

11

Supply-Chain Management

**PowerPoint presentation to accompany
Heizer and Render
Operations Management, 10e
Principles of Operations Management, 8e**

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10

OM Strategy Decisions

Supply-Chain Management

The objective is to build a chain of suppliers that focuses on maximizing value to the ultimate customer

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 final products, and deliver them through a distribution system

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**

A Supply Chain for Beer

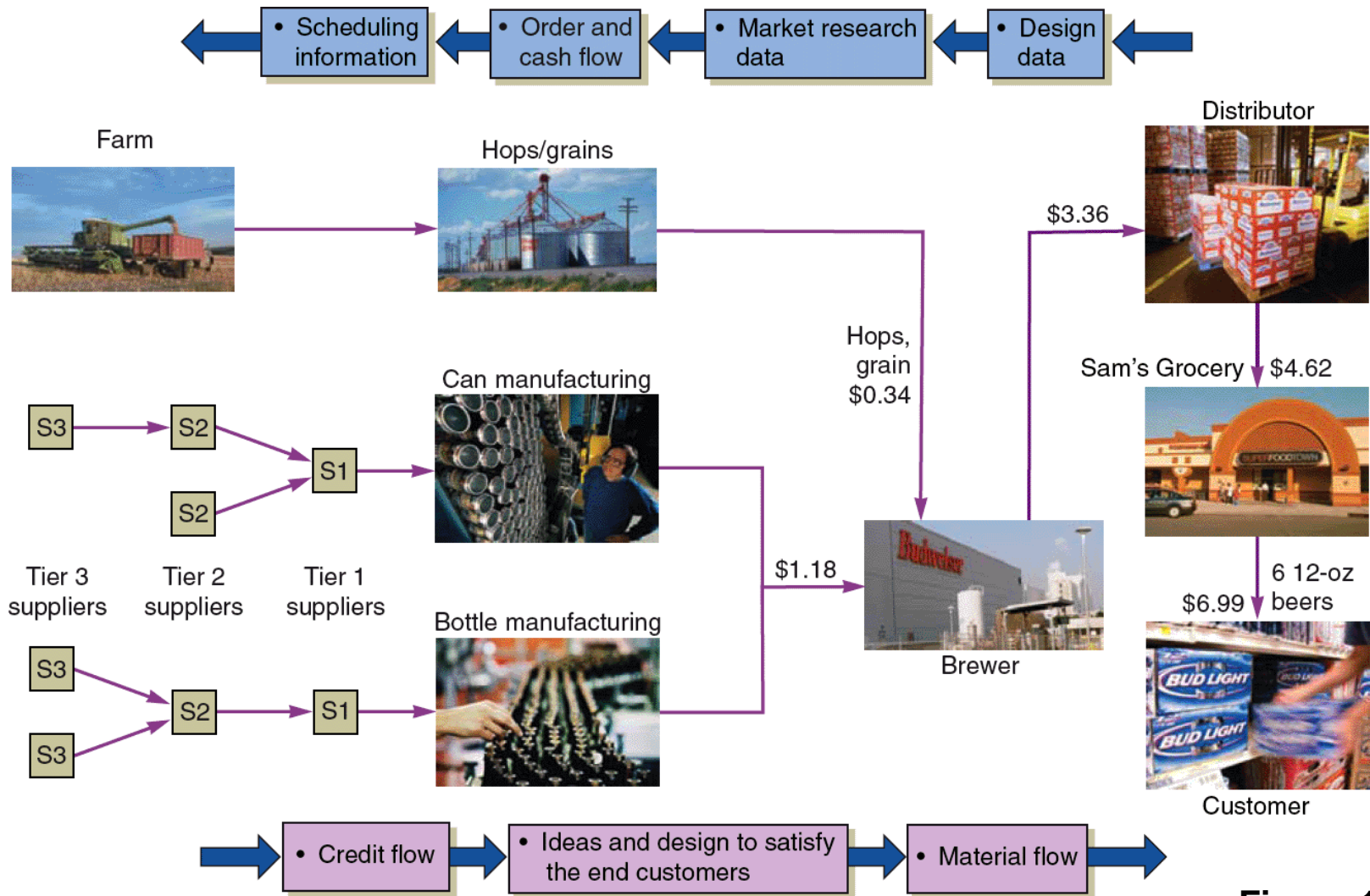


Figure 11.1

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

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

Table 11.1

Supply Chain Risk

- ◆ **More reliance on supply chains means more risk**
- ◆ **Fewer suppliers increase dependence**
- ◆ **Compounded by globalization and logistical complexity**
- ◆ **Vendor reliability and quality risks**
- ◆ **Political and currency risks**

Supply Chain Risk

- ◆ **Mitigate and react to disruptions in**
 - 1. Processes**
 - 2. Controls**
 - 3. Environment**

Supply Chain Risk

- ◆ **Reducing risk in supply chains**
 - ◆ **Process risk at McDonald's**
 - ◆ **Process risk at Ford**
 - ◆ **Controls at Darden Restaurants**
 - ◆ **Control risk at Boeing**
 - ◆ **Environmental risk at Hard Rock Café**
 - ◆ **Environmental risk at Toyota**

Ethics and Sustainability

- ◆ **Personal ethics**
 - ◆ **Institute for Supply Management Principles and Standards**
- ◆ **Ethics within the supply chain**
- ◆ **Ethical behavior regarding the environment**

Principles and Standards for Ethical Supply Management Conduct

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

Table 11.2

Supply Chain Economics

Supply Chain Costs as a Percent of Sales

Industry	% Purchased
All industry	52
Automobile	67
Food	60
Lumber	61
Paper	55
Petroleum	79
Transportation	62

Table 11.3

Supply Chain Economics

Dollars of additional sales needed to equal \$1 saved through the supply chain

Percent Net Profit of Firm	Percent of Sales Spent in the Supply Chain						
	30%	40%	50%	60%	70%	80%	90%
2	\$2.78	\$3.23	\$3.85	\$4.76	\$6.25	\$9.09	\$16.67
4	\$2.70	\$3.13	\$3.70	\$4.55	\$5.88	\$8.33	\$14.29
6	\$2.63	\$3.03	\$3.57	\$4.35	\$5.56	\$7.69	\$12.50
8	\$2.56	\$2.94	\$3.45	\$4.17	\$5.26	\$7.14	\$11.11
10	\$2.50	\$2.86	\$3.33	\$4.00	\$5.00	\$6.67	\$10.00

Table 11.4

Make-or-Buy Decisions

- ◆ **Choice between internal production and external sources**

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**

Supply Chain Strategies

- ◆ **Negotiating with many suppliers**
- ◆ **Long-term partnering with few suppliers**
- ◆ **Vertical integration**
- ◆ **Joint ventures**
- ◆ ***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

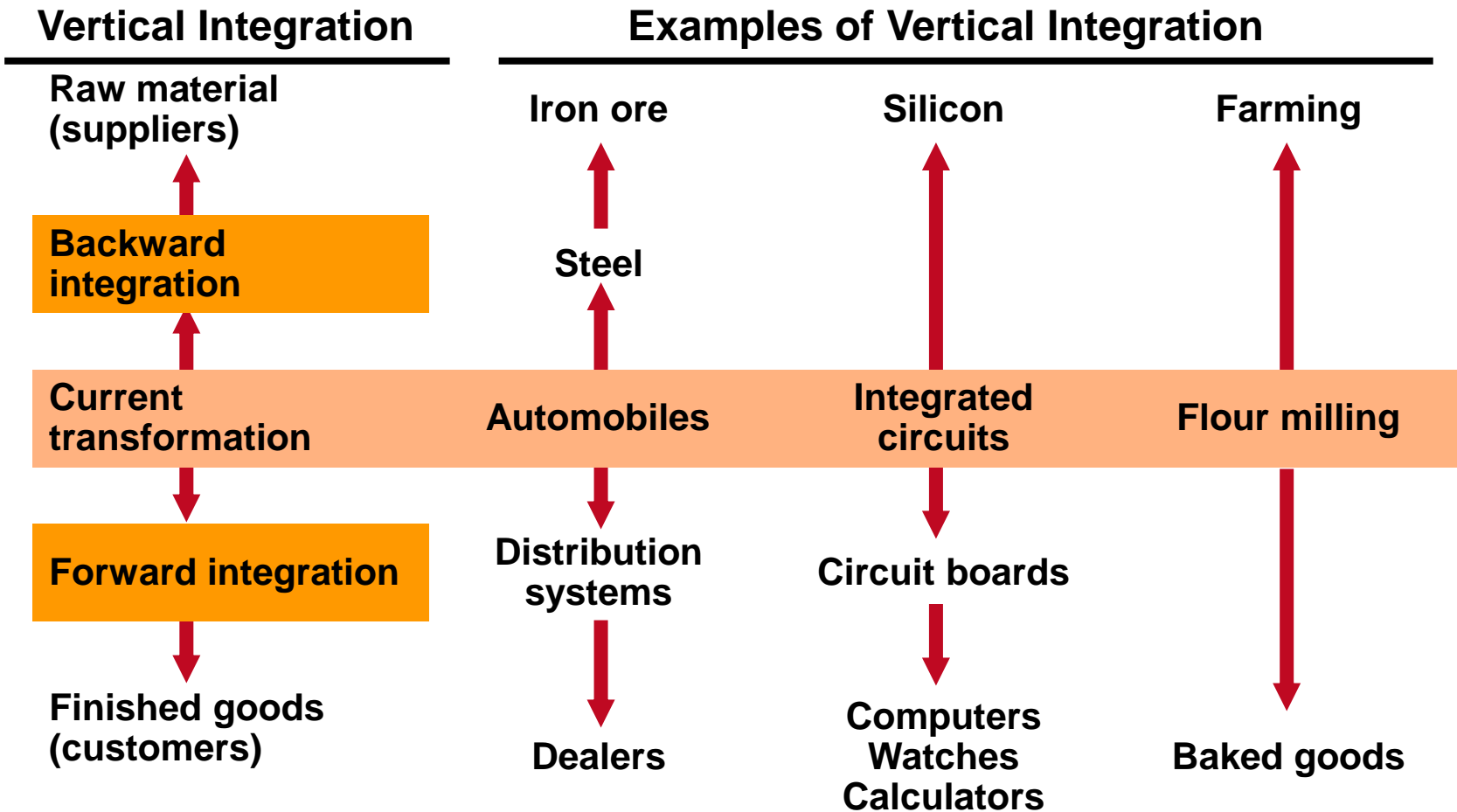


Figure 11.2

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**

Joint Ventures

- ◆ **Formal collaboration**
 - ◆ **Enhance skills**
 - ◆ **Secure supply**
 - ◆ **Reduce costs**
- ◆ **Cooperation without diluting brand or conceding competitive advantage**

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 (VMI)**

Opportunities in an Integrated Supply Chain

- ◆ **Collaborative planning, forecasting, and replenishment (CPFR)**
- ◆ **Blanket orders**
- ◆ **Standardization**

Opportunities in an Integrated Supply Chain

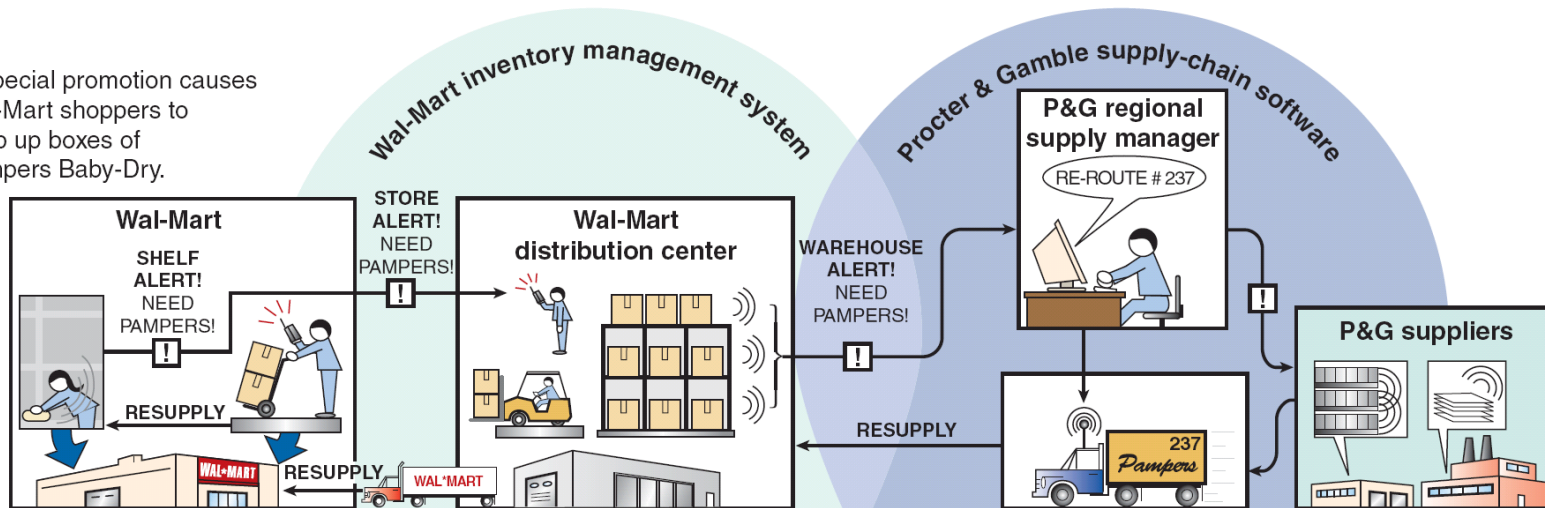
- ◆ **Postponement**
- ◆ **Drop shipping and special packaging**
- ◆ **Pass-through facility**
- ◆ **Channel assembly**

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

- 1. Catalogs provided by vendors**
- 2. Catalogs published by intermediaries**
- 3. 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 Evaluation

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

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

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

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

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

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

	Typical Firms	Benchmark Firms
Lead time (weeks)	15	8
Time spent placing an 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

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 = $(11.4/44.4) \times 100 = 25.7\%$

Measuring Supply-Chain Performance

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

Manufacturing (Toyota 5%)	15%
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

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

Table 11.8

Measuring Supply-Chain Performance

◆ Inventory turnover

Net revenue		\$32.5
Cost of goods sold		\$14.2
Inventory:		
Raw material inventory	\$.74	
Work-in-process inventory	\$.11	
Finished goods inventory	\$.84	
Total inventory investment		\$1.69

Measuring Supply-Chain Performance

◆ Inventory turnover

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory investment}}$$
$$= 14.2 / 1.69 = 8.4$$

Total inventory investment

\$1.69

Measuring Supply-Chain Performance

◆ Inventory turnover

$$\text{Average weekly cost of goods sold} = \$14.2 / 52 = \$.273$$

$$\begin{aligned} \text{Weeks of supply} &= \frac{\text{Inventory investment}}{\text{Average weekly cost of goods sold}} \\ &= 1.69 / .273 = 6.19 \text{ weeks} \end{aligned}$$

The SCOR Model

◆ Processes, metrics and best practices

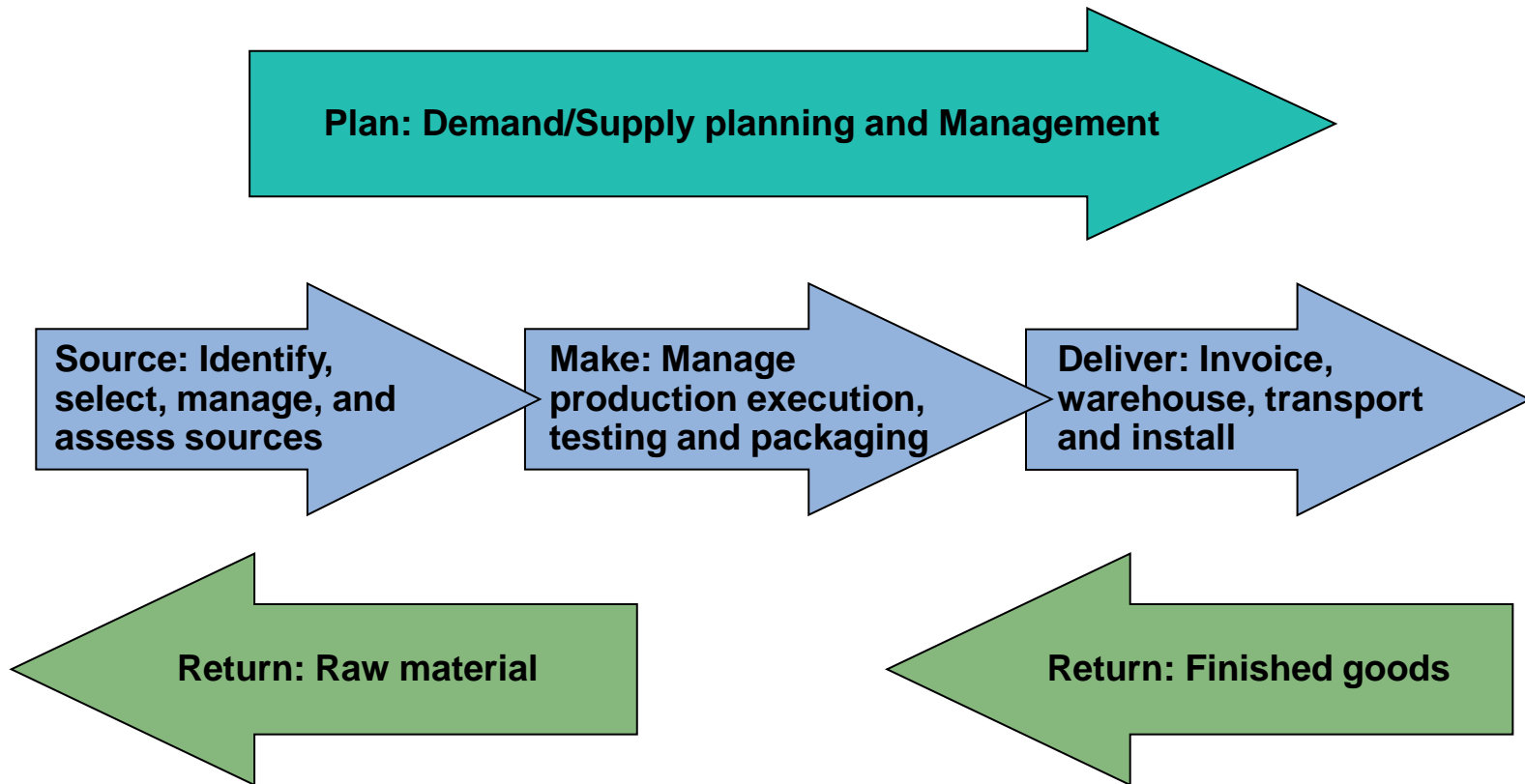


Figure 11.3