Supply Chain Analytics

Lecture 13: Forecasting in supply chain

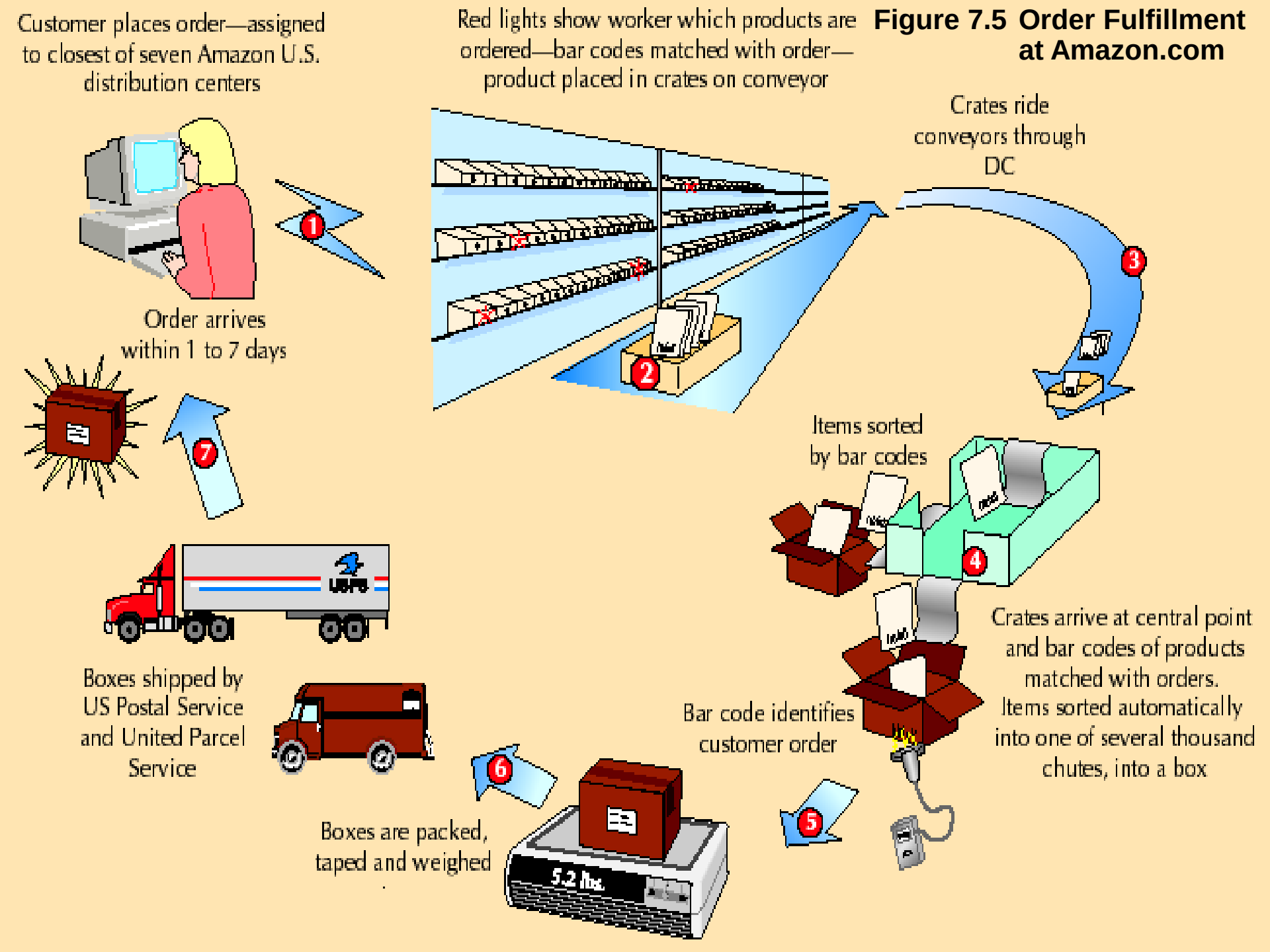
Lecturer: Davranova Dilorom

Order Fulfillment

Order fulfillment

- ***The process involved in responding to customer orders***
- ***Often a function of the degree of customization required***
  - ***Common approaches***
    - ***Engineer-to-order (ETO)***
    - ***Make-to-order (MTO)***
    - ***Assemble-to-order (ATO)***
    - ***Make-to-stock (MTS)***

Figure 7.5 Order Fulfillment at Amazon.com



DİSTRİBUTİON SYSTEM

Encompasses all of the distribution channels, processes and functions, including warehousing and transportation, that a product passes through on its way to the final customer.

Logistics

Refers to the movement of materials, services, cash and information in a supply chain.

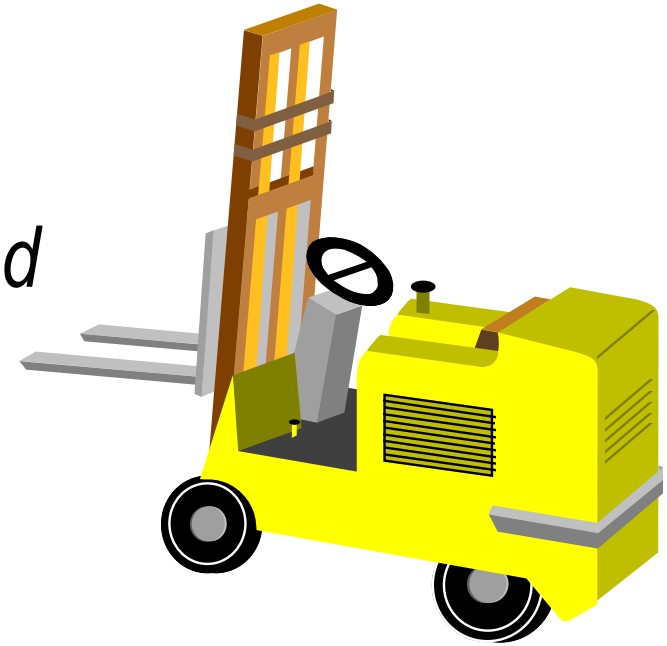
Includes:

- *movement within a facility,*
- *incoming and outgoing shipments of goods and materials (traffic management)*
- *decisions on shipping methods and time*
- *information flow throughout the supply chain (RFID to track goods)*

Logistics Management

- Includes and Integrates all materials functions

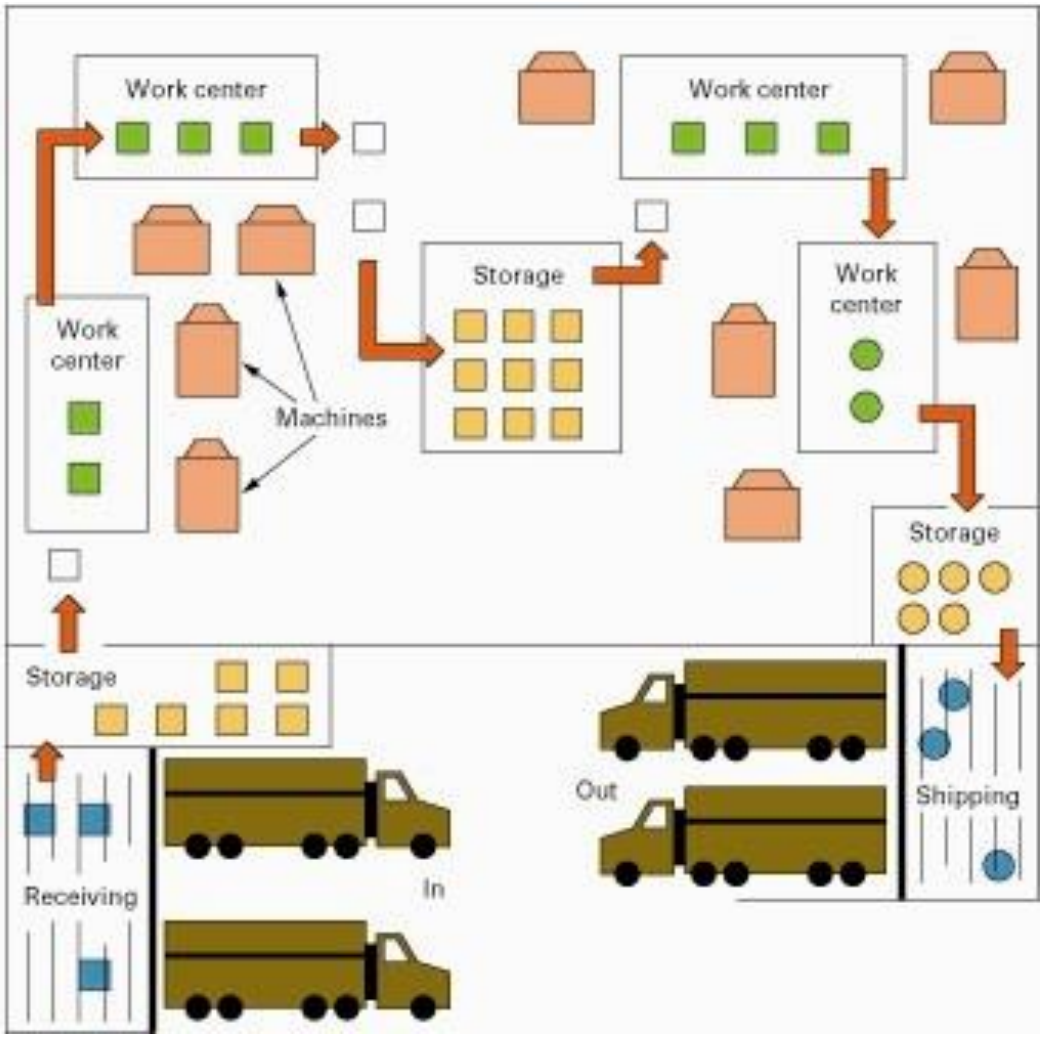
- *Purchasing*
- *Inventory management*
- *Production control*
- *Management of inbound outbound transportation, material handling*
- *Warehousing and stores*
- *Order fulfillment and distribution*
- *Incoming quality control*



Objective: Efficient, low cost operations

Materials Movement Within a Facility

FIGURE 11.5
Movement within a facility



INCOMING AND OUTGOING SHIPMENTS

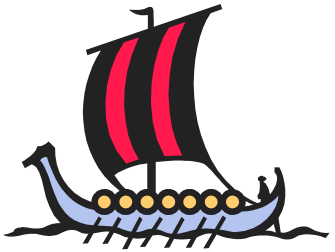
Traffic management

- Overseeing the shipment of incoming and outgoing goods
  - Handles schedules and decisions on shipping method and times, taking into account:
  - Costs of shipping alternatives
  - Government regulations
  - Needs of the organization
  - Shipping delays or disruptions

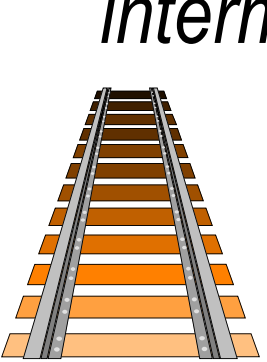
Distribution

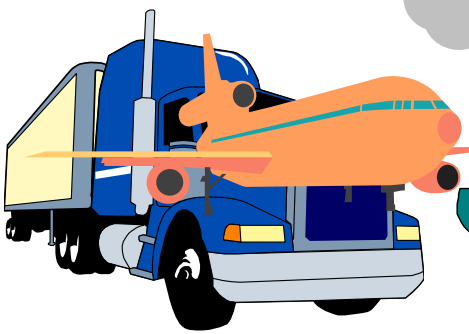
- ✓ *The actual movement of products and materials between locations*
- ✓ *Handling of materials and products at receiving docks, storing products, packaging, and shipping*
- ✓ *Often called logistics*
- ✓ *Driving force today is speed*
- ✓ *Particularly important for Internet dot-coms*

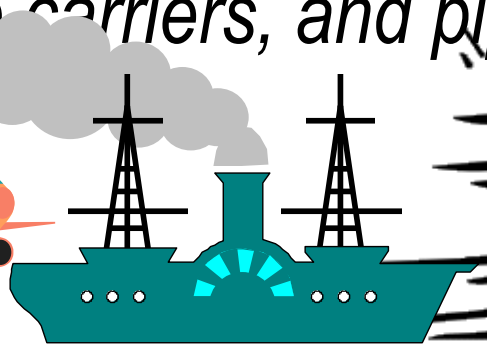
TRANSPORTATION

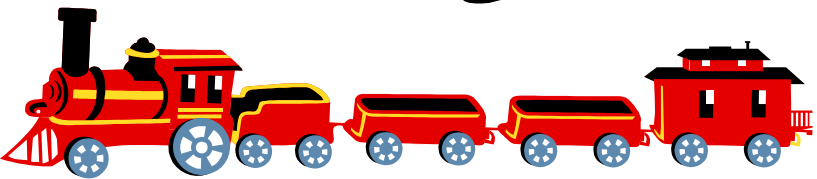


- ✓ *The movement of products and materials from one location to another as it makes its way to the end-use customer*
- ✓ *Important element, often overlooked*
- ✓ *Common methods are railroads, trucking, water, air, intermodal, package carriers, and pipelines*









EVALUATİNG SHİPPİNG ALTERNATİVES

Considerations include:

- Shipping costs
- Availabilitiy
- Materials being shipped
- Coordination of shipments with other SC activities
- Flexibility
- Speed
- Environmental considerations

DISTRIBUTION CENTERS AND WAREHOUSING

- ✓ *Trend is for more frequent orders in smaller quantities*
- ✓ *Flow-through facilities and automated material handling*
- ✓ *Final assembly and product configuration may be done at the DC*

WAREHOUSE MANAGEMENT SYSTEMS

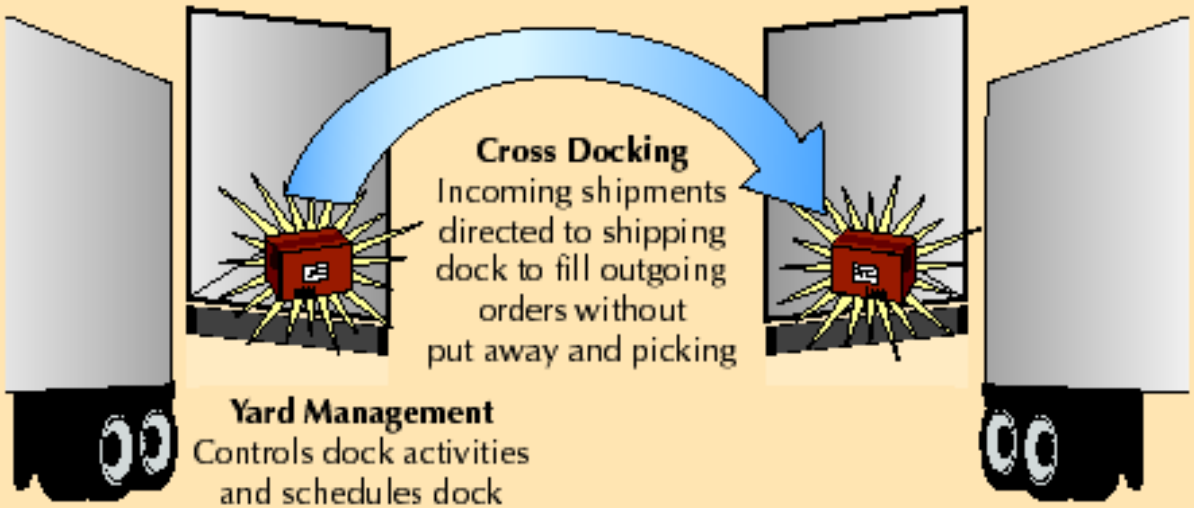
- ✓ *Highly automated systems*
- ✓ *Controls item putaway, picking, packing, and shipping*
- ✓ *Cross-docking: Goods arriving at a warehouse from a supplier are unloaded from the supplier's truck and loaded onto outbound trucks*
  - *Avoids warehouse storage*

Order Management
Orders added, modified or cancelled in real time

Labor Management
Plans, manages, and reports on performance of warehouse personnel

Warehouse Optimization
"Slotting" optimizes placement of items

Custom Labeling and Packaging
Special packaging; bar coding



Cross Docking
Incoming shipments directed to shipping dock to fill outgoing orders without put away and picking

Yard Management
Controls dock activities and schedules dock appointments to avoid bottlenecks

Order Tracking
Tracks inbound and outbound shipments

A WMS

Third-Party Logistics

The term used to describe the outsourcing of logistics management.

Includes warehousing and distribution

Reverse Logistics

Reverse logistics **– *the backward flow of goods returned to the supply chain (the process of transporting returned items)***

Products are returned to companies or third party handlers for a variety of reasons (*Defective products,recalled products,obsolete products, unsold products, parts replaced in the field, items for recycling, waste) *and in a variety of conditions

Processing returned goods

- ***Sorting, examining/testing, restocking, repairing***
- ***Reconditioning, recycling, disposing***

Elements of return management

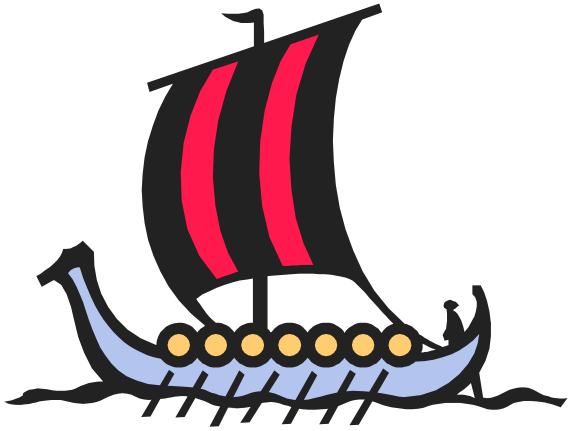
- ***Gatekeeping – screening returned goods to prevent incorrect acceptance of goods***
- ***Avoidance – finding ways to minimize the number of items that are returned***

GLOBAL SUPPLY CHAINS

- ✓Product design often uses inputs from around the world
- ✓Some manufacturing and service activities are outsourced to countries where labor and/or materials costs are lower
- ✓Products are sold globally

Complexities of Global Supply Chains

- ✓ *National and regional differences*
- ✓ *Language and cultural differences*
- ✓ *Currency fluctuations*
- ✓ *Political instability*
- ✓ *Quality issues*
- ✓ *Customs, business practices,*
- ✓ *Nonhomogeneoity of foreign markets*
- ✓ *Financial and economic considerations*
- ✓ *Governmental, environmental and regulatory considerations.*
- ✓ *Increased transportation costs and lead time*
- ✓ *Increased need for trust amongst supply chain partners*
- ✓ *Local capabilities*
- ✓ *Inadequate transportation and communication infrastructures*



INFRASTRUCTURE OBSTACLES TO GLOBAL TRADE

- ✓ *Some emerging markets lack suitable distribution systems, i.e. roads, rail systems*
- ✓ *Existing roads and ports may be inadequate*
- ✓ *Market instability, political instability*

- ✓ *Vertical integration is a common solution*

GLOBAL SUPPLY-CHAIN ISSUES

Supply chains in a global environment must be:

- ***Flexible enough to react to sudden changes*** *in parts availability, distribution, or shipping channels, import duties, and currency rates*
- ***Able to use the latest computer and transmission technologies*** *to schedule and manage the shipment of parts in and finished products out*
- ***Staffed with local specialists*** *to handle duties, trade, freight, customs and political issues*

CHALLENGES TO OPTİMİZİNG SCS

- Barriers to integration of organizations
- Getting top management on board
- Small businesses
- Variability and uncertainty
- Long lead times
- Dealing with trade-offs

TRADE-OFFS İN SCM

1. Lot-size-inventory (bullwhip)
2. Inventory-transportation costs
   - Cross-docking
3. Lead time-transportation costs
4. Product variety-inventory
   - Delayed differentiation
5. Cost-customer service
   - Disintermediation

TRADE-OFFS

Lot-size-inventory trade-off

- Large lot sizes yield benefits in terms of quantity discounts and lower annual setup costs, but it increases the amount of safety stock (and inventory carrying costs) carried by suppliers

Inventory-transportation costs

- Suppliers prefer to ship full truckloads instead of partial loads to spread shipping costs over as many units as possible. This leads to greater holding costs for customers
- Cross-docking
  - A technique whereby goods arriving at a warehouse from a supplier are unloaded from the suppliers truck and loaded onto outbound truck, thereby avoiding warehouse storage

TRADE-OFFS

Lead time-transportation costs

- Suppliers like to ship in full loads, but waiting for sufficient orders and/or production to achieve a full load may increase lead time

Product variety-inventory

- Greater product variety usually means smaller lot sizes and higher setup costs, as well as higher transportation and inventory management costs
- Delayed differentiation (a technique to increase SC efficiency)
  - Production of standard components and subassemblies which are held until late in the process to add differentiating features

TRADE-OFFS

Cost-customer service

- Producing and shipping in large lots reduces costs, but increases lead time
- Disintermediation (a technique to increase SC efficiency)
  - Reducing one or more steps in a supply chain by cutting out one or more intermediaries
- Drop Shipping
  - Shipping directly from the supplier to the end consumer, rather than from the seller, saving both time and reshipping costs

TECHNİQUES TO INCREASE SC EFFİCİENCY

Delayed differentiation

Postponing the tasks of differentiating a product for a specific customer until the latest possible point in the supply-chain network. Production of standard components and subassemblies, which are held until late in the process to add differentiating features

- Channel assembly (sending distributors the individual components and modules rather than finished goods)

Disintermediation

- Reducing one or more steps in a supply chain by cutting out one or more intermediaries

+ Cross Docking

+ Drop Shipping

Other Techniques to Increase SC Efficiency

- ***Outsourcing***
- ***Blanket orders*** *(a long-term purchase commitment to a supplier for items that are to be delivered against short-term releases to ship*
- ***Drop Shipping and Special Packaging*** **–** *supplier will ship to end consumer rather than to seller*
- ***Vendor managed inventory systems*** *The use of a local supplier to maintain inventory for the manufacturer.*
- ***Electronic ordering and funds transfer*** *(paperless ordering, payment by wire)*
- ***Internet purchasing*** *(e-procurement)*

POTENTİAL SOLUTİONS TO SC PROBLEMS

Problem	*Potential Improvement*	*Benefits*	*Possible Drawbacks*
Large inventories	***Smaller, more frequent deliveries***	***Reduced holding costs***	***Traffic congestion Increased costs***
Long lead times	***Delayed differentiation Disintermediation***	***Quick response***	***May not be feasible May need absorb functions***
Large number of parts	***Modular***	***Fewer parts Simpler ordering***	***Less variety***
Cost Quality	***Outsourcing***	***Reduced cost, higher quality***	***Loss of control***
Variability	***Shorter lead times, better forecasts***	***Able to match supply and demand***	***Less variety***

CRITICAL ISSUES İN SCM

Increased strategic importance

Emphasis on cost, quality,agility and customer service

Technology management

Increased conversion to lean production

Just-in-time deliveries

Few suppliers and vendor integration

Increased outsourcing

Globalization

Supply-Chain Performance Compared

	Typical Firms	Benchmark Firms
Administrative costs as percent of purchases	3.3%	0.8%
Lead time (weeks)	15	8
Time spent in placing order	42 minutes	15 minutes
Percentage of late deliveries	33%	2%
Percentage of rejected material	1.5%	.0001%
Number of shortages per year	400	4

Forecasting/Ordering

Then: Nabisco determines the amount of Planters cashews a customer in New York might sell in a quarter, without consulting the customer.

Now: Nabisco and its customer share sales forecasts based on current point-of-sale data, past demand patterns, and upcoming promotions via the Web, and agree on an amount to supply.

Procurement

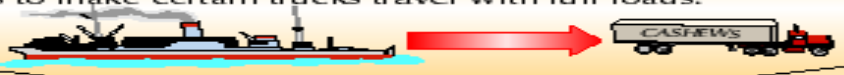
Then: Nabisco phones its Brazilian office and employees deliver the orders in person to local farmers, who put the raw cashews on trucks, which take them to the port.

Now: Nabisco contacts its Brazilian office by e-mail, but employees still must contact local farmers personally.

Transportation

Then: The shipping company notifies Nabisco when the cashews have sailed. When the cashews arrive in Jacksonville, Florida, a freight forwarder processes the paperwork to clear the shipment through customs, and scurries to locate a truck to deliver them to Nabisco plants. The truck takes the cashews to Nabisco's manufacturing plant, although it may be only half-full and return empty, costing Nabisco money.

Now: Shippers and truckers share up-to-date data online via a collaborative global logistics system like Nistevo or ClearCross that connects multiple manufacturers and transportation companies and handles the customs process. The system matches orders with carriers to make certain trucks travel with full loads.



Distribution

Then: The nuts are roasted and packed, and trucks take them to Nabisco's 12 warehouses across the country, where they are ready to be shipped to stores. However, they may not be near the store where the customer needs them because regional demand has not been discussed.

Now: After the nuts are roasted and packed at the plant, Nabisco sends the cashews to a third-party distributor, which relieves Nabisco of a supply chain activity not among its core competencies. The distributor consolidates the nuts on trucks with other products from Nabisco's competitors going to a customer resulting in full loads.

Customer

Then: If Nabisco ordered too many cashews they will turn soft in the warehouses, and if they ordered too few the customer will buy cashews elsewhere.

Now: Nabisco correctly knows the customer's needs so there is neither a shortage nor an oversupply of cashews. Transportation, distribution, warehousing, and inventory costs drop, and product and service quality improve.