

Supply Chain Management



Outline

- ☑ ***The Supply Chain's Strategic Importance***
 - ☑ ***Global Supply Chain Issues***
- ☑ ***Supply Chain Economics***
 - ☑ ***Make-or-Buy Decisions***
 - ☑ ***Outsourcing***

Outline – Continued

- ☑ ***Ethics in the Supply Chain***
- ☑ ***Supply Chain Strategies***
 - ☑ ***Many Suppliers***
 - ☑ ***Few Suppliers***
 - ☑ ***Vertical Integration***
 - ☑ ***Keiretsu Networks***
 - ☑ ***Virtual Companies***

Outline – Continued

- ☑ ***Managing the Supply Chain***
 - ☑ ***Issues in an Integrated Supply Chain***
 - ☑ ***Opportunities in an Integrated Supply Chain***
- ☑ ***E-Procurement***
 - ☑ ***Online Catalogs***
 - ☑ ***Auctions***
 - ☑ ***RFQs***
 - ☑ ***Realtime Inventory Tracking***

Outline – Continued

- ☒ ***Vendor Selection***
 - ☒ ***Vendor Evaluation***
 - ☒ ***Vendor Development***
 - ☒ ***Negotiations***

Outline – Continued

- ☒ ***Logistics Management***
 - ☒ ***Distribution Systems***
 - ☒ ***Third-Party Logistics***
 - ☒ ***Cost of Shipping Alternatives***
 - ☒ ***Logistics, Security, and JIT***
- ☒ ***Measuring Supply Chain Performance***

Learning Objectives

When you complete this chapter you should be able to:

- 1. Explain the strategic importance of the supply chain***
- 2. Identify five supply chain strategies***
- 3. Explain issues and opportunities in the supply chain***
- 4. Describe approaches to supply chain negotiations***

Learning Objectives

When you complete this chapter you should be able to:

- ☒ *Evaluate supply chain performance***
- ☒ *Compute percent of assets committed to inventory***
- ☒ *Compute inventory turnover***



Darden Restaurants

- ✓ ***Largest publicly traded casual dining company in the world***
- ✓ ***Serves over 300 million meals annually in more than 1,400 restaurants in the US and Canada***
- ✓ ***Annual sales of \$2.4 billion***
- ✓ ***Operations is the strategy***



Darden Restaurants

- ✓ ***Sources food from five continents and thousands of suppliers***
- ✓ ***Four distinct supply chains***
- ✓ ***Over \$1.5 billion spent annually in supply chains***
- ✓ ***Competitive advantage achieved through superior supply chain***

The Supply Chain's Strategic Importance

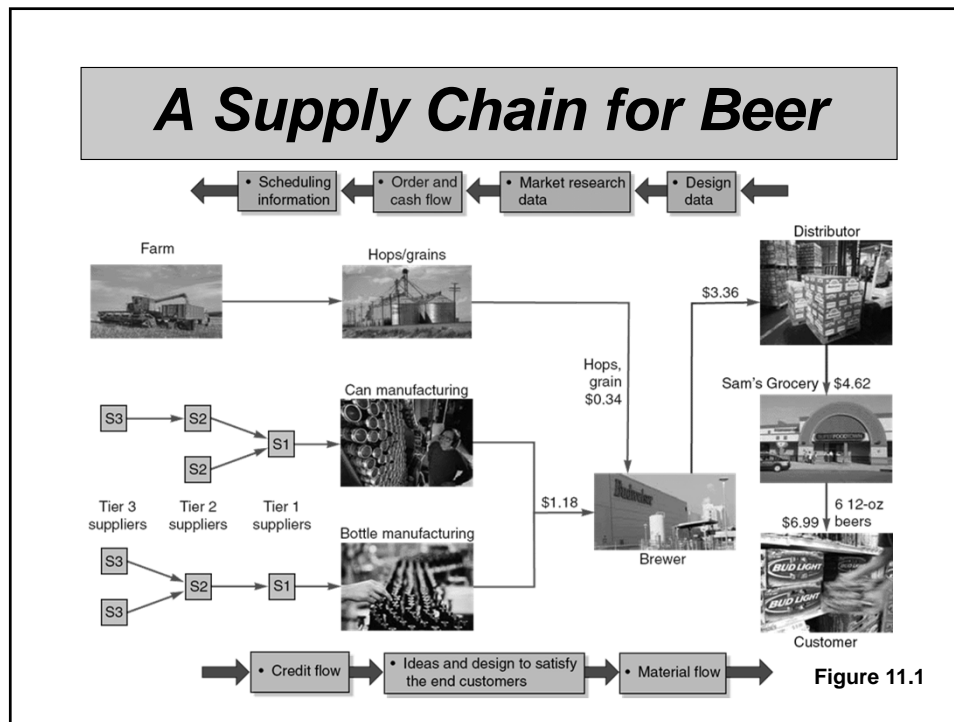
Supply chain management is the integration of the activities that procure materials and services, transform them into intermediate goods and the final product, and deliver them to customers

Competition is no longer between companies; it is between supply chains

Supply Chain Management

Important activities include determining

- 1. Transportation vendors***
- 2. Credit and cash transfers***
- 3. Suppliers***
- 4. Distributors***
- 5. Accounts payable and receivable***
- 6. Warehousing and inventory***
- 7. Order fulfillment***
- 8. Sharing customer, forecasting, and production information***



Global Supply Chain Issues

Supply chains in a global environment must be able to

- ☑ **React to sudden changes in parts availability, distribution, or shipping channels, import duties, and currency rates**
- ☑ **Use the latest computer and transmission technologies to schedule and manage the shipment of parts in and finished products out**
- ☑ **Staff with local specialists who handle duties, freight, customs and political issues**

How Supply Chain Decisions Impact Strategy

	Low-Cost Strategy	Response Strategy	Differentiation Strategy
Supplier's goal	Supply demand at lowest possible cost (e.g., Emerson Electric, Taco Bell)	Respond quickly to changing requirements and demand to minimize stockouts (e.g., Dell Computers)	Share market research; jointly develop products and options (e.g., Benetton)
Primary selection criteria	Select primarily for cost	Select primarily for capacity, speed, and flexibility	Select primarily for product development skills

Table 11.1

How Supply Chain Decisions Impact Strategy

	Low-Cost Strategy	Response Strategy	Differentiation Strategy
Process characteristics	Maintain high average utilization	Invest in excess capacity and flexible processes	Modular processes that lend themselves to mass customization
Inventory characteristics	Minimize inventory throughout the chain to hold down cost	Develop responsive system with buffer stocks positioned to ensure supply	Minimize inventory in the chain to avoid obsolescence

Table 11.1

How Supply Chain Decisions Impact Strategy

	<i>Low-Cost Strategy</i>	<i>Response Strategy</i>	<i>Differentiation Strategy</i>
<i>Lead-time characteristics</i>	<i>Shorten lead time as long as it does not increase costs</i>	<i>Invest aggressively to reduce production lead time</i>	<i>Invest aggressively to reduce development lead time</i>
<i>Product-design characteristics</i>	<i>Maximize performance and minimize costs</i>	<i>Use product designs that lead to low setup time and rapid production ramp-up</i>	<i>Use modular design to postpone product differentiation as long as possible</i>

Table 11.1

Supply Chain Economics

Supply Chain Costs as a Percent of Sales

<i>Industry</i>	<i>% Purchased</i>
<i>All industry</i>	<i>52</i>
<i>Automobile</i>	<i>67</i>
<i>Food</i>	<i>60</i>
<i>Paper</i>	<i>55</i>
<i>Petroleum</i>	<i>79</i>
<i>Transportation</i>	<i>62</i>

Table 11.2

Some SCM KPIs

Title	Description	Direction	Unit Type
Inventory Accuracy	Accuracy of the book inventory versus the counted inventory.	Minimize	Percentage
Inventory Turns	This KPI tells us how often the average inventory over a given period of time (usually a year) is sold in that same period of time.		Number
% of orders delivered with damaged products/items	Percentage of orders delivered with damaged products/items	Minimize	Percentage
Total transport cost as % of delivered sales	Total transport cost as a percentage of delivered sales.		Percentage
Total logistics costs as a percentage of sales	Total logistics costs as a percentage of sales.		Percentage
Scrap value %	Scrap value as a percentage of production value.	Minimize	Percentage
% of Inventory items incorrectly located	Percentage of Inventory items incorrectly located.	Minimize	Percentage
Size of safety stock	Size of safety stock is a term used to describe a level of stock that is maintained below the cycle stock to buffer against stock-outs. Safety Stock or Buffer Stock exists to counter uncertainties in supply and demand.	Range	Percentage
Inventory holding costs (IHC) as % of gross sales	Inventory holding costs (IHC) as a percentage of gross sales.	Minimize	Percentage
Inventory holding costs (IHC) as % of inventory value	Inventory holding costs (IHC) as a percentage of inventory value.	Minimize	Percentage
Customer order cycle time	The average time it takes to fill a customer order.	Minimize	Time
% of orders/items arrives at the right location	Percentage of orders/items arrives at the right location.	Maximize	Percentage
% of stock available at customers first request	Percentage of stock available at customers first request.	Maximize	Percentage
Damages as % of throughput	This is the ratio of damaged goods to actual throughput (e.g. per Truck Load).	Minimize	Percentage
Empty miles	Percentage of miles (trips) that carried no inventory/freight.	Minimize	Percentage

Some SCM KPIs (cont'd)

Title	Description	Direction	Unit Type
Inventory to obsolete goods ratio	Inventory to obsolete goods ratio. The ratio indicating the relative measure of the currently obsolete or inactive assets held by an entity. CALCULATION: (Obsolete or Inactive Assets) / Total Assets		Ratio
Percentage of problem suppliers	Percentage of problem suppliers.	Minimize	Percentage
% of safety stock used	Percentage of safety stock used in measurement period. Safety stock is a term used to describe a level of stock that is maintained below the cycle stock to buffer against stock-outs. Safety Stock or Buffer Stock exists to counter uncertainties in supply and demand.	Minimize	Percentage
Requested Time in Full (RTIF)	RTIF measures the success at delivering according to original customer delivery requirements.	Maximize	Percentage
% of orders that were captured with incorrect attributes	Percentage of orders that were captured with incorrect attributes (e.g. part #, qty, request date, delivery address)	Minimize	Percentage
% of undamaged goods after shipping/transportation	Percentage of undamaged goods after shipping/transportation.	Maximize	Percentage
On time ship rate	What percent of orders were shipped on or before the requested ship date. On time ship rate can be calculated on a line item, SKU, case or value basis.	Maximize	Percentage
Delivery Schedule Adherence (DSA)	Delivery Schedule adherence (DSA) is a business metric used to calculate the timeliness of deliveries from suppliers. Delivery schedule adherence is calculated by dividing the number of on-time deliveries in a period by the total number of deliveries made. The result is then multiplied by 100 and expressed as a percentage.	Maximize	Percentage
% of orders that were delivered with requested documentation	Percentage of orders that were delivered with the requested documentation.	Maximize	Percentage
Inventory Days of Supply	Inventory Days of Supply = Average Inventory / Cost of a Day's Sales Example: \$20 / \$0.5 = 40 days supply		Time
Percent Variability in Lead Time	Measures the level adjustment of the SKU to variation in pattern and quantity of demand. Represented as a percentage. A value of 1-2% is set as a benchmark.	Minimize	Percentage
Insurance costs as % of inventory costs	Insurance accounts for a portion of the inventory costs. Since it is better to be safe than sorry, companies generally get the material insured. It generally works out to 1%.		Percentage
% of shipment visibility/traceability	Shipment visibility/traceability percentage: calculated by dividing the total number of shipments via carriers with order tracking systems, by the total number of shipments sent during a period.	Maximize	Percentage
Manufacturing Schedule Adherence	The absolute variance of actual production to scheduled production.	Minimize	Percentage
% of items equipped with Radio frequency identification (RFID)	Percentage of items equipped with Radio frequency identification (RFID).		Percentage

Make-or-Buy Decisions

Reasons for Making

1. *Maintain core competence*
2. *Lower production cost*
3. *Unsuitable suppliers*
4. *Assure adequate supply (quantity or delivery)*
5. *Utilize surplus labor or facilities*
6. *Obtain desired quality*
7. *Remove supplier collusion*
8. *Obtain unique item that would entail a prohibitive commitment for a supplier*
9. *Protect personnel from a layoff*
10. *Protect proprietary design or quality*
11. *Increase or maintain size of company*

Table 11.4

Make-or-Buy Decisions

Reasons for Buying

1. *Frees management to deal with its core competence*
2. *Lower acquisition cost*
3. *Preserve supplier commitment*
4. *Obtain technical or management ability*
5. *Inadequate capacity*
6. *Reduce inventory costs*
7. *Ensure alternative sources*
8. *Inadequate managerial or technical resources*
9. *Reciprocity*
10. *Item is protected by a patent or trade secret*

Table 11.4

Outsourcing

- ☑ ***Transfers traditional internal activities and resources of a firm to outside vendors***
- ☑ ***Utilizes the efficiency that comes with specialization***
- ☑ ***Firms outsource information technology, accounting, legal, logistics, and production***

Ethics in the Supply Chain

- ☑ ***Opportunities for unethical behavior are enormous and temptations are high***
- ☑ ***Many companies have strict rules and codes of conduct that define acceptable behavior***
- ☑ ***Institute for Supply Management has developed a detailed set of principles and standards for ethical behavior***

Principles and Standards for Ethical Supply Management Conduct

***LOYALTY TO YOUR ORGANIZATION
JUSTICE TO THOSE WITH WHOM YOU
DEAL
FAITH IN YOUR PROFESSION***

Table 11.5

Principles and Standards for Ethical Supply Management Conduct

- 1. Avoid the intent and appearance of unethical or compromising practice in relationships, actions, and communications***
- 2. Demonstrate loyalty to the employer by diligently following the lawful instructions of the employer, using reasonable care and granted authority***
- 3. Avoid any personal business or professional activity that would create a conflict between personal interests and the interests of the employer***

Table 11.5

Principles and Standards for Ethical Supply Management Conduct

4. *Avoid soliciting or accepting money, loans, credits, or preferential discounts, and the acceptance of gifts, entertainment, favors, or services from present or potential suppliers that might influence, or appear to influence, supply management decisions*
5. *Handle confidential or proprietary information with due care and proper consideration of ethical and legal ramifications and government regulations*
6. *Promote positive supplier relationships through courtesy and impartiality*
7. *Avoid improper reciprocal agreements*

Table 11.5

Principles and Standards for Ethical Supply Management Conduct

8. *Know and obey the letter and spirit of laws applicable to supply management*
9. *Encourage support for small, disadvantaged, and minority-owned businesses*
10. *Acquire and maintain professional competence*
11. *Conduct supply management activities in accordance with national and international laws, customs, and practices, your organization's policies, and these ethical principles and standards of conduct*
12. *Enhance the stature of the supply management profession*

Table 11.5

Supply Chain Strategies

- ☑ ***Negotiating with many suppliers***
- ☑ ***Long-term partnering with few suppliers***
- ☑ ***Vertical integration***
- ☑ ***Keiretsu***
- ☑ ***Virtual companies that use suppliers on an as needed basis***

Many Suppliers

- ☑ ***Commonly used for commodity products***
- ☑ ***Purchasing is typically based on price***
- ☑ ***Suppliers compete with one another***
- ☑ ***Supplier is responsible for technology, expertise, forecasting, cost, quality, and delivery***

Few Suppliers

- ✓ ***Buyer forms longer term relationships with fewer suppliers***
- ✓ ***Create value through economies of scale and learning curve improvements***
- ✓ ***Suppliers more willing to participate in JIT programs and contribute design and technological expertise***
- ✓ ***Cost of changing suppliers is huge***

Vertical Integration

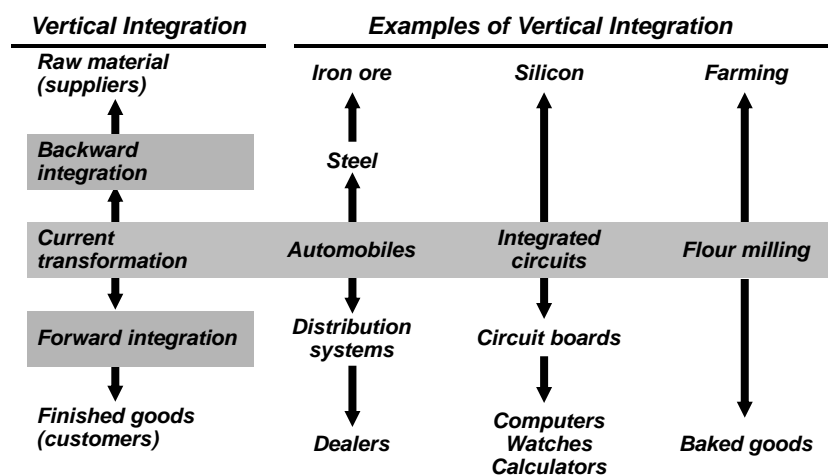


Figure 11.2

Vertical Integration

- ✓ ***Developing the ability to produce goods or service previously purchased***
- ✓ ***Integration may be forward, towards the customer, or backward, towards suppliers***
- ✓ ***Can improve cost, quality, and inventory but requires capital, managerial skills, and demand***
- ✓ ***Risky in industries with rapid technological change***

Keiretsu Networks

- ✓ ***A middle ground between few suppliers and vertical integration***
- ✓ ***Supplier becomes part of the company coalition***
- ✓ ***Often provide financial support for suppliers through ownership or loans***
- ✓ ***Members expect long-term relationships and provide technical expertise and stable deliveries***
- ✓ ***May extend through several levels of the supply chain***

Virtual Companies

- ☑ ***Rely on a variety of supplier relationships to provide services on demand***
- ☑ ***Fluid organizational boundaries that allow the creation of unique enterprises to meet changing market demands***
- ☑ ***Exceptionally lean performance, low capital investment, flexibility, and speed***

Managing the Supply Chain

There are significant management issues in controlling a supply chain involving many independent organizations

- ☑ ***Mutual agreement on goals***
- ☑ ***Trust***
- ☑ ***Compatible organizational cultures***

Issues in an Integrated Supply Chain

- ☑ ***Local optimization - focusing on local profit or cost minimization based on limited knowledge***
- ☑ ***Incentives (sales incentives, quantity discounts, quotas, and promotions) - push merchandise prior to sale***
- ☑ ***Large lots - low unit cost but do not reflect sales***
 - ☑ ***Bullwhip effect - stable demand becomes lumpy orders through the supply chain***

Opportunities in an Integrated Supply Chain

- ☑ ***Accurate “pull” data***
- ☑ ***Lot size reduction***
- ☑ ***Single stage control of replenishment***
- ☑ ***Vendor managed inventory***
- ☑ ***Blanket orders***

Opportunities in an Integrated Supply Chain

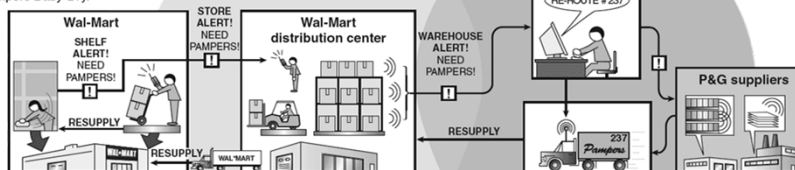
- ✓ **Standardization**
- ✓ **Postponement**
- ✓ **Drop shipping and special packaging**
- ✓ **Pass-through facility**
- ✓ **Channel assembly**

Radio Frequency Tags

Radio Frequency Tags: Keeping the Shelves Stocked

Supply chains work smoothly when sales are steady, but often break down when confronted by a sudden surge in demand. Radio frequency ID (or RFID) tags can change that by providing real-time information about what's happening on store shelves. Here's how the system works for Proctor & Gamble's Pampers.

1. A special promotion causes Wal-Mart shoppers to snap up boxes of Pampers Baby-Dry.



2. Each box of Pampers has an RFID tag. Shelf-mounted scanners alert the stockroom of urgent need for restock.

3. Wal-Mart's inventory management system tracks and links its in-store stock and its warehouse stock, prompting quicker replenishment and providing accurate real-time data.

4. Wal-Mart's systems are linked to the P&G supply-chain management system. Demand spikes reported by RFID tags are immediately visible throughout the supply chain.

5. P&G's logistics software tracks its trucks with GPS locators, and tracks their contents with RFID tag readers. Regional managers can reroute trucks to fill urgent needs.

6. P&G suppliers also use RFID tags and readers on their raw materials, giving P&G visibility several tiers down the supply chain, and giving suppliers the ability to accurately forecast demand and production.

E-Procurement

- ☒ ***Uses the internet to facilitate purchasing***
- ☒ ***Electronic ordering and funds transfer***
 - ☒ ***Electronic data interchange (EDI)***
 - ☒ ***Advanced shipping notice***

E-Procurement

- ☒ ***Online catalogs***
 - ☒ ***Catalogs provided by vendors***
 - ☒ ***Catalogs published by intermediaries***
 - ☒ ***Exchanges provided by buyers***

Internet Trading Exchanges

- ✓ ***Health care products – ghx.com***
- ✓ ***Retail goods – gnx.com***
- ✓ ***Defense and aerospace products – exostar.com***
- ✓ ***Food, beverage, consumer products – transora.com***
- ✓ ***Steel and metal products – metalsite.com***
- ✓ ***Hotels – avendra.com***

E-Procurement

- ✓ ***Auctions***
 - ✓ ***Maintained by buyers, sellers, or intermediaries***
 - ✓ ***Low barriers to entry***
 - ✓ ***Increase in the potential number of buyers***



E-Procurement

- ☑ ***RFQs***
 - ☑ ***Can make requests for quotes (RFQs) less costly***
 - ☑ ***Improves supplier selection***
- ☑ ***Real-time inventory tracking***

Vendor Selection

- ☑ ***Vendor evaluation***
 - ☑ ***Critical decision***
 - ☑ ***Find potential vendors***
 - ☑ ***Determine the likelihood of them becoming good suppliers***
- ☑ ***Vendor Development***
 - ☑ ***Training***
 - ☑ ***Engineering and production help***
 - ☑ ***Establish policies and procedures***

Vendor Selection

- ☑ **Negotiations**
 - ☑ **Cost-Based Price Model - supplier opens books to purchaser**
 - ☑ **Market-Based Price Model - price based on published, auction, or indexed price**
 - ☑ **Competitive Bidding - used for infrequent purchases but may make establishing long-term relationships difficult**

Vendor Evaluation

Criteria	Weights	Scores (1-5)	Weight x Score
<i>Engineering/research/innovation skills</i>	.20	5	1.0
<i>Production process capability (flexibility/technical assistance)</i>	.15	4	.6
<i>Distribution/delivery capability</i>	.05	4	.2
<i>Quality systems and performance</i>	.10	2	.2
<i>Facilities/location</i>	.05	2	.1
<i>Financial and managerial strength (stability and cost structure)</i>	.15	4	.6
<i>Information systems capability (e-procurement, ERP)</i>	.10	2	.2
<i>Integrity (environmental compliance/ethics)</i>	.20	5	1.0
Total	1.00		3.9

Logistics Management

- ☑ ***Objective is to obtain efficient operations through the integration of all material acquisition, movement, and storage activities***
- ☑ ***Is a frequent candidate for outsourcing***
- ☑ ***Allows competitive advantage to be gained through reduced costs and improved customer service***

Distribution Systems

- ☑ ***Trucking***
 - ☑ ***Moves the vast majority of manufactured goods***
 - ☑ ***Chief advantage is flexibility***
- ☑ ***Railroads***
 - ☑ ***Capable of carrying large loads***
 - ☑ ***Little flexibility though containers and piggybacking have helped with this***

Distribution Systems

☒ ***Airfreight***

- ☒ ***Fast and flexible for light loads***
- ☒ ***May be expensive***



Distribution Systems

☒ ***Waterways***

- ☒ ***Typically used for bulky, low-value cargo***
- ☒ ***Used when shipping cost is more important than speed***



Distribution Systems

- ✓ ***Pipelines***
 - ✓ ***Used for transporting oil, gas, and other chemical products***

Third-Party Logistics

- ✓ ***Outsourcing logistics can reduce costs and improve delivery reliability and speed***
- ✓ ***Coordinate supplier inventory with delivery services***
- ✓ ***May provide warehousing, assembly, testing, shipping, customs***



Cost of Shipping Alternatives

- ☑ *Product in transit is a form of inventory and has a carrying cost*
- ☑ *Faster shipping is generally more expensive than slower shipping*
- ☑ *We can evaluate the two costs to better understand the trade-off*

Cost of Shipping Alternatives

Value of connectors = \$1,750.00

Holding cost = 40% per year

Second carrier is 1 day faster and \$20 more expensive

$$\begin{aligned} \text{Daily cost of holding product} &= \left(\frac{\text{Annual holding cost}}{\text{cost}} \times \frac{\text{Product value}}{\text{value}} \right) / 365 \\ &= (.40 \times \$1,750) / 365 = \$1.92 \end{aligned}$$

Since it costs less to hold the product one day longer than it does for the faster shipping (\$1.92 < \$20), we should use the cheaper, slower shipper

Logistics, Security, and JIT

- ✓ ***Borders are becoming more open in the U.S. and around the world***
- ✓ ***Monitoring and controlling stock moving through supply chains is more important than ever***
- ✓ ***New technologies are being developed to allow close monitoring of location, storage conditions, and movement***



Measuring Supply Chain Performance

	<i>Typical Firms</i>	<i>Benchmark Firms</i>
<i>Lead time (weeks)</i>	15	8
<i>Time spent placing an order</i>	42 minutes	15 minutes
<i>Percentage of late deliveries</i>	33%	2%
<i>Percentage of rejected material</i>	1.5%	.0001%
<i>Number of shortages per year</i>	400	4

Table 11.6

Measuring Supply Chain Performance

☑ Assets committed to inventory

$$\text{Percent invested in inventory} = \left(\frac{\text{Total inventory investment}}{\text{Total assets}} \right) \times 100$$

Investment in inventory = \$11.4 billion

Total assets = \$44.4 billion

Percent invested in inventory = (11.4/44.4) x 100 = 25.7%

Measuring Supply Chain Performance

Inventory as a % of Total Assets (with exceptional performance)

Manufacturing (Toyota 5%)	20%
Wholesale (Coca-Cola 2.9%)	34%
Restaurants (McDonald's .05%)	2.9%
Retail (Home Depot 25.7%)	27%

Table 11.7

Measuring Supply Chain Performance

☑ *Inventory turnover*

$$\text{Inventory turnover} = \left(\frac{\text{Cost of goods sold}}{\text{Inventory investment}} \right)$$

Measuring Supply Chain Performance

Examples of Annual Inventory Turnover

<i>Food, Beverage, Retail</i>		<i>Manufacturing</i>	
<i>Anheuser Busch</i>	<i>15</i>	<i>Dell Computer</i>	<i>90</i>
<i>Coca-Cola</i>	<i>14</i>	<i>Johnson Controls</i>	<i>22</i>
<i>Home Depot</i>	<i>5</i>	<i>Toyota (overall)</i>	<i>13</i>
<i>McDonald's</i>	<i>112</i>	<i>Nissan (assembly)</i>	<i>150</i>

Table 11.8

Measuring Supply Chain Performance

☒ Inventory turnover

<i>Net revenue</i>	\$32.5
<i>Cost of goods sold</i>	\$14.2
<i>Inventory:</i>	
<i>Raw material inventory</i>	\$0.74
<i>Work-in-process inventory</i>	\$0.11
<i>Finished goods inventory</i>	\$0.84
<i>Total inventory investment</i>	\$1.69

Measuring Supply Chain Performance

☒ Inventory turnover

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory investment}}$$

$$= 14.2 / 1.69 = 8.4$$

<i>Total inventory investment</i>	\$1.69
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Measuring Supply Chain Performance

☑ *Inventory turnover*

$$\text{Average weekly cost of goods sold} = \$14.2 / 52 = \$0.273$$

$$\begin{aligned} \text{Weeks of supply} &= \frac{\text{Inventory investment}}{\text{Average weekly cost of goods sold}} \\ &= 1.69 / 0.273 = 6.19 \text{ weeks} \end{aligned}$$