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## Chapter 11

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# Supply Chain Management: You Better Get It Right

## R. W. Hine



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No business—small, midsize, or large—survives for more than a century without successfully identifying changing customer needs and adapting its processes and technologies. The adoption of new technologies is not limited to advanced manufacturing or web-based business. New technologies can be crucial to any business, even a business as seemingly prosaic as the local hardware store. However, successfully running a business with an inventory between twenty-five thousand and thirty thousand different items is anything but prosaic.

R. W. Hine has been a central fixture in Cheshire, Connecticut, since it was established in 1910. For the last quarter century, it has been owned and managed by Pat Bowman.

It is obvious that any local hardware store, which must carry an extremely large number of different products, faces a considerable challenge when competing with big box stores such as Home Depot or Lowe's. Hine is a relatively small enterprise with approximately twenty-five employees, many of whom are high school or college students working part time. Hine is able to effectively compete because of two main factors. The first is an edge seen in many small businesses—a clear focus on identifying and meeting what constitutes customer value and meeting it rapidly. A typical example is as follows: in anticipation of a major winter storm, Hine quickly stocked up on roof rakes—a tool that is used to remove heavy snow from roofs. Hine has had a tremendous success meeting the special needs of its customers. The second factor is Hine's membership in the ACE Hardware Cooperative. ACE Hardware was founded in 1924 to centralize purchasing for member stores. In 1973, ACE Hardware became a cooperative. Today, it consists of nearly 4,500 member hardware stores. The cooperative centralizes purchasing for all members. It provides all members with the benefit of volume purchasing, which significantly reduces costs. The cooperative also simplifies inventory maintenance issues for its member stores.

A member store can either order items directly from a participating supplier or have items shipped from an ACE Hardware warehouse. Shipments are generally done on a weekly or a semiweekly basis. Such rapid turnaround allows member stores, such as Hine, to respond to customer demand. Hine also uses Epicor enterprise resource planning (ERP) software. It enables Hine to monitor its historic sales information, set targeted inventory levels, and suggest reorder times. The juxtaposition of a commitment to giving customers value and the effective use of supply chain management techniques appear to prove that this local hardware store will succeed in its second century of operation.

## 11.1 The Supply Chain and a Firm's Role in It

### LEARNING OBJECTIVES

1. Understand what is meant by the term *supply chain management*.
2. Understand the four components of supply chain management.
3. Understand the “bullwhip” phenomenon.
4. Recognize the benefits for a small business in adopting supply chain management.

No man is an island, entire of itself. John Donne, “XVII. Meditation,” *The Literature Network*, accessed February 4, 2012, [www.online-literature.com/donne/409](http://www.online-literature.com/donne/409).

- John Donne

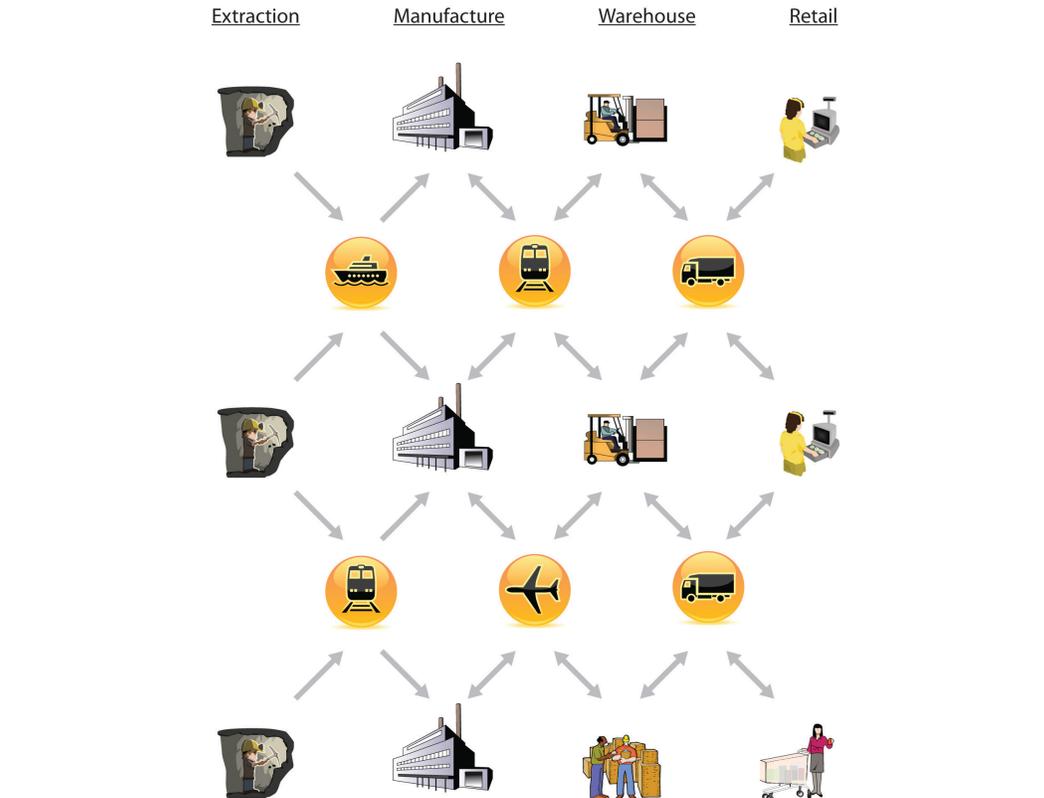
Given the almost daily exposure and coverage of modern business theories or concepts in the popular press, one of the great challenges for both small business owners and corporate executives is the need to separate the wheat from the chaff. In the last four or five decades, businesspeople have heard and read about the next great idea that will revolutionize business as we know it. One almost feels obligated to run out and buy a book that lays out the general principles of concepts such as **management by objectives**<sup>1</sup>, **business process reengineering**<sup>2</sup>, transactional versus transformational leadership, management by walking around, the **learning organization**<sup>3</sup>, matrix management, **benchmarking**<sup>4</sup>, lean methodologies, and several quality systems—total quality management, the Deming method, and Six Sigma. Some of these have proven to be business fads and have run their course—sometimes with poisonous effects. John Micklethwait and Adrian Woodridge, *Witch Doctors: Making Sense of the Management Gurus* (New York: Time Books, 1996), 22. Others, such as lean methodologies and some quality systems, have proven to be solid bases on which to improve an organization's efficiency and effectiveness.

1. A program in which the supervisor and the subordinate sit down and map out the objectives for the subordinate to accomplish in the upcoming year.
2. A management program that analyzes the processes of a business and tries to redesign them so that all non-value-added activities are eliminated.
3. An organization that is able to adapt to changing situations and pressures. It places a premium on organizations and individuals that can learn from the environment.
4. A program where a business looks at the world leaders in particular processes and attempts to emulate them.

A modern concept that has been popularized over the last two decades is that of supply chain management. In one sense, supply chain management is as old as business itself. One has to look only at the traffic along antiquity's Silk Road trade route. This route was used to move goods across Asia's vast steppes between China and the Middle East and as far west as ancient Rome. It possessed most of the fundamental elements of today's supply chain: goods were produced (make), transported (move), deposited in warehouses (store), purchased by merchants (buy), and sold to customers (sell; see [Figure 11.2 "Additional Flows in a Supply](#)

Chain"). As will be seen, these five activities are the core of any supply chain. Scott Webster, *Principles and Tools for Supply Chain Management* (Boston: McGraw-Hill, 2008), 62. If these activities have been universal dimensions of business, then what is different about supply chain management? That question will now be addressed.

Figure 11.1 *Material Flows in a Supply Chain*



## What Is a Supply Chain?

The owners of many small businesses may pride themselves on knowing many—if not all—of their employees. Other small businesses may have some degree of familiarity with most of their customers. They may have professional contacts with someone at the office of their immediate suppliers. Beyond those contacts, the daily demands of operations may mean that they have failed to see their firm’s position in the larger context known as the supply chain. What precisely do we mean when we use the term **supply chain management**<sup>5</sup>? Industrial organizations and academics provide several different definitions of supply chain management.

The Council of Supply Chain Management Professionals provides the following definition: “Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics

5. A systematic and integrated flow of materials, information, and money from the initial raw material supplier through fabricators, manufacturers, warehouses, distribution centers, retailers, and the final customer.

management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.”“CSCMP Supply Chain Management Definitions,” *Council of Supply Chain Management Professionals*, accessed February 1, 2012, [cscmp.org/aboutcscmp/definitions.asp](http://cscmp.org/aboutcscmp/definitions.asp).

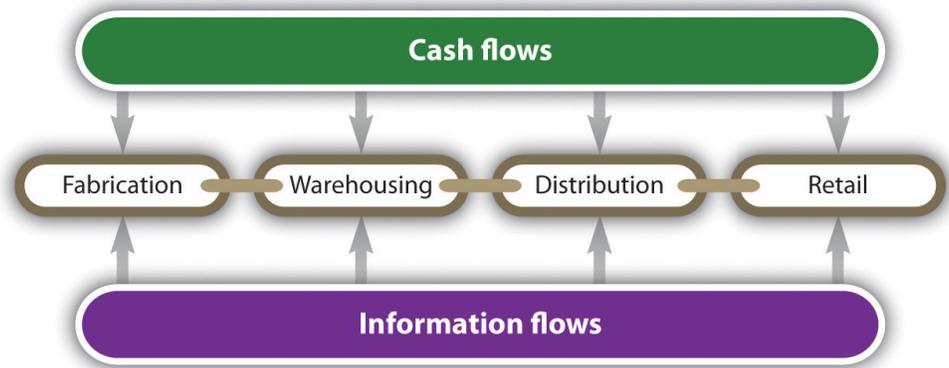
The Association for Operations Management (APICS) defines a supply chain as “a total systems approach to designing and managing the entire flow of information, materials, and services—from raw material suppliers, through factories and warehouses, and finally to the customer...The chain comprises many links, such as links between suppliers that provide inputs, links to manufacturing and service support operations that transform the input into products and services, and links to the distribution and local service providers that localized the product.”*APICS—Operations Management Body of Knowledge Framework*, 2nd ed. (Chicago: APICS, 2009).

In a seminal article on the subject, supply chain management was defined as follows: “Supply chain management is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.”John Mentzer, William DeWitt, James Keebler, Soonhong Min, Nancy Nix, Carlo Smith, and Zach Zacharia, “Defining Supply Chain Management,” *Journal of Business Logistics* 22, no. 2 (2001): 7.

For our purpose, we define the supply chain as follows: “It is a systematic and integrated flow of materials, information, and money from the initial raw material supplier through fabricators, manufacturers, warehouses, distribution centers, retailers, and the final customer. Its ultimate objective is the improvement of the entire process, which means an increase of economic performance of all participants and an increase in value for the end customer.”

If we examine these definitions, several common themes stand out. Supply chain management is not limited to the flow of goods and materials. The successful supply chain requires a consideration of both financial flows and information flows across the entire chain (see [Figure 11.2 "Additional Flows in a Supply Chain"](#)). A second theme is that organizations must overcome myopia of just being concerned with their immediate suppliers and customers. They must take into consideration their suppliers’ suppliers and their customers’ customers. To be able to do this, organizations must expand the flow of communication and information.

Figure 11.2 *Additional Flows in a Supply Chain*



One might easily pose the following question: How has the concept of supply chain management taken off in the last twenty years? The proliferation of supply chain management is a core concept for businesses that can be attributed to several major factors, including the following:

- **The increasing importance of globalization.** Global trade has seen a spectacular increase in the last half century. It is estimated that international trade has increased by 100 percent since 1955. Steve Schifferes, “Globalisation Shakes the World,” *BBC News*, January 21, 2007, accessed February 1, 2012, [news.bbc.co.uk/2/hi/business/6279679.stm](http://news.bbc.co.uk/2/hi/business/6279679.stm). The end of the Cold War in the early 1990s produced a political environment conducive to the promotion of the notion of free trade. Free trade advocates that nations lower or eliminate trade barriers and tariffs so that countries might develop some particular competencies so that they can participate in the global economy. Several trading blocs have been built during the last three decades that facilitate trade among their partners, including the European Union, which currently consists of twenty-seven countries with a total population in excess of five hundred million and a gross domestic product (GDP) greater than that of the United States. The European Union shares a common currency, and there are no trade barriers among its member states. NAFTA stands for the North American Free Trade Agreement and encompasses Canada, the United States, and Mexico. With respect to the combined GDP of these three countries, NAFTA represents the largest trading bloc in the world. Two other trading blocs in the Western Hemisphere are the Dominican Republic-Central American Free Trade Agreement and MERCOSUR (Common Southern Agreement), which promotes trade among Argentina, Brazil, Paraguay, and Uruguay. The spectacular growth of

international finance should also be considered when examining the growth of globalism in recent history.

- **Changes in consumer demands.** Across the world, consumers are becoming progressively more demanding. They expect better quality products with more options and at a lower cost. One has to look only at the global market for cell phones for an example. Even in countries that might be classified as Third World countries, consumers expect to be able to buy cell phones with cutting-edge capability at reasonable prices. This results in a great need for new products, which in turn requires a reduction in life cycle development times. Normally, increasing the product development time would generally result in higher cost, something that is unacceptable today. To meet increasing and often conflicting demands, businesses find that they must work closely with members of their supply chain.
- **Organizations that have recognized the need to change.** Increasingly, more and more businesses recognize that old models may no longer function. In the past, many businesses strove to be vertically integrated. This meant that they wanted to control as many aspects of their operations as possible. Large oil companies exhibit vertical, industry-wide integration. A firm such as Exxon-Mobil has the capacity to carry out almost all the functions associated with the petroleum industry. Exxon-Mobil has units that can explore for oil, drill for oil, transport oil, refine oil into gasoline, and sell it directly to consumers. In this way, it has almost complete control over the entire supply chain. This approach—total vertical integration—may work in some industries where firms recognize that it is economically advantageous to outsource noncore activities. Firms are making the decision whether to make or buy, and they are finding it financially attractive to have other businesses make components or products for them. As outsourcing became more popular, there was immediate recognition that businesses had to pay careful attention to all the elements of their supply chains. They had to develop working relationships with their suppliers and their customers. As will be highlighted in [Section 11.2.1 "Developing New Relationships"](#), successful supply chain management requires new approaches for dealing with suppliers. Those businesses that have successfully made this transition can fully exploit the benefits of supply chain management.

Another area where businesses have learned to change, which has greatly impacted the acceptance of supply chain management, is the change from a push philosophy to a pull philosophy. A push philosophy means that a business produces goods and services and pushes it into the marketplace. A push-based system will forecast demand in the market, produce the required amount, push the product

out the door, and hope that the forecast was correct. In contrast, a pull philosophy means that the production of goods and services is initiated only when the marketplace or the consumer demands it. Production is initiated by actual demand.

- **Technical innovations.** Today's approach to supply chain management would be impossible without technological revolutions in the fields of communication and computer software. It would be impossible to operate in a global supply chain without the Internet. As will be discussed in [Section 11.4 "The Three Threads"](#), software packages for customer relationship management (CRM), warehousing control, inventory management, and supply chain relationship software are vital to the growth of supply chains.

### Video Clip 11.1

*What Is a Supply Chain?*

[\(click to see video\)](#)

*A brief explanation of the supply chain.*

### Video Clip 11.2

*Supply Chain: Three Key Things to Know*

[\(click to see video\)](#)

*Rob O'Byrne of the Logistics Bureau talks about three key concepts for a supply chain.*

### Video Clip 11.3

*What Is Supply Chain Management?*

[\(click to see video\)](#)

*The first of a series of twelve videos on supply chain management, providing an excellent overview of the subject.*

## Key Elements of a Supply Chain

What precisely makes up a supply chain management system? Various authors identify the different components or elements of such a system. Martin Murray, “Introduction to Supply Chain Management,” *About.com*, accessed February 1, 2012, [logistics.about.com/od/supplychainintroduction/a/into\\_scm.htm](http://logistics.about.com/od/supplychainintroduction/a/into_scm.htm); Phillip Edwards, “Supply Chain for Small Businesses and Its Benefit,” *Small and Medium Business Corner*, April 22, 2011, accessed February 1, 2012, [smb-corner.com/2011/04/supply-chain-management-small-business](http://smb-corner.com/2011/04/supply-chain-management-small-business); Joel D. Wisner, G. Keong Leong, and Keah-Choon Tan, *Principles of Supply Chain Management: A Balanced Approach* (Mason, OH: South-Western, 2004), 13. The simple list would include four core elements: procurement, operations, distribution, and integration.

Figure 11.3 The Core Elements of a Supply Chain Management System



6. A process that not only involves the purchasing of parts, components, or services but also considers that the right parts are delivered in the exact quantities at the correct location on the specified time schedule at minimal cost.

The first of the four elements—**procurement**<sup>6</sup>—begins with the purchasing of parts, components, or services. However, it does not end with the purchase. Procurement must ensure that the right items are delivered in the exact quantities at the correct location on the specified time schedule at minimal cost. This means that procurement must concern itself with the determination of who should supply the parts, the components, or the services. It must address the question of assurance

that these suppliers will deliver as promised. The opening phrase of this question is often as follows: should the business make or buy a particular part or service? The make-or-buy question can have both strategic significance and economic significance. Some businesses will choose not to have others make or provide services because they believe they may lose control over particular technologies or skill sets. Will it benefit a business to have lower cost in the short run yet lose its source of competitive advantage in the long run to another competitor? Overseas outsourcing may pose difficulties with respect to communication difficulties, extended transportation distances, and timelines. The inability to ensure the overall quality of the outsourced item may be a deciding factor in not having another business make the part or provide the service. Recent difficulties with the quality assurance of products made in China have given many American manufacturers second thoughts about outsourcing.

There are, however, reasons for businesses to outsource production or services. The most obvious reason is associated with lower costs. Read the business press and discover the phrase *the China price*. This refers to the low cost of products produced in China given its low wages. One should not think that outsourcing is associated only with overseas manufacturing. Many firms will domestically outsource certain in-house service activities. The firm ADP specializes in preparing businesses payrolls, employee benefits, and tax compliance. ADP has been successful because it is able to provide a high-quality product at lower cost than many firms could produce in-house. Another reason why a business may outsource production or other activities is that the business is currently unable to meet particular demand levels.

If one were to exclude strategic considerations and merely look at economic issues, many make-or-buy decisions could be fairly straightforward variations of breakeven analysis. Imagine a firm is thinking about outsourcing the manufacture of a particular part to a Chinese firm. The plot is not unique from a technical standpoint, so outsourcing would have no strategic significance. The firm has gathered the data in [Table 11.1 "Data for Domestic Production versus Chinese Outsourcing Option"](#) for its own operations and that of the Chinese firm.

Table 11.1 Data for Domestic Production versus Chinese Outsourcing Option

Costs	Domestic Production (\$)	Outsourcing to China (\$)
Fixed costs	40,000	4,000
Labor cost per unit	9.90	4.25
Material cost per unit	7.20	7.20

Costs	Domestic Production (\$)	Outsourcing to China (\$)
Transportation cost per unit	0.40	3.80
Tariff duty per unit	0.00	1.50
Total cost per unit	17.50	16.75

With these figures, there is no need to conduct a breakeven analysis. Outsourcing to China produces a lower total unit cost, and the fixed costs are significantly lower. The total cost reduction would dictate that China is the preferred location to produce the part. But now envision another scenario, one in which the transportation cost increases by \$2.55 (increasing the transportation cost per unit to \$6.35) and the tariff duty per unit increases by \$1 per unit. These results are presented in Table 11.2 "Revised Data for Domestic Production versus Chinese Outsourcing Option".

Table 11.2 Revised Data for Domestic Production versus Chinese Outsourcing Option

Costs	Domestic Production (\$)	Outsourcing to China (\$)
Fixed costs	40,000	4,000
Labor cost per unit	9.90	4.25
Material cost per unit	7.20	7.20
Transportation cost per unit	0.40	6.35
Tariff duty per unit	0.00	2.50
Total cost per unit	17.50	19.30

Given these changes, we can now conduct a breakeven analysis.

Domestic Production Total Costs		Outsourced to China Total Costs
Fixed costs + total variable costs	=	Fixed costs + total variable costs
$\$40,000 + \$17.50 * Q$	=	$\$4,000 + \$19.30 * Q$
$(\$40,000 - \$4,000)$	=	$(\$19.30 - \$17.50) * Q$
\$36,000	=	$\$1.80 * Q$
break-even point Q	=	20,000 units
<b>Q = Quantity</b>		

This simply means that if the demand for the part is fewer than 20,000 units, then it is cheaper to produce the part in China; however, if the demand is greater than 20,000 units, it is cheaper to produce the part domestically.

The key issue in procurement is how one goes about selecting and maintaining a supplier, which can be approached from two directions. The first centers on how a firm might evaluate a potential supplier. The second is how a firm evaluates those businesses that are already suppliers to an operation. When looking at the potential suppliers of a business, a firm may be aided by examining those suppliers with some form of certification. Perhaps the most globally recognized certification program is ISO 9000, a program designed to ensure that suppliers are certified and fully committed to quality production. A supplier that is ISO 9000 certified may mean that incoming goods need not be tested. In examining suppliers, one might also look at the number of employees of the potential supplier who have received certification in the area of supply chain management. The Association for Operations Management, formerly known as the American Production and Inventory Control Society (APICS), has a program to certify professionals in supply chain management. After selecting a supplier, one must have a program that continuously evaluates the capability of the supplier. Some of the capabilities that may be considered include on-time delivery, the accuracy of delivery (i.e., correct items in the correct quantities are shipped), the ability to handle fluctuations in demand, and the ability to hold inventory until needed by the customer. One needs a comprehensive set of metrics to perform such an analysis. One set of metrics will be discussed in [Section 11.2.2 "Managing Information in New Ways"](#). In addition, one must think about developing a new type of relationship with suppliers, one that is not adversarial but develops a close working relationship bordering on being an alliance.

The second major element of supply chain management system is **operations**<sup>7</sup>. Having received raw materials, parts, components, assemblies, or services from suppliers, the firm now must transform them and produce the products or the services that meet the needs of its consumers. It must conduct this transformation in an efficient and effective manner for the benefit of the supply chain management system. We will briefly overview those operational activities that most directly relate to supply chain management.

One element is demand management. This involves attempting to match demand with capacity. In a manufacturing environment, this may entail a better and more detailed production schedule. In a service environment, it may entail rescheduling customer appointments to better match service provider availability. A key element is improvements in inventory control, which may be done by using **materials requirement planning**<sup>8</sup> software or instituting a **just-in-time**<sup>9</sup> program. Just-in-time attempts to create an inventory system where the inventory arrives exactly

7. The activities and tasks associated with turning a firm's inputs (materials, capital, and labor) into goods and services.
8. A computerized inventory control system that schedules the production of goods and takes into consideration the available and the required inventory.
9. An approach to inventory that seeks to eliminate excess waste and reduce inventory to a minimal level.

when it is needed. Another way of achieving operational efficiency to improve the supply chain management system is by adopting **lean methodologies**<sup>10</sup>. The essence of lean is attempting to eliminate all forms of waste from a production or service system.

The third element of the supply chain management system is **distribution**<sup>11</sup>. Distribution involves several activities—transportation (**logistics**<sup>12</sup>), warehousing, and **customer relationship management (CRM)**<sup>13</sup>. The first and most obvious is logistics—the transportation of goods across the entire supply chain. The need to efficiently transport goods has led to a hierarchy of logistics providers. Some argue that it now consists of a four-party hierarchy. First-party logistics providers are those who wish to ship goods to a particular location. Second-party logistics providers are those businesses that provide the means of transportation, including shipping freight by air, rail, or truck. Second-party logistics providers may also offer warehousing services to temporarily store goods. Third-party logistics providers specialize in offering an array of services to simplify transportation. They offer services that synthesize a variety of services, including the shipping of goods, warehousing, inventory management, and packaging. They also may offer services associated with facilitating customs operation and the resolution of problems associated with international transportation. The range of services can be so extensive that the literature segments third-party logistics providers into four groups. Susanne Hertz and Monica Alfredsson, “Strategic Development of Third-Party Logistics Providers,” *Industrial Marketing Management* 32, no. 2 (2003): 139. They range from those businesses that pick up and deliver goods to those businesses that essentially perform the entire logistics function for a customer. In the last fifteen years, a fourth level of logistics providers was added to this hierarchy. Although there is some argument as to what distinguishes sophisticated third-party logistics providers from fourth-party logistics providers, the essential distinction is that fourth-party logistics providers function as consultants for supply chain management logistics issues. They are non-asset-based integrators “Fourth-Party Logistics,” *Business Dictionary.com*, accessed February 27, 2012, [www.businessdictionary.com/definition/fourth-party-logistics-4PL.html](http://www.businessdictionary.com/definition/fourth-party-logistics-4PL.html).—firms do not own shipping assets or warehouses; they simply provide consulting services.

The CRM component of the distribution element represents an attempt to automate interactions with customers and facilitate the development of sales prospects through software packages. Most small businesses will start using CRM as a means of contacting current customers and future prospective customers. They then move on to software that automates the entire sales process. The ultimate goal of CRM is the greater connection with customers, thus providing them with greater value.

10. A series of techniques designed to eliminate waste from manufacturing and service processes and provide greater customer value.

11. A process that involves several activities: transportation (logistics), warehousing, and CRM.

12. The active management of the distribution of materials throughout a system.

13. A service approach that hopes to build a long-term and sustainable relationship with customers that has value for both the customer and the company.

The last element of supply chain management is the need for **integration**<sup>14</sup>. At the beginning of this chapter, we mentioned that many small businesses are unfamiliar with their immediate customers and their immediate suppliers; however, they may be part of a much larger chain. It is critical that all participants in the service chain recognize the entirety of the service chain. A failure to overcome the myopia of just being concerned with the immediate customer and the immediate supplier can produce significant disruptions in the entire chain. These disruptions can significantly increase costs and destroy value.

The impact of the failure to adopt a system-wide perspective—that is, examining the totality of the chain—is most clearly seen in what is known as the “bullwhip” effect. This effect illustrates how a narrow perspective can produce unexpected consequences. Envision a classic supply chain composed of a retailer—who is supplied by a wholesaler—who in turn is supplied by a distributor with a product coming from the manufacturer. Each element of this chain must forecast its anticipated demand and determine the appropriate levels of inventory. Because no element of this chain wishes to “stock out”—having insufficient inventory to meet a customer’s demand—each element will carry what is known as safety stock. In many cases, the more certain the demand, the greater the need for such safety stock. If demand at the retail level increases, then it follows that demand will also increase at each level further up the supply chain. If demand decreases at the retail level, the demand will likewise decrease further up the chain. The rate at which demand and inventory levels fluctuate is dependent on the lead time at each level in the chain. The delay between an increase for the retail level and the corresponding increase or decrease at the manufacturing level will be a function of this lead time. The bullwhip effect recognizes that the amplitude of inventory swings increases as one travels up the supply chain because each element of the supply chain is a relatively narrow focus of just trying to meet the needs of their customers. If the forecast for “shared” demand across the entire chain could be made simultaneously or if the lead time could be significantly reduced, then this phenomenon would not be quite as dramatic or problematic. The bullwhip effect calls for integrating information across the entire supply chain.

An **enterprise resource planning (ERP)**<sup>15</sup> system can successfully integrate information across the entire supply chain. An ERP system is an integrated set of computer programs that brings information about a firm’s accounting, financial, sales, and operations into a common database. Cecil C. Bozarth and Robert B. Handfield, *Introduction to Operations and Supply Chain Management*, 2nd ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2007), 519. One also needs a series of metrics that would indicate the overall performance of the supply chain. This should also be part of the integration process. We discuss such metrics in [Section 11.2.2 "Managing Information in New Ways"](#).

14. The coordination of all activities across the entire supply chain.
15. A system that integrates multiple business functions from purchasing to sales, billings, accounting records, and payroll.

### **Video Clip 11.4**

*Module 2: Buy It: Managing Supply*

[\(click to see video\)](#)

*An introduction to purchasing.*

### **Video Clip 11.5**

*Module 3: Make It: Manufacturing and Operations*

[\(click to see video\)](#)

*Manufacturing and supply chain management in local firms operations.*

### **Video Clip 11.6**

*Module 4: Move It: Transportation and Logistics*

[\(click to see video\)](#)

*Discussion of the difference between transportation and logistics.*

### **Video Clip 11.7**

*Module 5: Sell it and Service It: Retail Considerations*

[\(click to see video\)](#)

*Discussion of supply chains in the retail environment.*

## Web Resources

Supply Chain Management Description

An introduction to the topic.

[www.eil.utoronto.ca/profiles/rune/node5.html](http://www.eil.utoronto.ca/profiles/rune/node5.html)

About.com Introduction to Supply Chain Management

Brief coverage of supply chain management for small businesses with additional links.

[logistics.about.com/od/for-small-businesses/For\\_the\\_Small\\_Business.htm](http://logistics.about.com/od/for-small-businesses/For_the_Small_Business.htm)

Big Business Supply Chain Management: A Small Business Option?

Looks at the benefits of supply chain management for smaller businesses.

[smallbiztrends.com/2006/05/big-business-supply-chain-management-a-small-business-option.html](http://smallbiztrends.com/2006/05/big-business-supply-chain-management-a-small-business-option.html)

## KEY TAKEAWAYS

- The supply chain involves the integration of goods, finances, and information from the initial supplier to the final customer.
- A revolution in supply chain management has been produced by globalization, changes in consumer demand, organizations that recognize the need for changing ways of doing business, and technical innovations.
- Supply chains are composed of four major elements: procurement, operations, distribution, and integration.
- Supply chain management should not be seen as appropriate only for large businesses.

## EXERCISES

1. Interview the owners of five local businesses and ask them if they have a supply chain management system. If the answer is no, ask them if they intend to have such a system in the near future. If the answer is still no, ask them why not.
2. Ask the business owners how they handle their shipping needs.
3. The bullwhip effect is illustrated by a simulation known as the “BeerGame.” Go to the following website, which has an online version of the game: [www.masystem.com/o.o.i.s/1366](http://www.masystem.com/o.o.i.s/1366). Play the game as the retailer for a fifty-two-week period (it actually takes only a few minutes to play the game). Examine the results and write a short (two- to four-page) paper on what they signify.
4. Repeat Exercise 3 but assume the role of the manufacturer.

## 11.2 A Firm's Role in the Supply Chain

### LEARNING OBJECTIVES

1. Learn about the importance of developing new types of relationships with suppliers and customers.
2. Businesses need to strive toward win-win scenarios with their supplier partners.
3. Understand the need for accurate metrics to evaluate the performance of the supply chain management system.

### Developing New Relationships

**Game theory**<sup>16</sup> is a branch of mathematics. Broadly stated, game theory examines competitive situations in which one's outcomes may be influenced or dictated by the decisions of other players. It has been applied to a variety of worldwide domains, including economics, military operations, political science, and business strategy. It has its own very large literature base, and work in this field has been recognized by several Nobel prizes in economics. To better understand some of the risk associated for small businesses participating in supply chain management, we will briefly look at two types of games: zero-sum games and non-zero-sum games.

**Zero-sum games**<sup>17</sup> are those in which the total benefits for all participants total zero. Baseball can be seen as a zero-sum game. If one is told that the New York Yankees and the New York Mets played an exhibition game and the Yankees won, then one also knows that the New York Mets lost. Basketball and most games in professional football are also zero-sum games because there is a winner and a loser. Poker can also be seen as a zero-sum game. If your five friends have a Friday night game of poker and one player is up \$100, then you also know that the other four players have suffered a cumulative loss of \$100.

**Non-zero-sum games**<sup>18</sup>, on the other hand, are those that potentially have net results other than zero. This simply means that the loss of one player does not directly correspond to the gain of another player. In a non-zero-sum game, it is possible for all the players to win or for all the players to lose. The classic illustration of a non-zero-sum game is known as the prisoner's dilemma. The prisoner's dilemma hypothesizes that two criminals (prisoner A and prisoner B) are arrested and charged with the same crime. At the police station, they are separated, and each is given the following option: if you inform on the other prisoner, you will

16. A branch of mathematics that examines competitive situations in which one's outcomes may be influenced or dictated by the decisions of other players.
17. A game in which the total benefits for all participants total zero.
18. A game that potentially has net results other than zero.

be set free, while the other prisoner will receive a five-year sentence. Both prisoners would instinctively recognize that if they both remained silent, the police would have insufficient evidence to convict both of the crime. At worst, they would be held in the jail for several months. If, however, both prisoners informed on each other, they would probably receive a two-year sentence. Assuming that both prisoners wish to serve the minimal amount of time, their individual decisions will be dictated by what they believe will be the other prisoner's decision. There are four possible outcomes to this scenario:

1. Prisoner A informs on prisoner B while prisoner B remains silent. This is a win for prisoner A and a loss for prisoner B. This is a win-lose outcome.
2. Prisoner B informs on prisoner A while prisoner A remains silent. This is a win for prisoner B and a loss for prisoner A. This is a win-lose outcome.
3. Both prisoner A and prisoner B inform on each other. This situation essentially represents a loss for both prisoner A and prisoner B. This is a lose-lose outcome.
4. Both prisoner A and prisoner B trust each other and remain silent. This results in both prisoners doing a minimal amount of time. In effect, this is a win-win for both individuals.

The point of this brief introduction to game theory is to highlight the possibility of creating a **win-win scenario**<sup>19</sup>. In the prisoner's dilemma, the key to achieving a win-win outcome is that both parties must have complete trust in each other. This concept of mutual trust plays a critical role in successful supply chain management. Far too often, both the supplier and the customer perceive the relationship as a win-lose outcome only. Customers want suppliers to provide items at the lowest possible cost, with the highest quality, delivered exactly when needed. Customers often use multiple suppliers and play them off against each other to guarantee the lowest possible price. Suppliers want to provide customers with items of the highest possible price, with acceptable quality, and delivered when it is convenient for the supplier. These attitudes produce a "dance" between the customer and the supplier, where both are trying to win even if that means that the other loses. These attitudes often stem from the fact that there is no trust between the customer and the supplier.

W. Edwards Deming, the famous management guru who was most commonly associated with the quality movement, had several interesting insights into areas that would be associated with supply chain management. As one of the few management theorists whose ideas were comprehensive enough to be synthesized into a coherent business philosophy, Deming summarized his approach to management in fourteen points. One of these points is as follows: "End the practice

19. Outcomes where there can be multiple winners.

of awarding business on the basis of price. Instead, minimize total cost. Move toward a single supplier for any one item, with a long-term relationship of loyalty and trust.”Ken Boyer and Rohit Verma, *Operations and Supply Chain Management for the 21st Century* (Mason, OH: South-Western, 2009), 38.

Deming argued that the move toward a single supplier for a particular part could yield significant advantages. Using a single supplier requires that a customer must sign a multiyear agreement with the supplier. This enables both the supplier and the customer to better understand each other’s needs and capabilities. As this knowledge grows, the supplier can better serve the customer by improving quality, design, and service.W. Edwards Deming, *The New Economics for Industry, Government, Education*, 2nd ed. (Cambridge, MA: MIT Press, 2000), 232. From these improvements, one can easily anticipate that there will be lower costs and higher profits. A multiyear contract with a supplier guaranteeing particular sales is invaluable to many suppliers because of the benefit of such a contract when that supplier must deal with its bank. Deming counters the argument for the need for multiple suppliers, in case a catastrophe or a disaster strikes that single supplier, by suggesting that a tight and trusting relationship will lead the supplier to develop sufficient contingency plans. Deming argues that a sense of joint responsibility comparable to a marriage comes from such trust.

Building such trust between two organizations is not easy. It will often require significant changes in one or both parties. Such change is best induced when it is clear to all participants that there is top-level management support for the new ways of doing business. Top management must articulate the shared vision between the two organizations. Top management must clearly identify the objectives and metrics to be used by both the supplier and the customer. People need to clearly understand the joint benefits from adopting the new way of business. In addition, even with electronic communication, it is highly advisable that members of both organizations meet on a regular basis and perhaps tour each other’s facilities.

The new relationships that are required for the success of any supply chain management program are not easy to implement, but they are vital. Every effort must be made to adopt this win-win perspective.

### Video Clip 11.8

*Module 6: Supply Chain Integration*

[\(click to see video\)](#)

*How elements of a supply chain must be brought together.*

## Video Clip 11.9

*Module 7: Global Supply Chain Management*

[\(click to see video\)](#)

*An examination of global operations.*

## Video Clip 11.10

*Module 8: Socially Responsible Supply Chain Management*

[\(click to see video\)](#)

*Social responsibility and sustainability are important concepts.*

## Video Clip 11.11

*Module 9: Business Processes*

[\(click to see video\)](#)

*The moment a customer places an order through delivery.*

## Video Clip 11.12

*Module 11: Quality Management*

[\(click to see video\)](#)

*Supply chains are tasked with producing high-quality products.*

## Managing Information in New Ways

Cost, profits, and financial ratios can provide useful insights into the overall efficiency and effectiveness of any business. However, they do not always tell the full story. A sudden spike in the price of oil, a flood that destroys a low-cost supplier, an increase in interest rates, the closing of a large plant in a small town, or a national banking crisis are all external factors that can cripple the financial viability of any business. These external factors lie beyond the control of even the best management team. Sometimes we need to be very careful about what we measure and how we should measure. Although it adds a layer of complexity to a

basic accounting system, measurements that are useful for evaluating processes that serve customers can be provided.

When evaluating the supply chain of a business, there is a great need to carefully consider what metrics should be employed. Such a consideration should include at least some of the following factors:

- **Total supply chain cost.** All the operational expenditures of a cost associated with the requisite information systems.
- **Cash-to-cash cycle time.** The time between when an organization purchases raw materials and when they are paid by the customer.
- **Delivery.** The percentage of orders delivered on or before customer due dates.
- **Flexibility.** The amount of time required to handle a significant ramp up in production. Joel D. Wisner, G. Keong Leong, and Keah-Choon Tan, *Principles of Supply Chain Management: A Balanced Approach* (Mason, OH: South-Western, 2004), 442.

For those who are seriously committed to maximizing the benefits from successful supply chain management, study the **supply chain operations reference (SCOR) model**<sup>20</sup>. This model enables businesses to benchmark their supply chain management systems. Developed in 1996 by the Supply Chain Council in conjunction with AMR Research and Pittiglio Rabin Todd and Rath, Scott Webster, *Principles and Tools for Supply Chain Management* (Boston: McGraw-Hill, 2008), 55. the purpose of the SCOR model is to provide methods to measure and benchmark the performance of the supply chain management system of a business. Currently, one thousand firms, universities, and government agencies participate in the continuing evolution of the SCOR model. It is predicated on three major components: process modeling, performance measurement, and the determination of best practices.

The process-modeling component begins with five essential elements that link together the supply chain: plan, source, make, deliver, and return. Plan refers to those processes associated with the design of the supply chain, planning activities associated with the other four processes, and the implementation of all these plans. These plans should enable management to identify any significant gaps and determine how these gaps will be closed. Source refers to the ordering and the acquisition of goods and services to meet anticipated demand, including purchase orders, scheduling, receipts, and storage. Make refers to those processes used to create the product or the service, including, for example, make to stock, make to order, or engineer to order. Deliver refers to those processes associated with the development and the fulfillment of customer orders, including scheduling,

20. A comprehensive series of metrics to evaluate the performance of a supply chain's operations.

packaging, and shipping all orders. Lastly, return refers to those processes associated with the return of finished products by a customer. The SCOR model attempts to be as inclusive as possible with respect to these five major processes. Each process can be broken down into subcomponents. Currently, there are thirty subcomponents for the plan element, twenty-seven subcomponents for the source element, thirty-one subcomponents for the make element, sixty-one subcomponents for the deliver element, and thirty-six subcomponents for the return element. This program then goes on to identify specific metrics for nearly every subcomponent. It is the most comprehensive system of evaluation for supply chain management.

### **Video Clip 11.13**

*Walmart Logistics*

[\(click to see video\)](#)

*A Walmart logistics commercial.*

### **Video Clip 11.14**

*Ford Manufacturing Supply Chain*

[\(click to see video\)](#)

*A Cisco promotional video on supply chain management.*

### **Video Clip 11.15**

*Module 10: Measuring Performance*

[\(click to see video\)](#)

*Supply chains are tasked with being effective, efficient, and adaptable.*

## Web Resources

### Game Theory

A comprehensive set of materials from a professor's course on game theory.

[www.agsm.edu.au/bobm/teaching/SGTM.html](http://www.agsm.edu.au/bobm/teaching/SGTM.html)

### Prisoner's Dilemma

A computer application that allows individuals to play a game based on the prisoner's dilemma.

[www.gametheory.net/Mike/applets/PDilemma](http://www.gametheory.net/Mike/applets/PDilemma)

### SCOR Frameworks

An overview of SCOR from the Supply Chain Council.

[supply-chain.org/resources/scor](http://supply-chain.org/resources/scor)

### The SCOR Model for Supply Chain Strategic Decisions

An article describing SCOR.

[scm.ncsu.edu/scm-articles/article/the-scor-model-for-supply-chain-strategic-decisions](http://scm.ncsu.edu/scm-articles/article/the-scor-model-for-supply-chain-strategic-decisions)

### KEY TAKEAWAYS

- In game theory's non-zero-sum model, it is possible to produce win-win scenarios for multiple players.
- Win-win scenarios require mutual trust.
- Supply chain management success needs new levels of trust and respect for it to function properly in the long run.
- Supply chain management needs metrics to evaluate its performance.
- Existing models of supply chain metrics (SCOR) can handle the most complicated of supply chains.

### EXERCISES

1. Identify some examples in your life and in business of win-win scenarios.
2. How were these scenarios achieved?
3. What were the greatest threats to these scenarios?
4. Interview five small business owners and ask them if they have had any experiences with win-win scenarios and how were they achieved.
5. Ask the same five small business owners how they measure (if they do) the effectiveness of the performance of their supply chain.
6. Imagine a local bakery that produces goods for a regional supermarket chain. Examine the SCOR model and determine if it is appropriate for evaluating the bakery's supply chain.

## 11.3 The Benefits and the Risks of Participating in a Supply Chain

### LEARNING OBJECTIVES

1. Understand the major benefits to be derived from adopting a supply chain management system.
2. Understand the challenges of creating such a system.
3. Understand the technical and managerial risks associated with supply chain management.
4. Recognize the benefits for a small business in adopting supply chain management.

### The Benefits of Successful Supply Chain Management

For any small business, a commitment to developing a supply chain management system is not a small undertaking. It involves the commitment of significant financial resources for the acquisition of appropriate software. Policies and procedures must be changed in accordance with the needs of the new system. Personnel must be trained in not only using the new software but also adapting to new ways of doing business. Small businesses accept these challenges of adopting supply chain management systems because such systems are viewed as being important for long-term survival and because businesses anticipate substantial management and economic benefits.

The management benefits of supply chain management system include the following:

- **Silo busting.** By their very nature, supply chain management systems improve communication across all functions within a business. This leads to employees having a better understanding of the entire operations of a business and how their work relates to the overall benefits of the business.
- **Improve communications with suppliers and customers.** Improved communications with customers enhances the overall value provided to those customers. The improvement in customer satisfaction leads to longtime relationships, which yields significant economic benefits. Improved communications with suppliers improve the overall operational efficiency of both participants, reduce costs, and improve profits.

- **Supplier selection.** Supply chain management systems can help businesses evaluate prospective suppliers and monitor the performance of current suppliers. This capability can lead to strategic sourcing and significant cost savings plus improvement of the when-and where-needed variables.
- **Improvements in purchasing.** The automation of purchasing reduces errors and improves the economic efficiency of the purchasing function. Disciplined purchasing can allow for the full exploitation of available discounts.
- **Reduction of inventory costs.** Supply chain management systems can produce significant cost savings across all levels of inventory. Improved forecasting and scheduling will lead to increases in inventory turns and a corresponding reduction of costs.
- **Improvements in operations.** Improved quality control reduces the scrap rate, which in turn can have significant cost savings. Better production scheduling translates into producing what is needed when it is needed. The business does not have to spend additional money trying to expedite the production of particular orders to customers. The cost of goods sold is reduced in this manner. An additional benefit of supply chain management systems is that they lead to better utilization of plant and equipment. Great utilization translates into less likelihood that unneeded assets will be acquired, which has major financial benefits.
- **Error reduction.** By automating processes, billing errors and errors associated with purchasing and shipping quantities can be reduced. This not only saves money but also improves satisfaction with both suppliers and customers.
- **Improvements in transportation operations.** Accurate deliveries reduce returns and their associated costs. Sophisticated shipping models can reduce the overall cost of transportation.
- **Additional financial benefits.** Such systems can improve the collections process, which impacts customer relations, reduces bad debts, and improves cash flow.

## The Risks Associated with Supply Chain Management

The major risks associated with a supply chain management system fall into two categories: technical and managerial.

Michael Porter's five forces model is a model of the major factors that contribute to an industry's overall structure. It also points to factors that might affect the overall profitability of the particular business within that industry. The greater the strength of these forces, the greater the challenge to make above average return

profits for businesses in that industry. It is useful to review two of those forces—the power of suppliers and the power of buyers—and reexamine how they might influence the profitability of any business in the supply chain.

Porter identifies the following factors that might contribute to the overall strength of each force. He argued that suppliers are powerful (see [Figure 11.3 "The Core Elements of a Supply Chain Management System"](#)) when the following occurs:

- **They are concentrated.** When an industry is dominated by only a few suppliers, these suppliers generally have a greater ability to dictate terms to their customers. The mining company DeBeers, which controls more than 50 percent of the world diamond production, is able to set the selling price of diamonds for most of the world's jewelers. Mason A. Carpenter and William G. Sanders, *Strategic Management and Dynamic Perspective* (Upper Saddle River, NJ: Prentice Hall, 2008), 108. It should be pointed out, however, that in some cases concentration, particularly a duopoly, provides an opportunity for customers to force the two competing firms to compete more readily against each other. Think of the situation of Boeing and Airbus and their relationship to their customers—various airlines. At present, there are only two major producers of commercial aircraft, and airlines sometimes obtain better deals from one manufacturer because of their desire to maintain parity in market share.
- **The size of the suppliers is large relative to the buyers.** Suppliers are powerful when they are large and sell to a set of fragmented buyers. Think of the largest oil companies that sell gasoline to independent stations. The power in this scenario lies with the large oil companies.
- **Switching costs are high.** Suppliers have power when the cost of switching to an alternative supplier is expensive. Many businesses stay with Microsoft products because to do otherwise means that they would have to repurchase new hardware and software for the entire organization.

Problems may also arise from a heavier reliance on one customer in the supply chain. Even large companies need to be aware of their relative strength in the supply chain. Rubbermaid is the most admired corporation in America, as voted by *Fortune* magazine in 1993 and 1994, yet it had significant difficulties when dealing with one of its major customers—Walmart. In the early 1990s, Rubbermaid found that the cost for a key ingredient—resin—had increased by 80 percent. Mary Ethridge, "News about the Wal-Mart Struggle," accessed February 2, 2012, [www.dsausa.org/lowwage/walmart/Dec17\\_03.html](http://www.dsausa.org/lowwage/walmart/Dec17_03.html). Walmart's almost total focus on lowering its prices led it to drop many of Rubbermaid's products. This began a

downward spiral for Rubbermaid, which led to its acquisition by Newell Inc. Rubbermaid went from the status of the most admired corporation to being a basket case because it failed to recognize its excessive dependence on one customer.

## Web Resources

### The Benefits of Supply Chain Management

A list of benefits from SAP, a software company.

[searchsap.techtarget.com/feature/Checklist-Quantifying-Supply-Chain-Management-benefits](https://searchsap.techtarget.com/feature/Checklist-Quantifying-Supply-Chain-Management-benefits)

### The Risks of Supply Chain Management

A Forbes article on the risks associated with supply chain management.

[www.forbes.com/2006/11/15/risks-supply-chain-strategies-biz-logistics-cx\\_rm\\_1115strategies.html](https://www.forbes.com/2006/11/15/risks-supply-chain-strategies-biz-logistics-cx_rm_1115strategies.html)

### Risk and Rewards in Supply Chain Management

A Harvard working paper.

[hbswk.hbs.edu/archive/4971.html](https://hbswk.hbs.edu/archive/4971.html)

### KEY TAKEAWAYS

- There are significant benefits for businesses that adopt supply chain management systems.
- The benefits stem from improved customer relations, cost cutting, and increased operational efficiencies.
- The adoption of a supply chain management perspective can pose risks.
- Businesses must consider the relative power of both their suppliers and their customers.

### EXERCISES

1. Interview the owners of local businesses who say they have some form of a supply chain management system and ask them if they believe they have benefited from the system.
2. Ask them how they have benefited.
3. Ask them to identify the major problems they had with implementing and using the system.
4. Ask them if they believe they have the “power” in their supply chain or if the “power” is in the hands of their suppliers.

## 11.4 The Three Threads

### LEARNING OBJECTIVES

1. Understand how customer value is enhanced by supply chain management.
2. Understand how cash flow can be increased, in the long term, by using supply chain management.
3. Understand the various computer programs that make up a supply chain management program.
4. Recognize the risks that can stem from adopting a single supplier program.

### Customer Value Implications

Throughout this text, we have emphasized the importance for small businesses to constantly focus on the notion of improving value for their customers. Successfully implementing a supply chain management system offers tremendous possibilities for not only improving value to customers but also significantly enhancing the capabilities and profitability of the small business itself. Supply chain management improves customer value in the following ways:

- **Reduced inventory.** A well-executed supply chain management system means that customers receive orders when they need them. Further, this does not necessarily imply that the supplier will be holding the inventory for the customer—although that might occur. It refers to the fact that better communication and better scheduling may enable the supplier to produce the item exactly when it is needed.
- **Improvement in the order accuracy.** Supply chain management should guarantee that when orders are shipped, the right items are shipped in the right quantity. This does not disrupt the production of the customer and eliminates product returns, which results in economic benefits for both the customer and the supplier.
- **Reduced cycle time for product development.** To ensure success, the customer and the supplier must develop new levels of trust. This trust will evolve into a long-term relationship. Both parties begin to know each other better, including each other's needs and capabilities. As this evolves, the supplier is in a better position to help the customer develop new products far more rapidly. It greatly reduces the product cycle time.

- **Financial benefits.** These value improvements all translate into significant cost savings. Cost savings experienced by the supplier can be transferred into cost savings for the customer. Relatively modest improvements in inventory reduction, reduced safety stock size, reduce stockouts, improved order fill rates, and reduced transit time can yield surprisingly large financial benefits to both parties.
- **Peace of mind.** Having a supplier that one can trust to accurately deliver items in a timely low-cost fashion, which has also developed contingency plans to cope with potential problems, is relatively unique and provides the customer with a high level of comfort. One may be unable to place an economic price on such peace of mind.

### Cash-Flow Implications

It must be recognized that committing to a supply chain management system from scratch will entail a major investment. New approaches to software can reduce both the cost and the risk of such a commitment. However, businesses will want to recoup most of the investment as quickly as possible—perhaps six months or less. Given the potential for cost savings, the impact on increasing cash flow should be obvious.

What is not obvious is the potential for significant improvements in cash flow from minor improvements generated by supply chain management systems. To illustrate this, let us look at an example adapted from Coyle et al. (2009). John J. Coyle, C. John Langley, Brian Gibson, Robert A. Novak, and Edward J. Bardi, *Supply Chain Management: A Logistics Perspective*, 8th ed. (Mason, OH: South-Western, 2008), 301. Assume that a firm is in the following situation: It ships orders to customers; if the orders are incomplete or inaccurate, the firm assumes the full cost of the return and follow-up shipping. When an incorrect shipment is made, to ameliorate their upset customers, the firm takes \$100 off the bill. However, when some customers find that the order is incomplete or inaccurate, they are so upset that they cancel the order. Here are the data:

Number of orders per year	50,000
Number of items per order	25
Profit per unit (\$)	30
Price reduction for incorrect order (\$)	100
Back order cost per order (\$)	200
Percentage of totally correct orders	90
Percentage of incorrect orders cancelled	25

It can be readily seen that the profit per order is \$750 ( $25 \times \$30$ ). We now examine the lost cash flow from the situation. The lost cash flow has several components. The first component is the back order cost, which is composed of the number of orders that will have to be back filled. The second component is associated with the losses from the incorrect orders that were canceled. The last component is the price reduction for the incorrect order.

$$\text{lost cash flow} = \text{backorder costs} + \text{cancelled sales costs} + \text{price reduction costs}$$

These can be computed as follows:

$$\text{lost cash flow} = [\text{number of orders} \times (1 - \text{percentage of totally correct orders}) \times \text{backordered cost per order}]$$

$$[\text{number of orders} \times (1 - \text{percentage of totally correct orders}) \times \text{percentage of incorrect orders cancelled} \times \text{profit per order}] + [\text{number of orders} \times (1 - \text{percentage of totally correct orders}) \times \text{price reduction for incorrect order}]$$

Now let us substitute the correct values into this equation.

$$\text{lost cash flow} = [50,000 \times (1 - .90) \times \$200] + [50,000 \times (1 - .90) \times (.25) \times \$750] + [50,000 \times (1 - .90) \times \$100]$$

$$\text{lost cash flow} = \$1,000,000 + \$937,500 + \$500,000 = \$2,437,500$$

We now assume that an “improved” supply chain management system has been installed. The percentage of correctly filled orders increases from 90 percent to 96 percent. If we substitute 96 percent into these equations, we find that the *new* lost cash flow would decrease to \$975,000. This means that a 6 percent increase in order accuracy leads to a 60 percent decrease in the loss of cash flow.

## Implications of Technology and the E-Environment

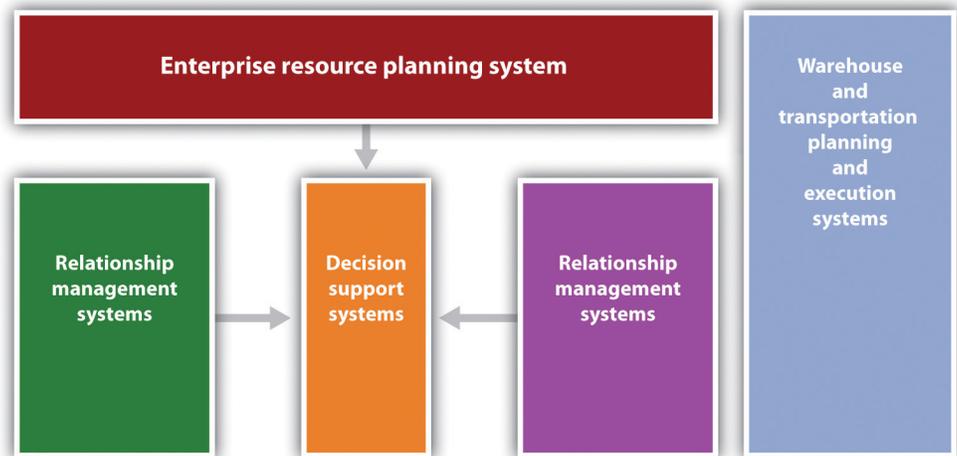
It should be obvious that contemporary supply chain management cannot be conducted through paper and pencil procedures. The backbone of today’s supply chain management is software. Initially, it would be impossible to think of developing such systems without **electronic data interchange**<sup>21</sup>. Today, the Internet serves as the basis for sharing communication between suppliers and customers. However, there is more to the technology behind supply chain management system than merely the exchange of data.

21. The ability to electronically transfer large “packets” of data across various locations and programs.

Supply chain management requires several types of software packages and the need to successfully integrate them. One can identify several major software components

of a supply chain management system (see [Figure 11.4 "Schematic for a Supply Chain Management Information System"](#)). One section would be **supplier relationship management**<sup>22</sup> programs. These programs involve planning and controlling the actions with upstream suppliers. Such programs would cover many aspects of procurement—supplier analysis, order execution, payment, and performance monitoring. Joel D. Wisner, G. Keong Leong, and Keah-Choon Tan, *Principles of Supply Chain Management: A Balanced Approach* (Mason, OH: South-Western, 2004), 76. There would also be customer relationship management (CRM) software that would handle all interactions with customers. Enterprise resource planning (ERP) would handle the necessary integration of all data. ERP coordinates data flows from finance, accounting, and operations to provide management with a seamless overview of the performance of a business. It may also have a **decision support system**<sup>23</sup>, which allows for data manipulation or the use of analytical modeling tools to provide a better decision-making environment. It may involve using mathematical programming models to optimize decisions. Another set of modules dedicated to logistics would focus on the optimal use of warehousing and shipping. These functions are sometimes handled externally by either a third- or fourth-party logistics provider.

Figure 11.4 Schematic for a Supply Chain Management Information System



22. Programs that involve planning and controlling the actions with upstream suppliers, including supplier analysis, order execution, payment, and performance monitoring.

23. A program that allows for data manipulation or the use of analytical modeling tools to provide a better decision-making environment, which may involve the use of mathematical programming models to optimize decisions.

Not too long ago, the acquisition and the operation of these software packages would have been prohibitive for most small businesses from both a cost standpoint and a technical standpoint. Fortunately, software providers now recognize that small and midsize businesses represent a tremendous market for supply chain management software. It was estimated in 2008 that the demand for business enterprise software applications for small and mid-sized businesses would grow at a nearly 11 percent annualized growth rate until 2012. “Small and Medium-Sized Business Enterprise Applications Market to Grow to \$80.3 Billion by 2012,” *Business*

Wire, June 11, 2008, accessed February 2, 2012, [www.reuters.com/article/2008/06/11/idUS117514+11-Jun-2008+BW20080611](http://www.reuters.com/article/2008/06/11/idUS117514+11-Jun-2008+BW20080611). Microsoft, Oracle, and SAP have developed systems that enable small to midsize companies to handle all the complexities of global supply chain management. Carol Lawrence, "Enterprise Resource Planning Software Become More Accessible to Small and Midsize Companies," *McClatchy Tribune Business News*, August 8, 2010. Large software vendors such as Oracle estimated that the midmarket clientele was approximately 4,500 out of their total client base of 7,000 customers. Several factors can be attributed to this rapid growth in small to midsize businesses. The first was that many software providers were willing to offer in-house installation at a predictable cost. Second and perhaps the most important factor is the increasing move to **cloud-based software**<sup>24</sup>, where software resides on an external server to which the businesses are connected to via the Internet. It provides several substantial benefits to small businesses: lowers software and hardware costs, installation is significantly easier, maintenance and training costs are lower, and free upgrades may sometimes be available. The use of Internet-based systems also makes it easier to maintain lines of communications with one's suppliers and customers. Robert LaGarde, president of LaGarde E-business Solution, has stated that "using Internet technology to provide customers with online demand access to supply chain systems is critical to nurturing and growing relationships with customers." David Hayes, "When Size Doesn't Matter (in business)," *McClatchy Tribune Business News*, March 4, 2010. What initially appeared to be a remarkably complex system of programs has now been made available to even very small businesses.

## Video Clip 11.16

*Impact of RFID Technology on Supply Chain Management*

[\(click to see video\)](#)

*The impact of RFID technology on supply chains.*

## Video Clip 11.17

*Supply Chains and Information Technology*

[\(click to see video\)](#)

*Modern-day supply chains are tasked with responding at lightning speed.*

24. Software located off-site, generally maintained by another party, and that can be accessed anywhere there is an Internet connection.

## Video Clip 11.18

*Future Supply Chain 2016*

(click to see video)

*The main supply chain challenges for consumer products and retail for the next decade.*

### Video Link 11.1

Japan: The Business Aftershocks

Japan is a small country with a supersized role in the global supply chain (a short ad precedes the video clip).

[online.wsj.com/video/japan-the-business-aftershocks/8D24FD7D-5767-4F4C-AC35-7124F8E1F571.html?mod=googlewsj](http://online.wsj.com/video/japan-the-business-aftershocks/8D24FD7D-5767-4F4C-AC35-7124F8E1F571.html?mod=googlewsj)

## Web Resources

List of Supply Chain Management Software

A comprehensive list of SCM software with links.

[www.capterra.com/supply-chain-management-software](http://www.capterra.com/supply-chain-management-software)

About.com SCM Software

Supply chain management software with links to other sites.

<http://logistics.about.com/gi/o.htm?zi=1/XJ/Ya&zTi=1&sdn=logistics&cdn=money&tm=75&gps=19114191259550&f=00&tt=14&bt=1&bts=1&zu=http%3A//technology.inc.com/managing/articles/200805/supplychain.html>

The Benefits of Supply Chain Management Software

Identifies benefits and includes option to download a report on the top fifteen ERP providers.

[www.business-software.com/erp/supply-chain/benefits-of-supply-chain-erp.php](http://www.business-software.com/erp/supply-chain/benefits-of-supply-chain-erp.php)

## KEY TAKEAWAYS

- Supply chain management can enhance customer value in many ways.
- Cost savings brought about by supply chain management systems can produce amplified improvements in cash flow.
- Supply chain management systems can be seen as a collection of interconnected software packages.
- The advent of cloud computing can make supply chain management systems available for small businesses.

## EXERCISES

1. Interview the owners of five local businesses and ask them how supply chain management has or could enhance their customers' value.
2. For those small business owners who have a functioning supply chain management system, ask them if they have noticed improvements in cash flow attributable to the system.
3. Ask them what system(s) they use and why they went with these computer packages.
4. Ask them if they have contingency plans for the loss of key suppliers.

## Disaster Watch

This chapter has emphasized that successful supply chain management requires successful integration across the supply chain. It has been argued that businesses should actively seek to have a single source supplier for particular parts and components. Having a single source supplier may result in a closer relationship that should yield significant economic benefit. Many businesses, both large and small, have moved toward, if not a single supplier, then a significantly reduced number of suppliers for particular parts. This, however, may have some serious negative consequences.

Apple introduced its new iPad 2 tablet on March 2, 2011. Little more than a week later, on March 11, Japan was struck by a major earthquake and damage from the resulting tsunami. Although the two events may seem to be unrelated, there were several connections. It was estimated that Japanese firms manufactured at least five major components in the iPad 2. Although some of these firms were not damaged by either the earthquake or the tsunami, they found that maintaining production schedules was a challenge due to curtailment and available electricity, the movement of supplies, and employees being unable to arrive at work. “These factors are having a major impact on ‘delicate processes, such as semiconductor lithography,’ said the report, especially as the country continues to experience aftershocks.” Michelle Maisto, “Apple iPad 2 Production Hindered by Japan Earthquake: IHS iSuppli,” *eWeek.com*, March 19, 2011, accessed February 2, 2012, [www.eweek.com/c/a/Mobile-and-Wireless/Apple-iPad-2-Production-Hindered-by-Japan-Earthquake-IHS-iSuppli-385386](http://www.eweek.com/c/a/Mobile-and-Wireless/Apple-iPad-2-Production-Hindered-by-Japan-Earthquake-IHS-iSuppli-385386). Apple was not the only firm affected by the Japanese disaster. The port of Sendai was heavily damaged, and many goods could not be shipped out. As one commentator put it, “It is a nuclear winter for the economy.” Peter Müller and Alexander Neubacher, “Disaster in Japan Sends Ripples through the Global Economy,” *Spiegel Online International*, March 22, 2011, accessed February 2, 2012, [www.spiegel.de/international/business/0,1518,752325,00.html](http://www.spiegel.de/international/business/0,1518,752325,00.html).

Further exacerbating the situation for Apple was an explosion at Foxconn Technology Group’s plant in Chengdu, China. The explosion killed three workers and injured many more. In addition, the initial estimate was that Apple might lose production of more than half a million iPad 2 units while the plant was closed for repairs. “Blast Could Cut iPad 2 Production by 500,000: iSuppli,” *Taipei Times*, May 25, 2011, accessed February 12, 2012, [www.taipetimes.com/News/biz/archives/2011/05/25/2003504064](http://www.taipetimes.com/News/biz/archives/2011/05/25/2003504064).

Disruptions in the supply chain need not be caused by natural disasters. They can occur because of human failings and can have significant consequences. Toys “R” Us was severely damaged in 1999 when its online customer order system proved to be inadequate for demand at Christmastime. In the same time frame, The Hershey Company, which expended approximately \$100 million on developing software for its supply chain, found that attempting to develop an order system, a CRM system, and a supply chain planning system proved to be too much of a technical challenge. Because of failures in the system, Hershey missed at least \$150 million in orders. Hershey was guilty of trying to implement these systems simultaneously. They had gone a “bridge too far.” “The 11 Greatest Supply Chain Disasters,” *SupplyChainDigest*, January 2006, accessed February 2, 2012, [www.scdigest.com/assets/refs/SCDigest\\_Top-11-SupplyChainDisasters.pdf](http://www.scdigest.com/assets/refs/SCDigest_Top-11-SupplyChainDisasters.pdf).

There is actually a field called supply chain sensitivity analysis that attempts to identify the extent of disruptions in the supply chain caused by external factors. It relies on computer simulation analysis. Jack Kleijen, “Supply Chain Simulation Tools and Techniques: A Survey,” *International Journal of Simulation and Process Modeling* 1, no. 1/2 (2005): 82. Obviously, such an approach is beyond the capability of most small businesses.