



Chapter 11

Supply Chain Management

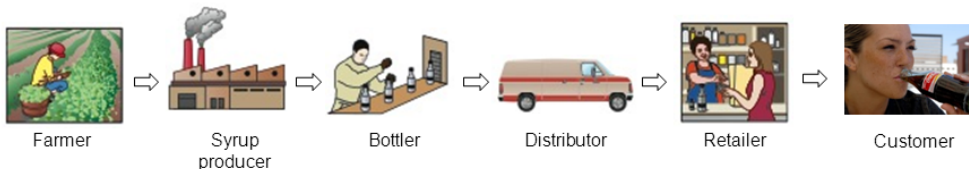
Chapter 11 Learning Objectives:

- Explain the strategic importance of the supply chain
- Identify six supply-chain strategies
- Explain issues and opportunities in the supply chain
- Discuss supplier selection, development, and contracting
- Explain major issues in logistics management
- Compute the percentage of assets committed to inventory and inventory turnover

From Chapter 1:

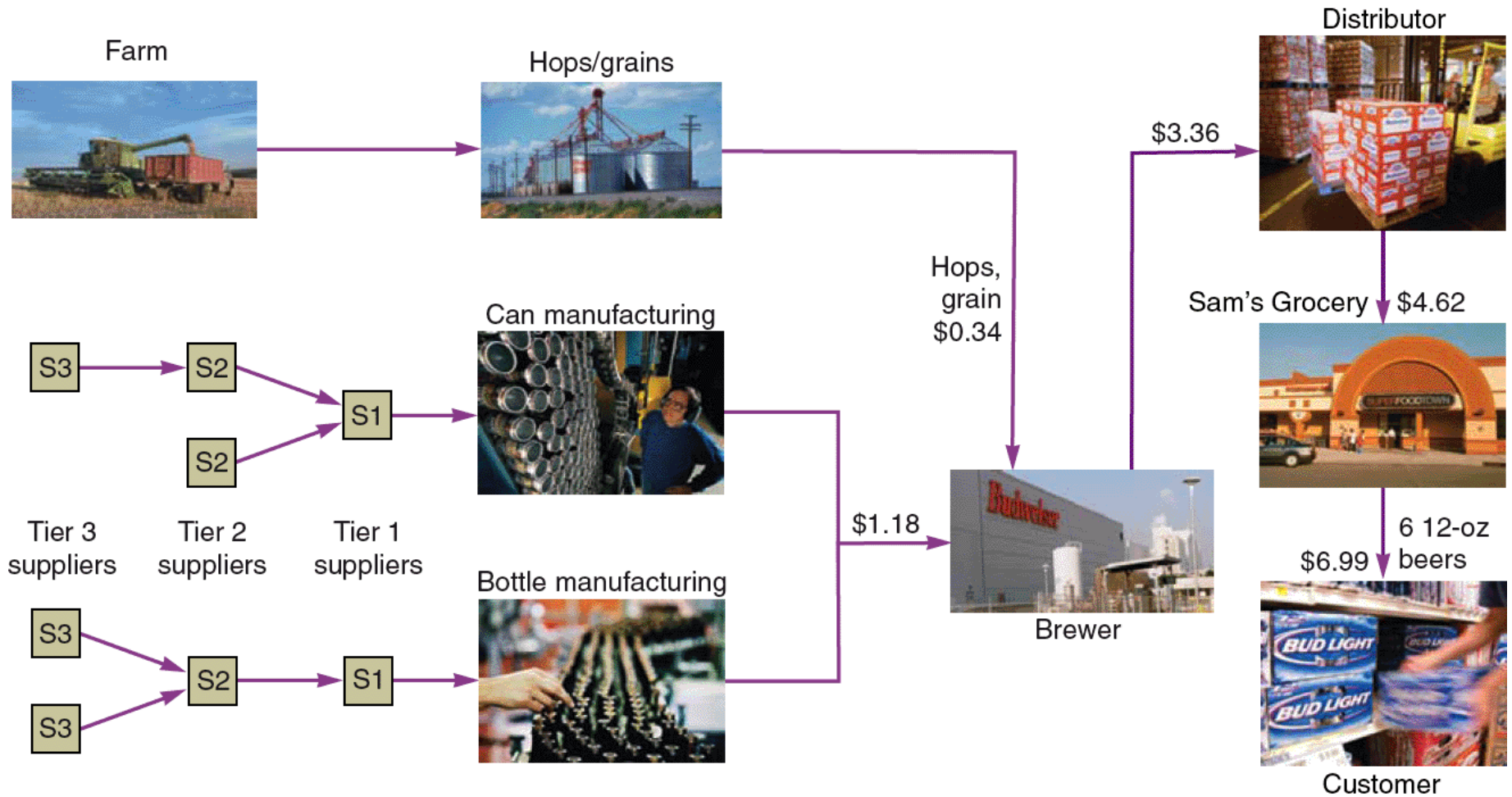
The Supply Chain

- Supply Chain: a global network of organizations and activities that supplies a firm with goods and services
 - Members of the supply chain collaborate to achieve high levels of customer satisfaction, efficiency and competitive advantage
 - In general, starts with the provider of basic raw materials and continues all the way to the final customer at the retail store
- Example: Supply chain for a bottle of Coke
 - Requires beet or sugar cane farmer, a syrup producer, a distributor and a retailer, each adding values to satisfy a customer



- Supply chain management: the coordination of all supply chain activities involved in enhancing customer value
- The objective of supply chain management is to coordinate activities within the supply chain to maximize the supply chain's competitive advantage and benefits to the ultimate customer
- Competition is no longer between companies; it is between supply chains

A Supply Chain for Beer



Gartner Best Supply Chains

The Gartner Supply Chain Top 25 for 2023



01

**Schneider
Electric**

02

**Cisco
Systems**

03

**Colgate-
Palmolive**

04

**Johnson &
Johnson**

05

PepsiCo

06

Pfizer

07

Microsoft

08

Lenovo

09

Walmart

10

L'Oréal

11 The Coca-Cola Company

12 Diageo

13 Inditex

14 Tesla

15 Siemens

16 Intel

17 Nestlé

18 AstraZeneca

19 Dell Technologies

20 McDonald's

21 HP Inc.

22 AB InBev

23 Alibaba

24 GlaxoSmithKline

25 Dow

[gartner.com](https://www.gartner.com)

Note: "Ranks" for tied composite scores are determined using next decimal point comparison.
Source: Gartner
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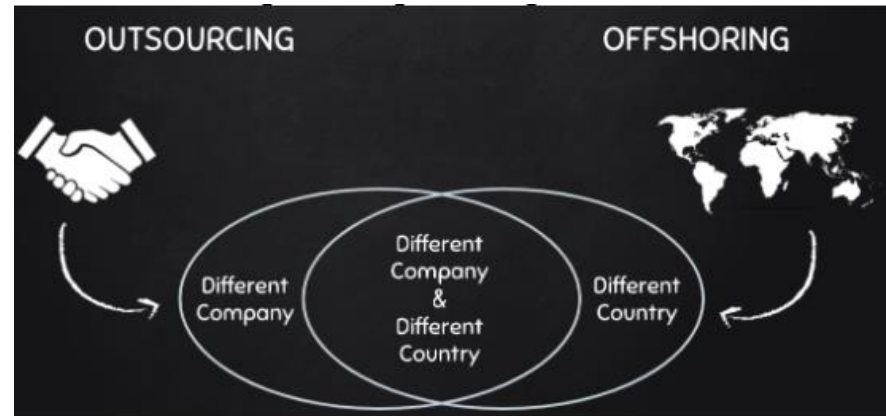
Gartner

Measure / Weighting

- Return on Assets (20%)
- Inventory Turns (5%)
- Revenue Growth (10%)
- ESG (15%)
- Analyst vote (25%)
- Peer vote (25%)

Supply Chain Costs as a % Sales

Industry	% Purchased
Automobile	67
Beverages	52
Chemical	62
Food	60
Lumber	61
Metals	65
Paper	55
Petroleum	79
Transportation	62

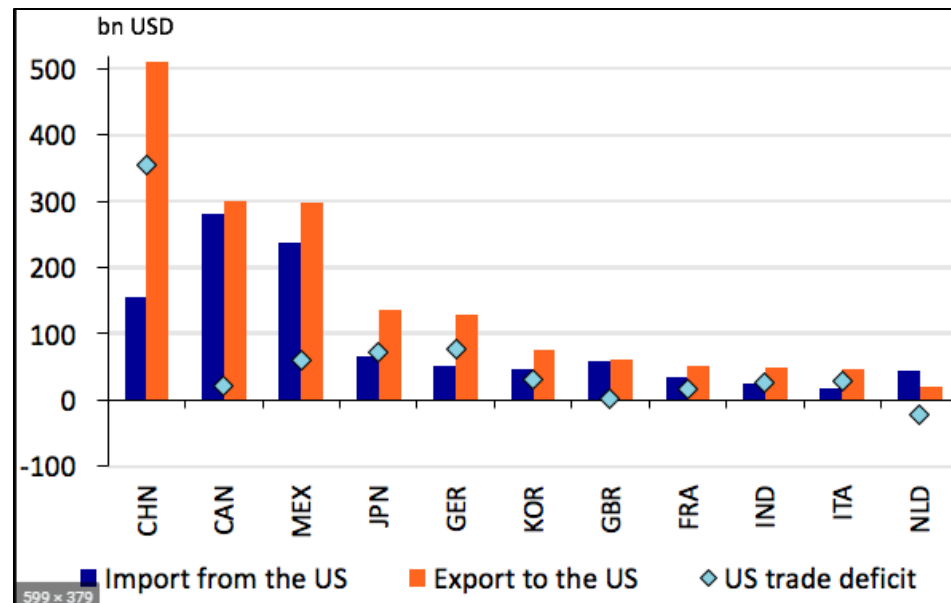
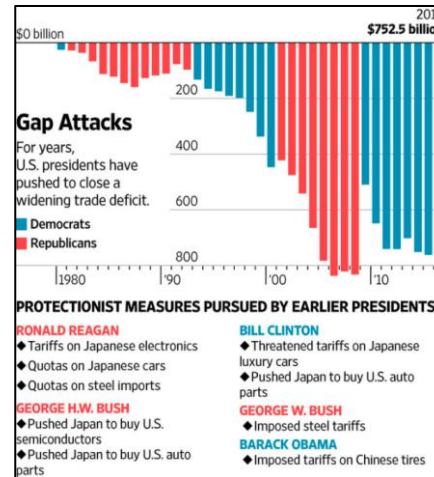


- Make-or-buy decision: a choice between producing a component or service in-house or purchasing it from an outside source
- Offshoring: moving processes to a foreign country but retaining control
- Outsourcing: transferring a firm's activities that have traditionally been internal to external suppliers

Obama's "Insourcing"



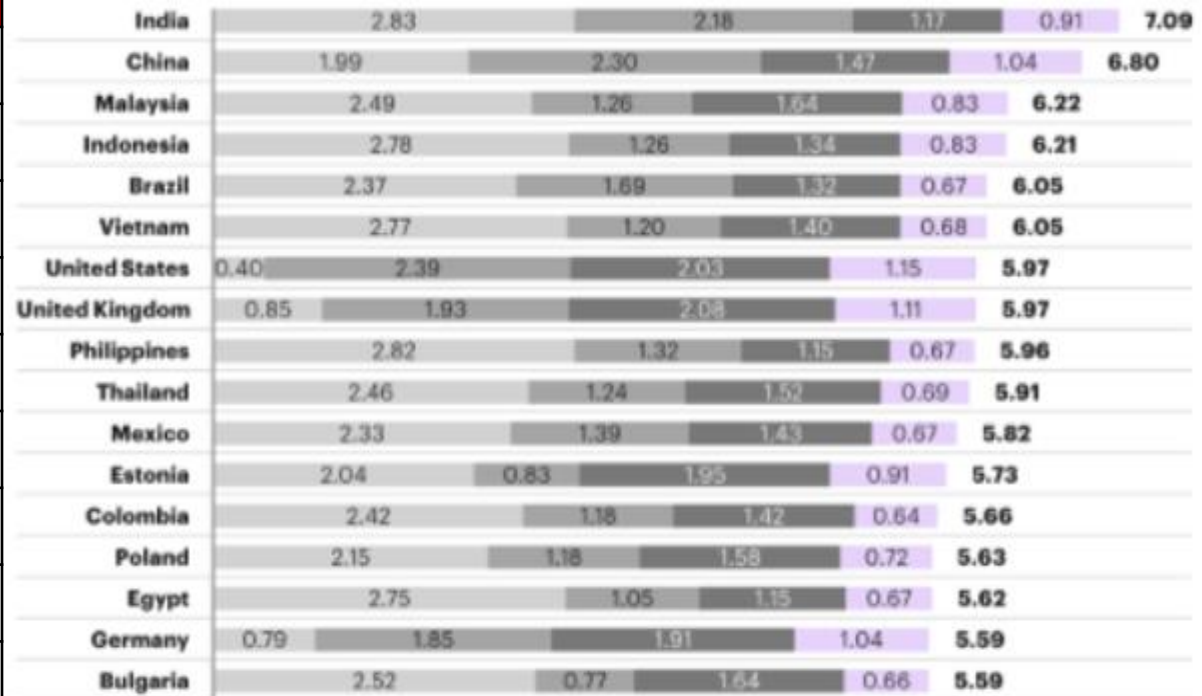
President Barack Obama, joined by 19 business leaders at the "**Insourcing** American Jobs" forum. "[My] message to business leaders today is simple: ask yourselves what you can do to **bring jobs back** to the country that made our success possible," the President said. [January 11, 2012]



Top Offshoring Destinations

- Ranking of top 10 Offshoring locations (out of 50 countries) in the annual A.T. Kearny Global Operations survey
 - Based on financial attractiveness, workforce availability, employee skill set, business environment & digital resonance

Rank	Country	Rating
1	India	7.1
2	China	6.8
3	Malaysia	6.2
4	Indonesia	6.2
5	Brazil	6.1
6	Vietnam	6.1
7	USA	6.0
8	UK	6.0
9	Philippines	5.9
10	Thailand	5.9



Outsourcing as a Supply Chain Strategy

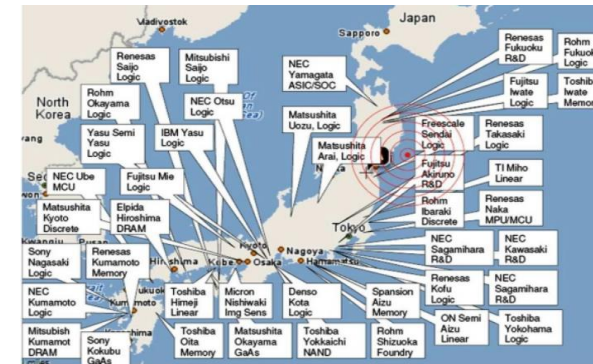
- What is outsourcing? Procuring from external supplier's service or products that are normally part of an organization
 - Extension of the long-standing practice of subcontracting
- Common processes outsourced are
 - Purchasing
 - Logistics
 - R&D
 - Operations
 - Service management
 - Human resources
 - Finance/accounting
 - Customer relations
 - Sales/Marketing
 - Training
 - Legal processes

How Supply Chain Decisions Impact Strategy

	LOW COST STRATEGY	RESPONSE STRATEGY	DIFFERENTIATION STRATEGY
Primary supplier selection criteria	<ul style="list-style-type: none"> • Cost 	<ul style="list-style-type: none"> • Capacity • Speed • Flexibility 	<ul style="list-style-type: none"> • Product development skills • Willing to share information • Jointly and rapidly develop products
Supply chain inventory	<ul style="list-style-type: none"> • Minimize inventory to hold down costs 	<ul style="list-style-type: none"> • Use buffer stocks to ensure speedy supply 	<ul style="list-style-type: none"> • Minimize inventory to avoid product obsolescence
Distribution network	<ul style="list-style-type: none"> • Inexpensive transportation • Sell through discount distributors/retailers 	<ul style="list-style-type: none"> • Fast transportation • Provide premium customer service 	<ul style="list-style-type: none"> • Gather and communicate market research data • Knowledgeable sales staff
Product design characteristics	<ul style="list-style-type: none"> • Maximize performance • Minimize cost 	<ul style="list-style-type: none"> • Low setup time • Rapid production ramp-up 	<ul style="list-style-type: none"> • Modular design to aid product differentiation

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
- To reduce risk, must mitigate and react to disruptions in
 - Research and assess possible risks
 - Innovative planning
 - Reduce potential disruptions
 - Prepare responses for negative events
 - Flexible, secure supply chains
 - Diversified supplier base

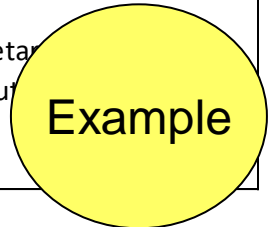


Supply Chain Risks and Tactics

RISK	RISK REDUCTION TACTICS	EXAMPLE
Supplier failure to deliver	Use multiple suppliers; effective contracts with penalties; subcontractors on retainer; pre-planning	McDonald's planned its supply chain 6 years before its opening in Russia. Every plant—bakery, meat, chicken, fish, and lettuce—is closely monitored to ensure strong links
Political	Political risk insurance; cross-country diversification; franchising and licensing	Hard Rock Café reduces political risk by franchising and licensing, rather than owning, when the political and cultural barriers seem significant
Natural catastrophes	Insurance; alternate sourcing; cross-country diversification	Toyota , after its experience with fires, earthquakes, and tsunamis, now attempts to have at least two suppliers, each in a different geographical region, for each component

Risk and Mitigation Tactics

Risk Level	Definition	Examples
1	Lowest risk level. Non-Strategic, Highly tactical commodities. Multiple sources immediately available and generally excess capacity or high inventory at supplier (Off the Shelf).	Basic Shop Supplies (glue, epoxy, paint, tape), Terminals, Hardware.
2	Low risk. Non-strategic, moderately tactical commodities, Numerous sources immediately available with moderate capacity.	Off the shelf passive components: Resistors, capacitors, insulated wire, packaging material, labels, decals.
3	Moderate risk suppliers. No requirement for short or long term contracts. Typically characterized by fewer available suppliers. Ability to leverage suppliers still high. Still highly streamlined acquisition process.	Meters, thermostats, switches, keypads, potentiometers, relays, insulators, connectors, fuses, shunts.
4	Medium risk suppliers. Short term contracts usually required. Information or data is usually provided by customer to supplier.	Rack slides, diodes, capacitors, ferrite beads, cores, low technology sheet-metal, crystals, machined parts, circuit breakers, displays, LED's, Batteries, fans, crystals.
5	High risk suppliers. Special design requirements required by customer. Documented quality systems needed to produce parts consistently. Single sourced suppliers. Jigs, fixtures usually required.	Stampings, Transformer, Plastic injection molded parts, PCBA's, purchased pwr supplies, Assy Inductors, Assy Transformers.
6	Highest risk. Typically characterized by special tooling, processes, technologies only available at this sole source supplier. No substitutes, restricted by capacity and low inventory. Also could include suppliers in geographically high risk areas (civil unrest, labor strife, unstable government.	Design, processes, technologies is proprietary Complex metal fabrication, ASIC's, Buy-Out



Risk and Mitigation Tactics

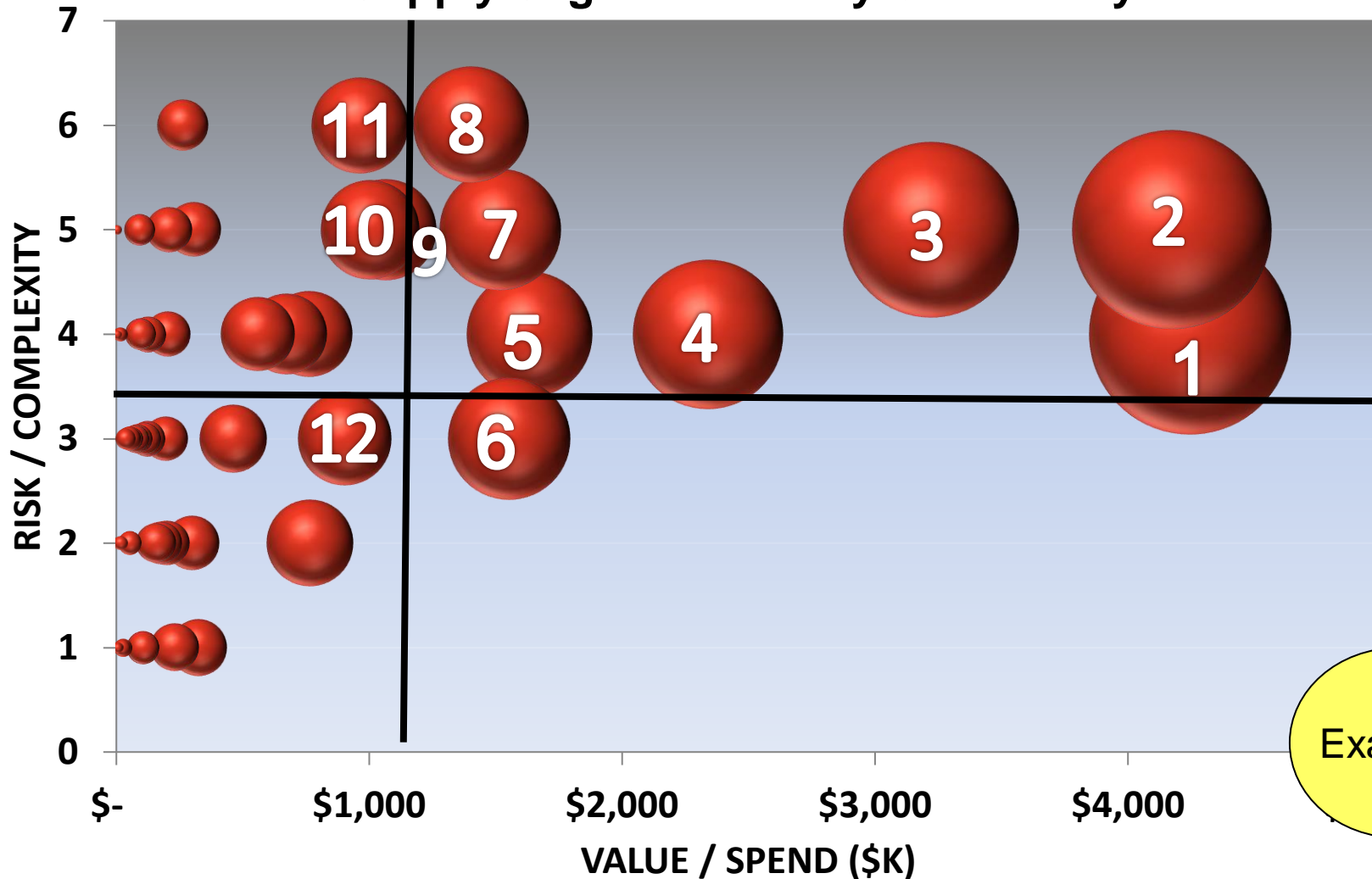
Sum of P.O.EXT.

CCG1	#	Commodity Segmentation	Total (\$M)	Risk	CM	%	%Accum
170	1	FABRICATED & MACHINED PARTS METAL / P	\$ 4,247	4	KS	13.7%	13.7%
470	2	ASSEMBLY, TRANSFORMERS & INDUCTORS	\$ 4,174	5	KS	13.4%	27.1%
182	3	ASSEMBLY PCBA ACTIVE TURNKEY	\$ 3,221	5	AB	10.4%	37.5%
390	4	IC	\$ 2,341	4	AB	7.5%	45.0%
120	5	ASSEMBLY, CABLE/HARNESS	\$ 1,636	4	KS	5.3%	50.3%
240	6	CAPACITOR	\$ 1,554	3	AB	5.0%	55.3%
210	7	BARE BOARD (PWB)	\$ 1,520	5	AB	4.9%	60.1%
690	8	TRANSISTORS (FET)	\$ 1,404	6	AB	4.5%	64.7%
310	9	DIODE / SCR	\$ 1,066	5	AB	3.4%	68.1%
141	10	EMI FILTERS CATALOG	\$ 1,004	5	AB	3.2%	71.3%
340	11	FINISHED GOODS BUY-OUT ACTIVE	\$ 963	6	AB	3.1%	74.4%
270	12	CONNECTOR / STRAIN RELIEFS / PINS (856-X)	\$ 904	3	AB	2.9%	77.3%
260	13	COMPUTER PERIPHERALS (881-XXX-XX)	\$ 767	2	AB	2.5%	79.8%
320	14	FAN	\$ 763	4	AB	2.5%	82.3%
610	15	RESISTOR & SHUNTS	\$ 674	4	AB	2.2%	84.4%
380	16	HEATSINKS FROM EXTRUSION	\$ 561	4	KS	1.8%	86.2%
400	17	INSULATORS	\$ 463	3	KS	1.5%	87.7%
570	18	Others	\$ 326	1	-	1.0%	88.8%
600	19	BATTERIES	\$ 307	5	KS	1.0%	89.8%
220	20	RELAY	\$ 303	2	AB	1.0%	90.7%
560	21	POWER SUPPLY PURCHASED COMPONENT	\$ 264	6	AB	0.8%	91.5%
370	22	HARDWARE (I.e. bolt/nut/screw/washer/etc.)	\$ 232	1	KS	0.7%	92.2%
350	23	DISPLAY / LED	\$ 210	5	AB	0.7%	92.9%
680	24	POTENTIOMETERS	\$ 205	4	AB	0.7%	93.6%

Example

Risk and Mitigation Tactics

Supply Segmentation by Commodity



Example

- Because so much money passes through the supply chain, the opportunity for ethical lapses is significant
 - Personal ethics
 - Ethics within the supply chain
 - Ethical behavior regarding the environment
- Institute for Supply Management Principles and Standards for Ethical Supply Management Control:
 - Promote and uphold responsibilities to one's employer; positive supplier and customer relationships; sustainability and social responsibility; protection of confidential and proprietary information; applicable laws, regulations, and trade agreements; and development of professional competence
 - Avoid perceived impropriety, conflicts of interest, behaviors that negatively influence supply chain decisions; and improper reciprocal agreements

- Six sourcing strategies
 1. Negotiating with many suppliers
 2. Long-term partnering with few suppliers
 3. Vertical integration
 4. Joint ventures
 5. Keiretsu
 6. Virtual companies that use suppliers on an as needed basis



Supply Chain Strategies:

1. Many Suppliers

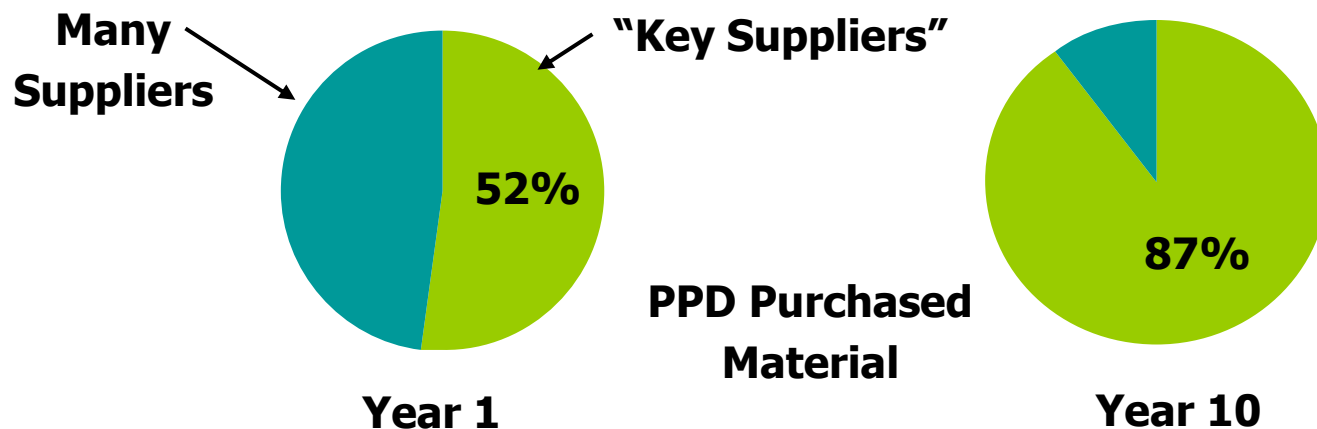
- Negotiating with many suppliers
 - Commonly used for commodity products
 - Purchasing is typically based on price
 - Suppliers compete with one another
 - Supplier is responsible for technology, expertise, forecasting, cost, quality, and delivery
 - Does not foster long term relationships



Supply Chain Strategies:

2. Few Suppliers

- Long-term partnering with 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



Supply Chain Strategies:

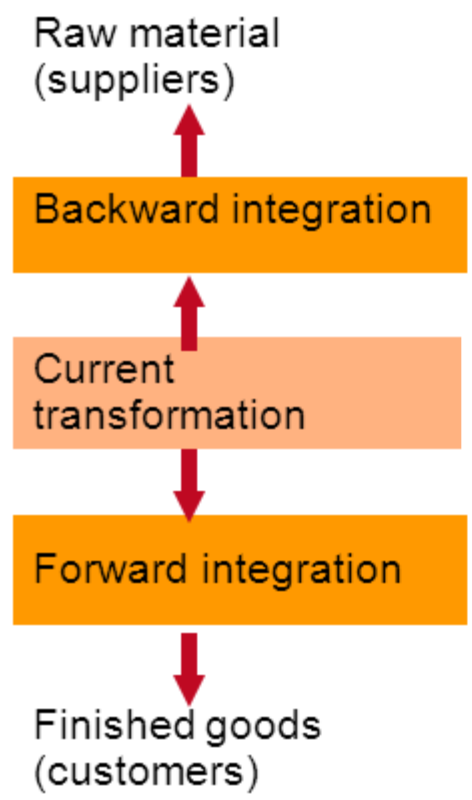
3. Vertical Integration

- Vertical integration: Developing the ability to produce goods or service previously purchased or buying a supplier or distributor
 - Can improve cost, quality, and inventory but requires capital, managerial skills, and demand
 - Risky in industries with rapid technological change
- Backward integration refers to acquiring capabilities at the **front-end** of the supply chain (for instance, **suppliers**)
- Forward integration refers to acquiring capabilities toward the **back-end** of the supply chain (for instance, **distribution** or even customers)

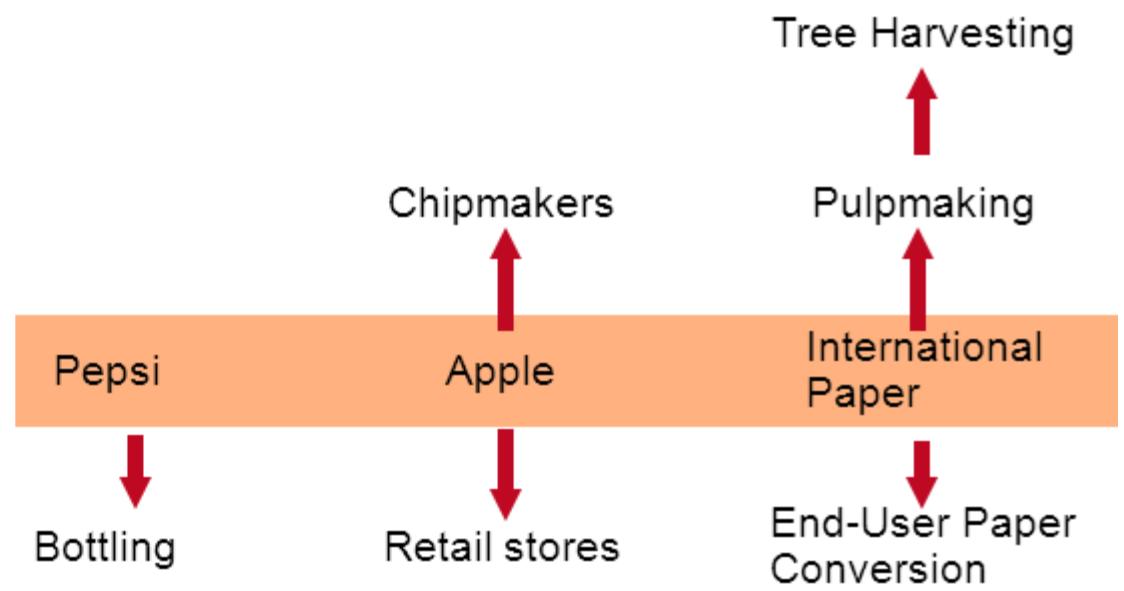
Supply Chain Strategies:

3. Vertical Integration

Vertical Integration



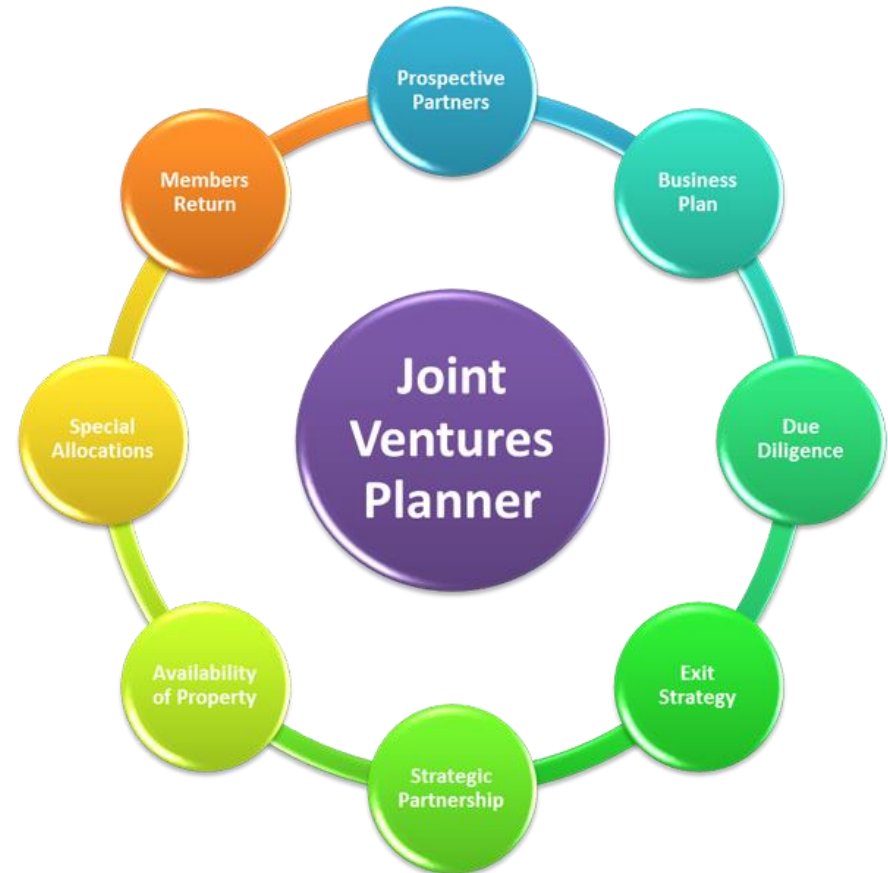
Examples of Vertical Integration



Supply Chain Strategies:

4. Joint Ventures

- Formal collaboration
 - Enhance skills
 - Secure supply
 - Reduce costs
- Cooperation without diluting brand or conceding competitive advantage or sharing trade secrets



Supply Chain Strategies:

5. Keiretsu Networks

- Keiretsu: a Japanese term that describes suppliers who become part of a company coalition
 - 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

THE WALL STREET JOURNAL.

Toyota Shakes Up a Japanese Tradition

Auto maker chooses German Supplier for key vehicle technology, as keiretsu network fails [10/28/15]



Supply Chain Strategies:

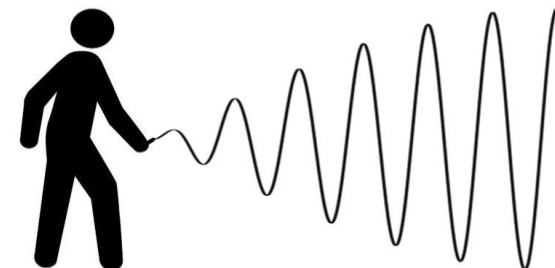
6. Virtual Companies

- Virtual companies: companies that rely on a variety of supplier relationships to provide services on demand (also “hollow corporations” or “network companies”)
- Fluid organizational boundaries that allow the creation of unique enterprises to meet changing market demands
- Exceptionally lean performance, low capital investment, flexibility, and speed



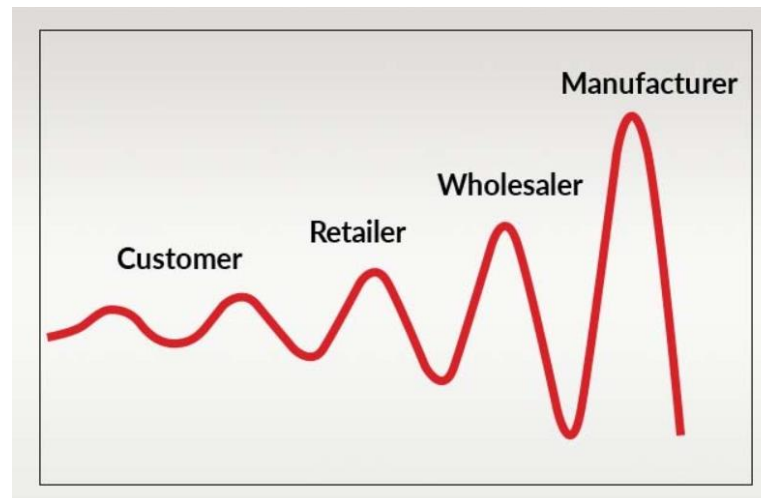
Issues in Managing the Integrated Supply Chain

- Three issues complicate development of an efficient, 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
- These three issues often lead to the bullwhip effect!

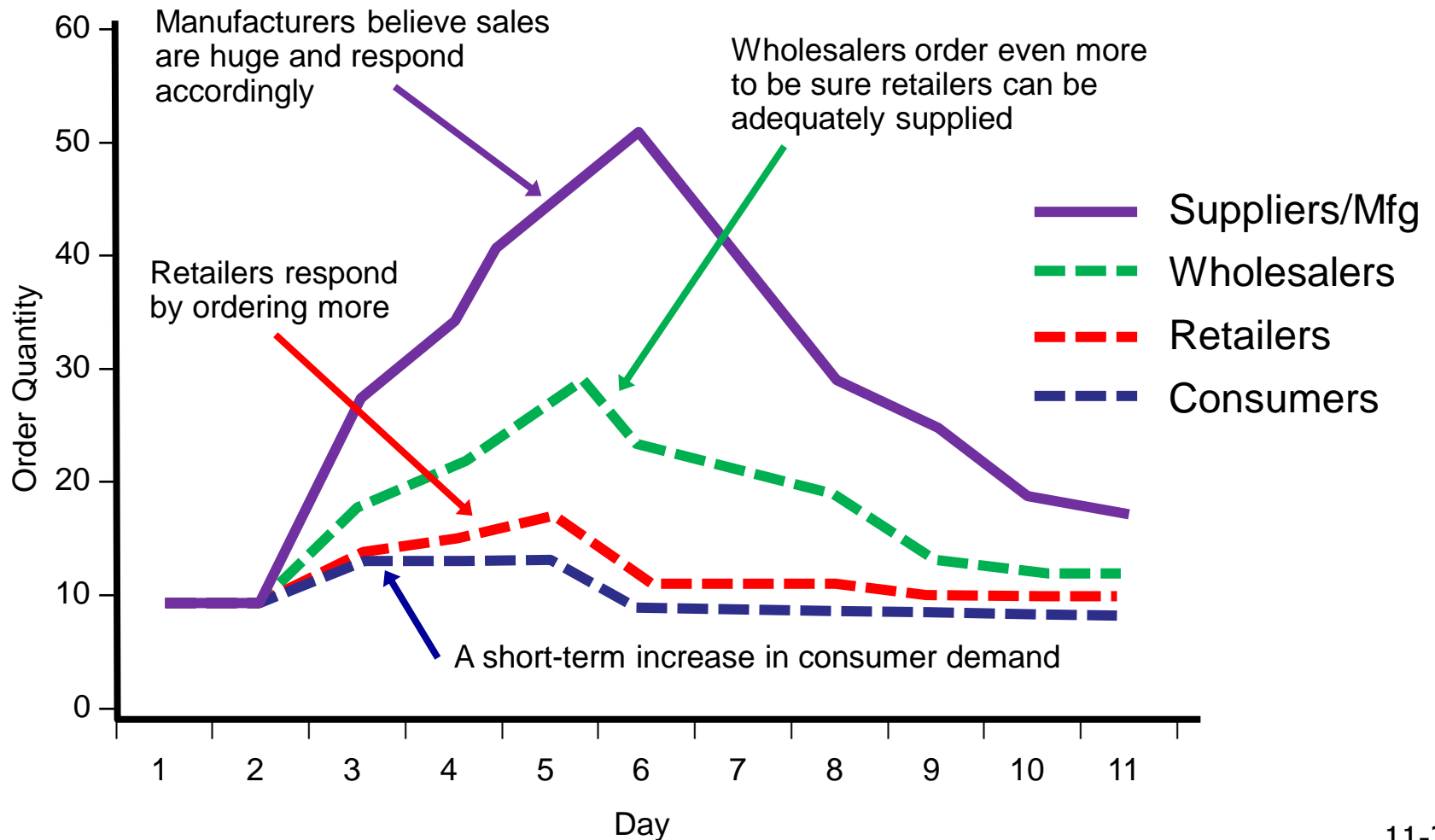


Issues in Managing the Integrated Supply Chain

- Bullwhip effect: the increasing fluctuation in orders that move through the supply chain
 - The tendency for larger order size fluctuations as orders are relayed through the supply chain
 - Creates unstable production schedules, expensive capacity change costs, longer lead times, obsolescence
 - Damage can be minimized with supplier coordination and planning



The Bullwhip Effect



Opportunities in Managing the Integrated Supply Chain

- Opportunities for effective management of the Supply Chain are everywhere. The textbook highlights 11 items:
 - Accurate Pull Data
 - Lot Size Reduction
 - Single-Stage Control of Replenishment
 - Vendor Managed Inventory (VMI)
 - Collaborative Planning, Forecasting, and Replenishment (CPFR)
 - Blanket Orders
 - Product Standardization
 - Postponement
 - Electronic Ordering and Funds Transfer
 - Drop Shipping and Special Packaging
 - Blockchain

Supplier Evaluation is needed to finding potential suppliers. To determine likelihood of their becoming good suppliers through:

1. Supplier Qualification (Selection)
2. Supplier Certification
3. Supplier Education

Supplier Development is required to integrate the supplier into the system. This is done through:

- Quality requirements
- Product specifications
- Schedules and delivery
- Audits / Scorecards
- Procurement policies
- Engineering and production help
- Information transfer procedures

Building & Developing the Supply Base

Supplier Qualification & Selection: Many factors play a role

- Choosing suppliers just based off lowest price is becoming rare
- Factor weighting techniques consider multiple criteria
 - Each factor is assigned a weight and a score
 - Choose the supplier with the **best weighted score**

CRITERION	WEIGHT	FABER PAINT		SMITH DYE	
		SCORE (1-5) (5 HIGHEST)	WEIGHT x SCORE	SCORE (1-5) (5 HIGHEST)	WEIGHT x SCORE
Engineering/innovation skills	.20	5	1.0	5	1.0
Production process capability	.15	4	0.6	5	0.75
Distribution capability	.05	4	0.2	3	0.15
Quality performance	.10	2	0.2	3	0.3
Facilities/location	.05	2	0.1	3	0.15
Financial strength	.15	4	0.6	5	0.75
Information systems	.10	2	0.2	5	0.5
Integrity	.20	5	1.0	3	0.6
Total	1.00		3.9		4.2

Negotiations are a significant element in purchasing and require a unique skillset and training. There are 3 main negotiation tactics:

- **Cost-based price model**
 - Supplier opens books
- **Market-based price model**
 - Based on published, auction, or indexed prices
- **Competitive bidding**
 - Common policy for many purchases
 - Does not generally foster long-term relationships



Contracting requires shared risks, benefits, & can create incentives for both parties. Terms and Conditions (T&C's) outline costs, term, liability, litigation process, eligible members and termination clauses.

Centralized Purchasing: Ordering done by a corporate Buying team.

Objective is to obtain efficient operations through the integration of all material acquisition, movement, and storage activities.

- **Waterway:** Cargo shipments via containers and oceangoing ships
- **Trucking:** Moves the majority of manufactured goods, offers flexibility
- **Railroads:** Capable of carrying large loads, but less flexibility
- **Airfreight:** Fast and flexible for light loads, but usually expensive
- **Pipelines:** Used for transporting oil, gas, and other chemical products
- **Multimodal:** Combines shipping methods. Common, especially in international shipments. Aided by *standardized containers*.



Then what?
Warehousing often
adds 8-10% to the
cost of a product

Measuring Supply-Chain Performance

- Inventory-based metrics:
 - Assets committed to inventory:

$$\text{Percentage Invested in Inventory} = \frac{\text{Average inventory investment}}{\text{Total Assets}} \times 100$$

- Inventory turnover:

$$\text{Inventory turnover} = \frac{\text{Cost of Goods Sold (COGS)}}{\text{Inventory Investment}}$$

- Weeks of supply:

$$\text{Weeks of supply} = \frac{\text{Inventory Investment}}{(\text{Annual COGS}/52 \text{ weeks})}$$

Example: Home Depot's Inventory Investment

- Home Depot's management wishes to track its investment in inventory as one of its performance measures. Recently, Home Depot had \$11.4 billion invested in inventory and total assets of \$44.4 billion

$$\text{Percentage Invested in Inventory} = \frac{\text{Average inventory investment}}{\text{Total Assets}} \times 100$$

$$\text{Percentage invested in inventory} = \left(\frac{11.4}{44.4} \right) \times 100 = 25.7\%$$

Assets Committed to Inventory

Inventory as Percentage of Total Assets (with examples of exceptional performance)

Manufacturer (Toyota 5%)	15%
Wholesale (Coca-Cola 2.9%)	34%
Restaurants (McDonald's .05%)	2.9%
Retail (Home Depot 25.7%)	28%

Example: Inventory Turnover at PepsiCo

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

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

$$= 14.2 / 1.69 = 8.4$$

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

Example: Weeks of Supply at PepsiCo

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Finished goods inventory	\$0.84	
Total inventory investment		\$1.69

$$\text{Weeks of supply} = \frac{\text{Inventory investment}}{(\text{Annual COGS}/52 \text{ weeks})}$$

$$= 1.69 / (\$14.2 / 52) = 6.19 \text{ weeks}$$