 - Postponement of final programming of semiconductor devices
 - Assemble to order rather than assemble to stock (Dell Computer)

Example: Capacity Pooling Flexibility Configurations



Source: Jordan and Graves (1995)

Further Topics:

Design for Logistics

- Many firms now consider SCM issues in the design phase of product development. (This has been referred to DFL or Design for Logistics).
- One example is IKEA whose furniture comes in simple to assemble kits that allows them to store the furniture in the same warehouse-like locations where they are displayed and sold.

Disadvantages of (Non-SCM) Standard Operations: Multi-level Distribution Systems with no cooperation

- May require more inventory than simpler distribution systems
- May increase total order lead times from the plant to the customer
- Could ultimately result in greater costs for storage and movement of goods
- Could contribute to the bullwhip effect

Further Topics:

Incentives in the Supply Chain

- Newsvendor type item
 - Manufacturer produces for c ; sells it to the retailer for w ; and retailer sells the product for p
- In the newsvendor the underage cost for the retailer is $p - w$, for the manufacturer is $w - c$, and for the supply-chain as a whole is $p - c$
- Because $(p - w) > (p - c)$, the retailer will understock from the standpoint of maximizing profit to the whole supply chain
 - This is *double marginalization*.
 - Because each firm naturally considers its own margin, the decisions are not those of a centralized decision maker

Further Topics: Incentives in the Supply Chain using Contracts

Consider newsvendor problem to get an intuition

- Buy-back
- Revenue Sharing
- Sales rebate
- Quantity flexibility
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