Supply Chain Management - Introduction

- *Say we get an order from a European retailer to produce 10,000 garments. For this customer we might decide to buy yarn from a Korean producer but have it woven and dyed in Taiwan. So we pick the yarn and ship it to Taiwan. The Japanese have the best zippers … so we go to YKK, a big Japanese zipper manufacturer, and we order the right zippers from their Chinese plants. …the best place to make the garments is Thailand. So we ship everything there. …the customer needs quick delivery, we may divide the order across five factories in Thailand. Effectively, we are customizing the value chain to best meet the customer's needs.* (Interview of Victor Fung of *Li & Fung* in HBR, Sept-Oct 1998.)

Supply Chain Management - Introduction

- Founded in 1906
- Today 35 offices in 20 countries
- 1997 revenues of $ 1.7 billion
- Largest export trading company in Hong Kong
- Customers- American and European retailers
- Sources clothing and other consumer goods ranging from toys to fashion accessories to luggage

Supply Chain Management - Introduction

- Order from Europe
- Buy yarn from Korea
- Weave and dye in Taiwan
- Buy Japanese zippers made in China
- Make the garments in Thailand in five different factories
- Pulling apart the value chain and optimizing at each step

- ## <u>Victor Fung</u>

" *Today, assembly is the easy part. The hard part is managing your suppliers and the flow of parts." Good supply chain management strips away time and cost from product delivery cycles. Our customers have become more fashion driven, working with six or seven seasons a year instead of just two or three. Once you move to shorter life cycles, the problem of obsolete inventory increases dramatically. With customer tastes changing rapidly and markets segmenting into narrow niches, it's not just fashion products that are becoming increasingly time sensitive."*
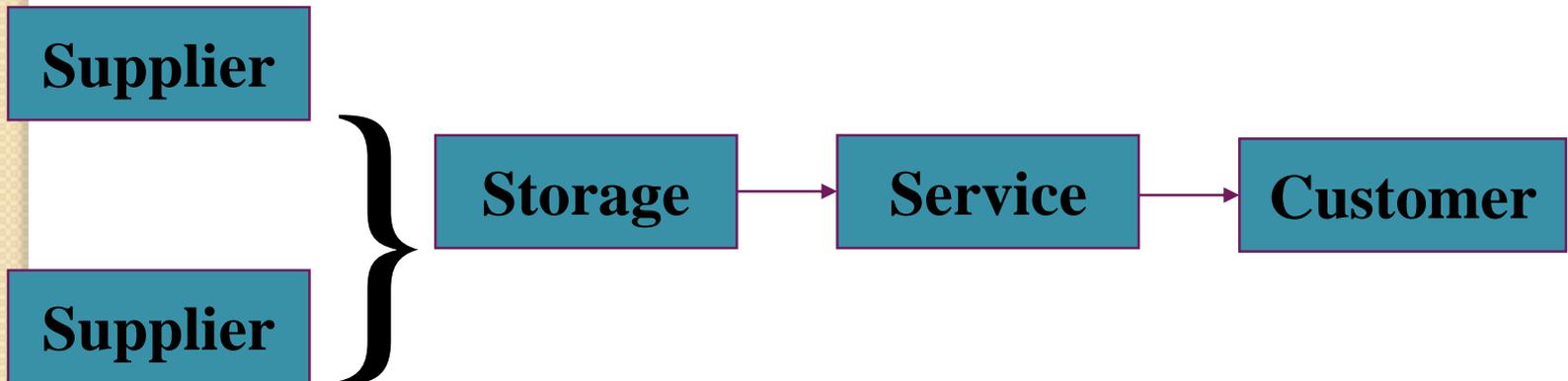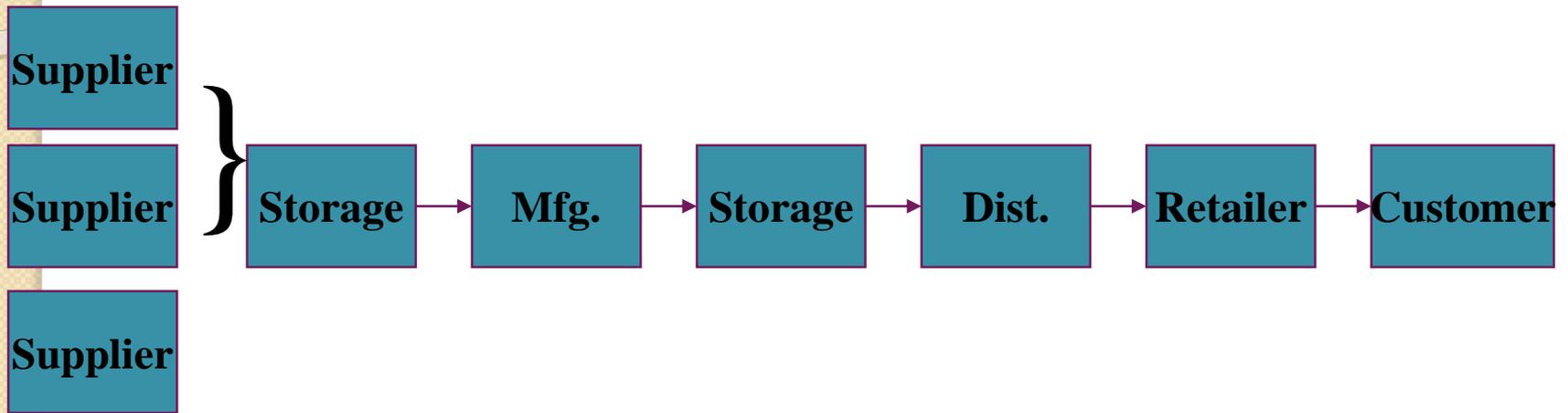
Supply Chain Management - Introduction

- A *value chain* is another name for a *supply chain*.

- A *supply chain* is a sequence of organizations - their facilities, functions and activities - that are involved in producing and delivering a product or service.

- *Li & Fung* is Hong Kong's largest export trading company. It has also been innovative in supply chain management.

- In the interview example, it can be seen that *Li & Fung* has created a supply chain for the purpose of meeting a customer's needs. In general, this case is more the exception than the rule, but serves to illustrate some of the pieces of a supply chain.
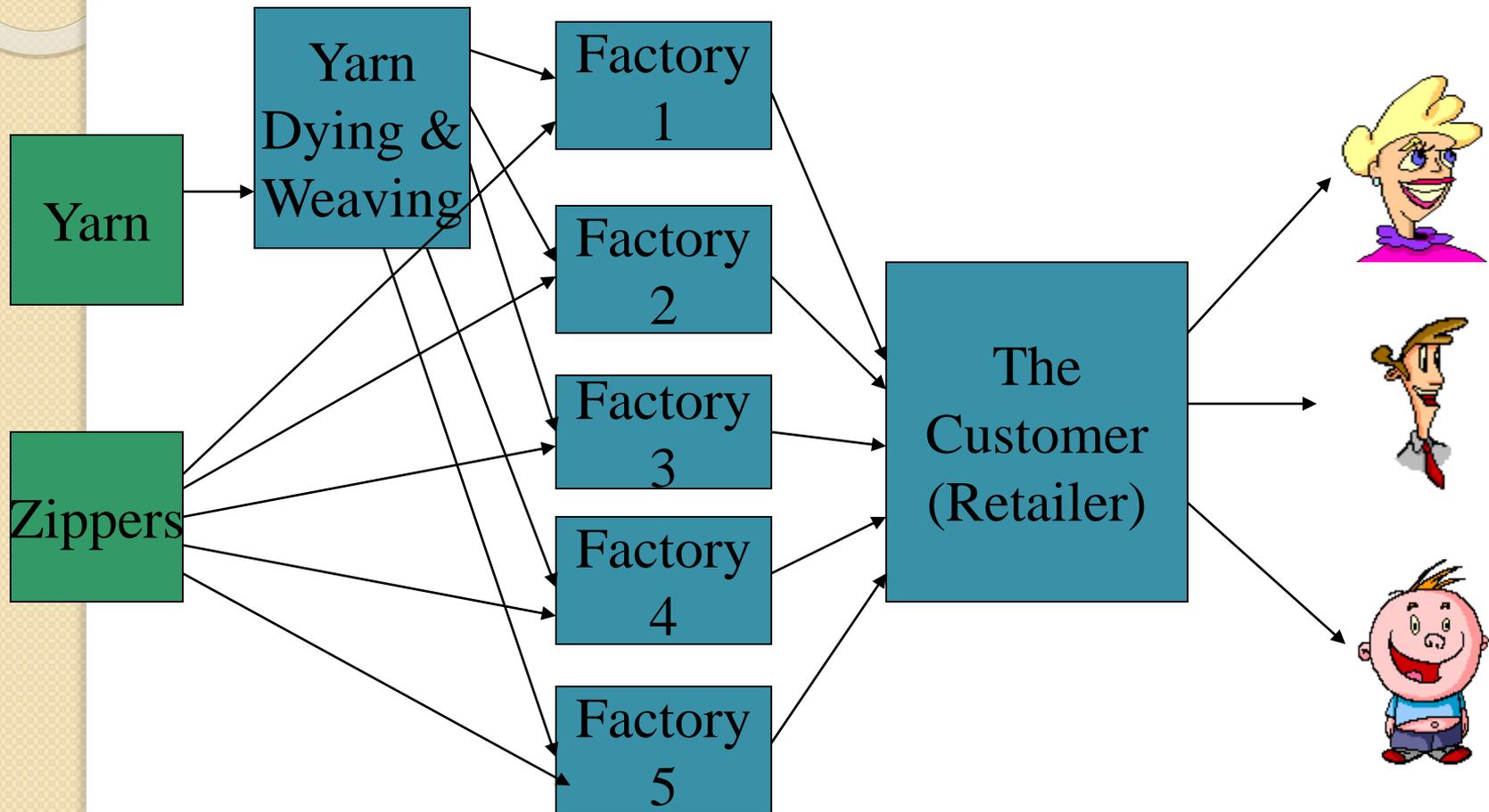
Supply Chain Management - Introduction

In a supply chain, virtually all of the members serve as both customers as well as suppliers. In the *Li & Fung* example, the Korean yarn producer and the Japanese zipper producer are probably only suppliers and the customer's customers are
probably only customers. Every other organization in the supply chain is both a customer and a supplier.

Supply Chain Management - Introduction

Supplier

Supplier } Storage → Mfg. → Storage → Dist. → Retailer → Customer

Supplier

Supplier } Storage → Service → Customer

Supplier

Supply Chain Management - Introduction

```
                    ┌──────────┐
                    │ Factory  │
                    │    1     │
                    └──────────┘
┌──────────┐  ┌──────────┐  ┌──────────┐
│  Yarn    │→ │  Yarn    │  │ Factory  │
│          │  │ Dying &  │  │    2     │
└──────────┘  │ Weaving  │  └──────────┘        ┌──────────┐
              └──────────┘  ┌──────────┐        │   The    │
┌──────────┐                │ Factory  │  →     │ Customer │
│ Zippers  │                │    3     │        │(Retailer)│
│          │                └──────────┘        └──────────┘
└──────────┘                ┌──────────┐
                            │ Factory  │
                            │    4     │
                            └──────────┘
                            ┌──────────┐
                            │ Factory  │
                            │    5     │
                            └──────────┘
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Supply Chain Management - Introduction

- *Supply chain management* deals with linking the organizations within the supply chain in order to meet demand across the chain as efficiently as possible. In our example, *Li & Fung* is creating and managing the links. In non-brokered supply chains, one or more of the chain's organizations can provide the management function.

- Why is supply chain management so important?

  ◦ To gain efficiencies from procurement, distribution and logistics

  ◦ To make outsourcing more efficient

  ◦ To reduce transportation costs of inventories

  ◦ To meet competitive pressures from shorter development times, more new products, and demand for more customization

Supply Chain Management - Introduction

- To meet the challenge of globalization and longer supply chains
- To meet the new challenges from e-commerce
- To manage the complexities of supply chains
- To manage the inventories needed across the supply chain
- Why is supply chain management difficult?
  - Different organizations in the supply chain may have different, conflicting objectives
    - Manufacturers: long run production, high quality, high productivity, low production cost
    - Distributors: low inventory, reduced transportation costs, quick replenishment capability
    - Customers: shorter order lead time, high in-stock inventory, large variety of products, low prices
  - Supply chains are dynamic - they evolve and change over time

Supply Chain Management - Introduction

- Supply chains and vertical integration
  - For any organization vertical integration involves either taking on more of the supplier activities (backward) and/or taking on more of the distribution activities (forward)
  - An example of backward vertical integration would be a peanut butter manufacturer that decides to start growing peanuts rather than buying peanuts from a supplier
  - An example of forward vertical integration would be a peanut butter manufacturer that decides to start marketing their peanut better directly to grocery stores
  - In supply chains, some of the supplying and some of the distribution might be performed by the manufacturer

Supply Chain Management - Introduction

◦ The significance of vertical integration in the supply chain is that the activities that are performed by the manufacturer are typically more easily managed than those which are performed by other organizations

◦ Therefore, the degree of vertical integration can have an impact on the structure and relationships between members of a supply chain

Supply Chain Management - Introduction

- Strategic, tactical and operating issues
  - Strategic - long term and dealing with supply chain design
    - Determining the number, location and capacity of facilities
    - Make or buy decisions
    - Forming strategic alliances
  - Tactical - intermediate term
    - Determining inventory levels
    - Quality-related decisions
    - Logistics decisions
  - Operating - near term
    - Production planning and control decisions
    - Goods and service delivery scheduling
    - Some make or buy decisions

Supply Chain Management - Introduction

- Key issues in supply chain management include
  - Distribution network configuration
    - How many warehouses do we need?
    - Where should these warehouses be located?
    - What should the production levels be at each of our plants?
    - What should the transportation flows be between plants and warehouses?
  - Inventory control
    - Why are we holding inventory? Uncertainty in customer demand? Uncertainty in the supply process? Some other reason?
    - If the problem is uncertainty, how can we reduce it?
    - How good is our forecasting method?

Supply Chain Management - Introduction

- Distribution strategies
  - Direct shipping to customers?
  - Classical distribution in which inventory is held in warehouses and then shipped as needed?
  - Cross-docking in which transshipment points are used to take stock from suppliers' deliveries and immediately distribute to point of usage?
- Supply chain integration and strategic partnering
  - Should information be shared with supply chain partners?
  - What information should be shared?
  - With what partners should information be shared?
  - What are the benefits to be gained?

Supply Chain Management - Introduction

- Product design
  - Should products be redesigned to reduce logistics costs?
  - Should products be redesigned to reduce lead times?
  - Would delayed differentiation be helpful?
- Information technology and decision-support systems
  - What data should be shared (transferred)
  - How should the data be analyzed and used?
  - What infrastructure is needed between supply chain members?
  - Should e-commerce play a role?
- Customer value
  - How is customer value created by the supply chain?
  - What determines customer value? How do we measure it?
  - How is information technology used to enhance customer value in the supply chain?

Supply Chain Management - Introduction

- How can you assess how well your supply chain is performing?
  - The SCOR model - Supply Chain Operations Reference Model - developed by the Supply Chain Council (http://www.supply-chain.org/) can be used to assess performance
  - SCOR model metrics include:
    - On-time delivery performance
    - Lead time for order fulfillment
    - Fill rate - proportion of demand met from on-hand inventory
    - Supply chain management cost
    - Warranty cost as a percentage of revenue
    - Total inventory days of supply
    - Net asset turns

Supply Chain Management - Introduction

- Creating an effective supply chain
  - Develop strategic objectives and tactics
  - Integrate and coordinate activities in the internal portion of the supply chain
  - Coordinate activities with suppliers and customers
  - Coordinate planning and execution across the supply chain
 - Consider forming strategic partnerships

SCM - Inventory Management Issues

- Manufacturers would like to produce in large lot sizes because it is more cost effective to do so. The problem, however, is that producing in large lots does not allow for flexibility in terms of product mix.

- Retailers find benefits in ordering large lots such as quantity discounts and more than enough safety stock.

- The downside is that ordering/producing large lots can result in large inventories of products that are currently not in demand while being out of stock for items that are in demand.

SCM - Inventory Management Issues

- Ordering/producing in large lots can also increase the safety stock of suppliers and its corresponding carrying cost. It can also create what's called the *bullwhip effect.*

- The *bullwhip effect* is the phenomenon of orders and inventories getting progressively larger (more variable) moving backwards through the supply chain.

- Volatility amplification along the network

- Increase in demand variability as we move upstream away from the market

- Mainly because of lack of communication and coordination

- Delays in information and material flows

SCM - Inventory Management Issues
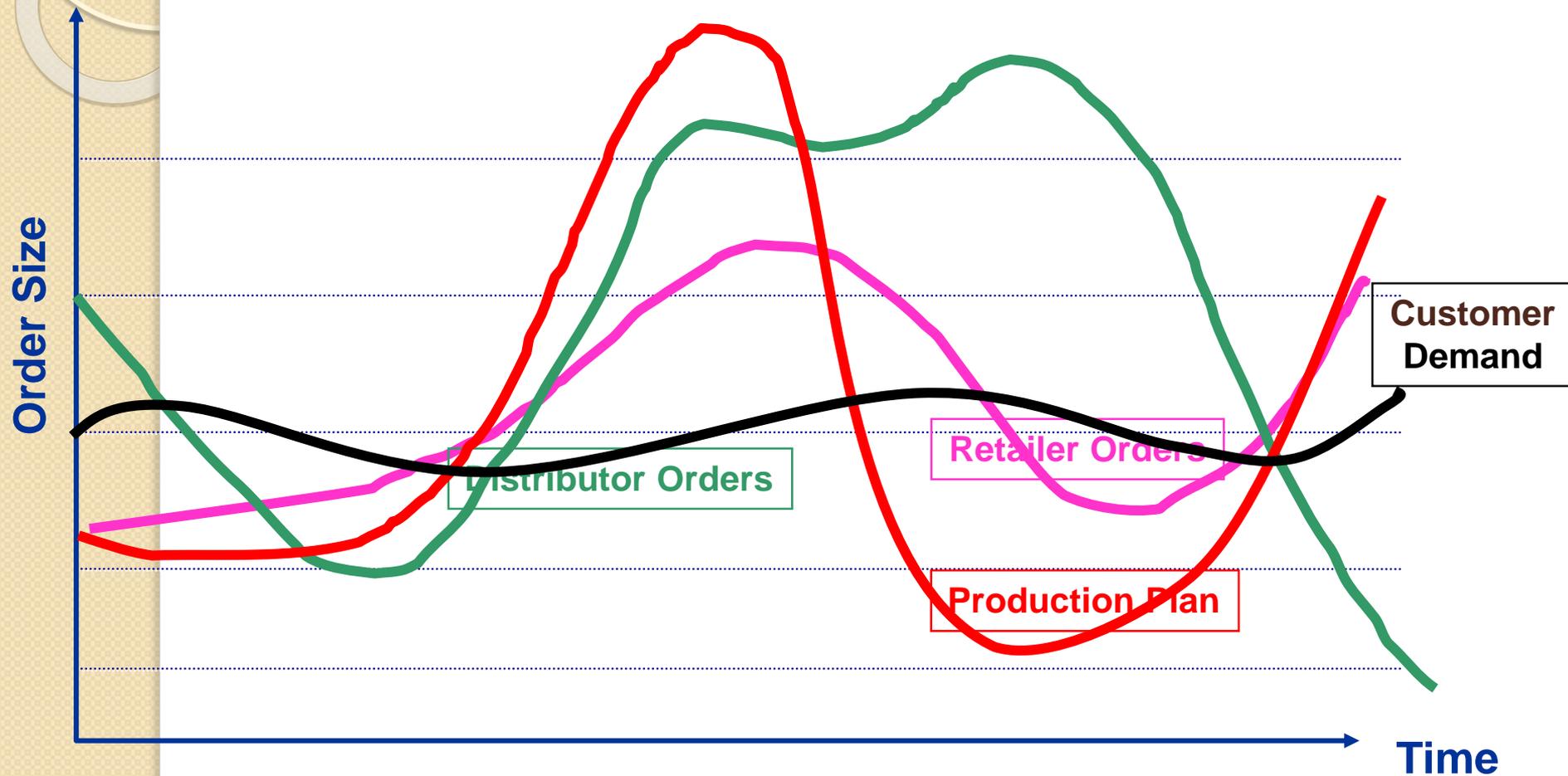
Source: Tom Mc Guffry, Electronic Commerce and Value Chain Management, 1998

SCM - Inventory Management Issues

- Some of the causes of variability that leads to the *bullwhip effect* includes:

  ◦ **Demand forecasting** Many firms use the *min-max inventory policy*. This means that when the inventory level falls to the reorder point (*min*) an order is placed to bring the level back to the *max* , or the *order-up-to-level*. As more data are observed, estimates of the mean and standard deviation of customer demand are updated. This leads to changes in the safety stock and order-up-to level, and hence, the order quantity. This leads to variability.

  ◦ **Lead time** As lead time increases, safety stocks are increased, and order quantities are increased. More variability.

SCM - Inventory Management Issues

- **Batch ordering.** Many firms use batch ordering such as with a min-max inventory policy. Their suppliers then see a large order followed by periods of no orders followed by another large order. This pattern is repeated such that suppliers see a highly variable pattern of orders.

- **Price fluctuation.** If prices to retailers fluctuate, then they may try to stock up when prices are lower, again leading to variability.

- **Inflated orders.** When retailers expect that a product will be in short supply, they will tend to inflate orders to insure that they will have ample supply to meet customer demand. When the shortage period comes to an end, the retailer goes back to the smaller orders, thus causing more variability.

SCM - Inventory Management Issues

- How then can we cope with the *bullwhip effect?*

- Centralizing demand information occurs when customer demand information is available to all members of the supply chain. This information can be used to better predict what products and volumes are needed and when they are needed such that manufacturers can better plan for production. However, even though centralizing demand information can reduce the *bullwhip effect,* it will not eliminate it. Therefore, other methods are needed to cope with the *bullwhip effect.*

SCM - Inventory Management Issues

- Methods for coping with the *bullwhip effect* include:
  - **Reducing uncertainty.** This can be accomplished by centralizing demand information.
  - **Reducing variability.** This can be accomplished by using a technique made popular by *WalMart* and then *Home Depot* called *everyday low pricing* (EDLP). EDLP eliminates promotions as well as the shifts in demand that accompany them.
  - **Reducing lead time.** Order times can be reduced by using EDI (electronic data interchange).
  - **Strategic partnerships.** The use of strategic partnerships can change how information is shared and how inventory is managed within the supply chain. These will be discussed later.

SCM - Inventory Management Issues

- Other helpful techniques for improving inventory management include:
  - **Cross-docking.** This involves unloading goods arriving from a supplier and immediately loading these goods onto outbound trucks bound for various retailer locations. This eliminates storage at the retailer's inbound warehouse, cuts the lead time, and has been used very successfully by *WalMart* and *Xerox* among others.
  - **Delayed differentiation.** This involves adding differentiating features to standard products late in the process. For example, *Bennetton* decided to make all of their wool sweaters in undyed yarn and then dye the sweaters when they had more accurate demand data. Another term for *delayed differentiation* is *postponement.*

SCM - Inventory Management Issues

- **Direct shipping.** This allows a firm to ship directly to customers rather than through retailers. This approach eliminates steps in the supply chain and reduces lead time. Reducing one or more steps in the supply chain is known as *disintermediation*. Companies such as *Dell* use this approach.

SCM - Strategic Partnering

- *Strategic partnering* (SP) is when two or more firms that have complementary products or services join such that each may realize a strategic benefit. Types of strategic partnering include:
    - Quick response,
    - Continuous replenishment,
    - Advanced continuous replenishment, and
    - Vendor managed inventory (VMI)

SCM - Strategic Partnering

- In *quick response* SP vendors receive point-of-sales (POS) data from retailers. The data are then used to synchronize production and inventory management at the supplier. Although the retailer still prepares and submits individual orders to the supplier, the POS data is used to improve forecasting and scheduling.

- In *continuous replenishment* SP vendors again receive POS data and use them to prepare shipments at previously agreed to intervals as well as to maintain agreed to inventory levels. This approach is used by *WalMart.*

SCM - Strategic Partnering

- In *advanced continuous replenishment* SP suppliers will gradually decrease inventory levels at the retailer's location as long as they can still meet service levels. The result is that inventory level are continuously improved. *Kmart* uses this approach.

- In *vendor managed inventory* SP the supplier will decide on the appropriate inventory levels for each of the products it supplies and the appropriate inventory policies to maintain these levels. One of the best examples of this is the SP between *WalMart* and *Proctor & Gamble*.

SCM - Strategic Partnering

Criteria ⇒ Types ⇓	Decision Maker	Inventory Ownership	New Skills Employed by vendors
Quick Response	Retailer	Retailer	Forecasting Skills
Continuous Replenishment	Contractually Agreed to Levels	Either Party	Forecasting & Inventory Control
Advanced Continuous Replenishment	Contractually agreed to & Continuously Improved Levels	Either Party	Forecasting & Inventory Control
VMI	Vendor	Either Party	Retail Management

SCM - Strategic Partnering

- Requirements for an effective SP include:
  - Advanced information systems,
  - Top management commitment, and
  - Mutual trust
- Steps in SP implementation include:
  - Contractual negotiations
    - Ownership
    - Credit terms
    - Ordering decisions
    - Performance measures

SCM - Strategic Partnering

- Develop or integrate information systems
- Develop effective forecasting techniques
- Develop a tactical decision support tool to assist in coordinating inventory management and transportation policies

- Advantages of SP include:
  - Fully utilize system knowledge
  - Decrease required inventory levels
  - Improve service levels
  - Decrease work duplication
  - Improve forecasts

SCM - Strategic Partnering

- Disadvantages of SP include:
  - Expensive technology is required
  - Must develop supplier/retailer trust
  - Supplier responsibility increases
  - Expenses at the supplier also often increase
- *Third party logistics* (3PL) involves the use of an outside company to perform part or all of a firm's materials management and product distribution function.
  - Examples of companies that provide 3PL include *Ryder Dedicated Logistics* and *J.B. Hunt.*
  - Examples of companies that use 3PL include *3M, Dow Chemical, Kodak* and *Sears.*