# The Internet Value Chain

CHAPTER 2

## LEARNING OBJECTIVES

By the time you complete this chapter you will be able to:

1. Distinguish between the following concepts: supply chain, value chain, and virtual value chain or net.
2. List the business processes that are necessary to manage the supply chain.
3. Identify the core marketing processes.
4. Explain the role of information, first in integrating the value chain and later in making it virtual.
5. Define EDI, ERP, and Web services and explain their role in integrating the value chain.
6. Explain the four Vs of business transformation.

In 1995 furniture-maker Herman Miller was a business in trouble. The closely held company had prospered for over 70 years as a manufacturer of high-end office furniture systems. Its products were marketed to large corporations through a sales force of 300 and over 240 contract office furniture dealers. But in spite of its trophy case of design awards and reputation as one of the most agreeable employers in the country, lead times to fill customer orders were long, delivery was haphazard, and customer service was poor. There was a measurable decline in customer satisfaction and expenses were out of control. Sales were up slightly, but profits fell by nearly 90 percent in a single year. The disarray led to the exodus of almost 200 employees that year, including the CEO.

The nature of its products increased the complexity of the situation. Herman Miller processed over 3,000 orders for furniture and accessories each week. The furniture was sold as a system; if a single item was missing, the order could not be shipped. The required coordination between eight separate manufacturing plants was missing:

> . . . a lack of synchronization created a three- to-four-week lag time between when the first and last components of an order were completed. "We'd get in one item one day, then the panels would come in the next day, then a few days later the chairs would come in," [Mark] Douglas [project manager] recalls. "This meant we had three or four weeks of finished goods waiting for the rest of the order. This was driving high inventory in both our warehouses and our plants. When all this waiting time was factored in, we were looking at very extended internal lead times of 8 to 12

> weeks," the project manager notes. Add at least another month on the end of that in the distributor network (80 percent of Herman Miller's sales move through a dealer network), and you get a very slow product pipeline.[1]

As the first step in resolving the problem, Herman Miller implemented planning software to improve production scheduling and delivery with the specific goal of improving customer satisfaction through better, faster service. The software allowed creation of a firm completion date by querying each plant about when it could build the ordered items. Each item was then synchronized to the longest production date, with a rule of not building any item more than three days before that date. The results were striking:

> Within 18 months . . . Herman Miller had boosted delivery performance—i.e., on-time shipments—from 70% to 99%. It decreased leadtime by 22%, and now ships 30% of orders directly to customers, bypassing distribution center layovers and handling. The company reduced finished goods waiting time to two days and eliminated $50 million to $70 million in pipeline inventory. Other impressive milestones; a 40% increase in throughput and a 100% increase in inventory turns.[2]

The savings on the initial project represented a threefold return on the original investment of almost $6 million.

Five years after the transformation began Herman Miller had a fully integrated, Internet-based division, initially designed to serve the small business market it had previously ignored. The division was called SQA for "simple, quick, and affordable." Their delivery objective is two weeks, compared to six to eight weeks for the company as a whole. Choices of color, finish, and fabric are limited, but service has been greatly improved. Salespeople produce the office design on a laptop in 3-D at the client's location and the system is activated:

> The heart of SQA's success . . . sits smack dab on the manufacturing floor. When an order is completed, it is zapped via the Web to an SQA factory in Michigan or in California. As soon as the order is transmitted, another program schedules a manufacturing date and reserves space on a truck that will deliver it a week or two later. Within two hours, the dealer and customer receive an e-mailed confirmation of the delivery and installation time.
>
> The company developed another program to give its network of more than 500 suppliers access to its ordering system on the Web. That means companies that make, say, chair coverings or laminated surfaces can check what the factory's needs will be weeks in advance. As soon as inventories are expected to drop below a certain level—usually a day's worth of production—the supplier sends more. . . . Companies that perform consistently below expectations are warned and eventually face termination of their contracts.[3]

The customer's order is installed from three days to two weeks after the date of the sale with a 99 percent on-time record. Other benefits of the system include an inventory turn of 40 times a year as compared to the industry average of less than 20. Order entry errors are almost nonexistent as opposed to 20 percent for manual systems. Because the system is so efficient, it has opened the small business market, previously viewed as uneconomical, to Herman Miller. It was used as a blueprint for the rest of the corpo-

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[1]Lisa H. Harrington, "A Tale of Two Planners," April 3, 2000, www.industryweek.com, p. 2.

[2]Ibid., pp. 3–4.

[3]David Rocks, "Reinventing Herman Miller," *Business Week e.biz*, April 3, 2000, p. 96.

ration under the rubric of "Speed, Convenience, and Reliability." It has been embedded in the entire product offering by means of their eZconnect customer page.[4]

This example captures the essence of the Internet-based value chain. On the demand side, it is focused on customer needs. Needs are determined and then products are manufactured, not the reverse. On the supply side, vendors become an integral part of the process, acting on information from manufacturing and distribution systems, not on the basis of paper orders. The system completely integrates the activities of both dealers and suppliers with those of the manufacturer, and, at its best, focuses all activities on value creation for the customer. It wrings costs out of the process at every possible point.

A number of concepts are important to understanding the evolution of the value chain and what makes value chains effective in the Internet environment.

## Value Chain Concepts

Michael Porter popularized the concept of the value chain in the early 1980s. The familiar graphic provides a useful basis for understanding how the enterprise produces value for its customers. It identifies the primary activities as inbound logistics, operations, outbound logistics, marketing and sales, and service. It also recognizes the support activities of infrastructure, human resources, technology, and procurement.

Unfortunately for our ease of understanding, in the last few years the term has been widely used in a different way. In the context of the automation of business processes and later the Internet, the term **value chain** has come to mean the seamless, end-to-end integration of activities throughout the channel of distribution. In essence, this value chain concept incorporates two familiar business processes—the supply chain and the channel of distribution (Figure 2.1). Companies are moving, first, to integrate the supplier-facing side of their channels—the supply chain. Only a few have moved to integrate on the customer-facing side, the **channel of distribution.**

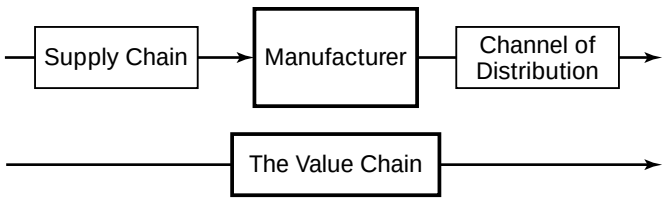


**FIGURE 2.1 The Value Chain Concept**

Otis Elevator, however, has been integrating with customer infrastructure for many years. In 1988 it introduced the first Remote Elevator Monitoring (REM) system. REM is a diagnostic system that monitors the performance of Otis elevators and

[4]Interview with Mark Schurman, Director, External Communications, July 2002.

other brands with which Otis has service contracts. It monitors both the usage level and individual systems within the elevator. The system schedules regular maintenance calls based on the level of usage. If it detects an urgent problem, it reports the condition to a 24-hour communications center, which in turn dispatches a repair person with the required tools and parts. According to Otis, the system identifies most problems before they occur, minimizing elevator downtime. By analyzing all the hundreds of systems in an elevator, the company also maintains that the number of service calls are minimized and performance is optimized.

With the advent of the Internet, the process became more streamlined and new services were added. The Otis Web site now allows registered users to review the entire service history of their equipment. It also has a planning service that allows customers to design and plan their next elevator project. This service has greatly reduced the cycle time for planning and specifying Otis projects.[5]

Figure 2.2 blends several concepts that help to clarify some of these issues by focusing on the manner in which an enterprise creates value. The primary business processes are those identified by Porter and take place at the corporate level. As you can see, the marketing and sales function represents one of several fundamental business processes.

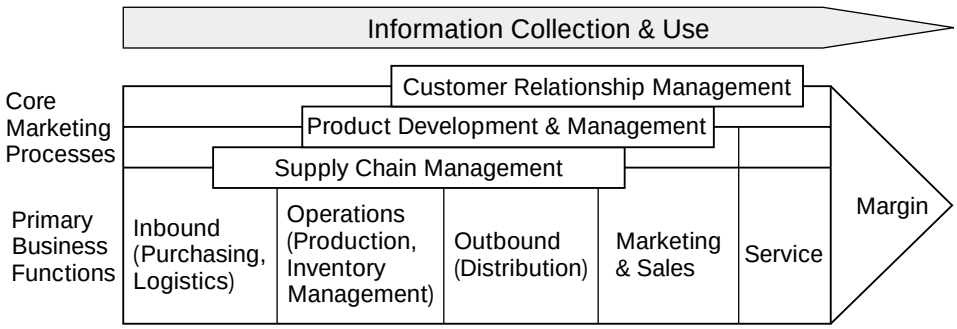


**FIGURE 2.2 Value-Creating Activities**

Source: Adapted from Prof. Debra L. Zahay. Used with permission.

Marketing itself has three core processes—supply chain management, product development and management, and customer relationship management.[6] Supply chain management is discussed in this chapter in the context of creating the value chain. The implications of the Internet for product development and management are covered in Chapter 6, and customer relationship management is the subject of Chapter 8.

This conceptualization also emphasizes the importance of information in value creation. In early stages, information fosters integration between members of the value

[5]The Boston Consulting Group, "How the Internet Can Boost Your Brand," March 2001, www.bcg.com; www.otis.com.

[6]Rajendra K. Srivastava, Tasadduq A. Shervani, and Liam Fahey, "Marketing, Business Processes, and Shareholder Value: An Organizationally Embedded View of Marketing Activities and the Discipline of Marketing," *Journal of Marketing*, 1999, pp. 168–179.

chain. In later stages it permits the development of a virtual value chain and the creation of new types of value.

Taken together, all the elements of the process determine the margin realized by the firm. Using e-business techniques can increase margins in a number of ways. Enterprises have generally focused on the supply side first, because there are large savings to be realized from streamlining the procurement process. These savings can be passed on to customers in the form of price reductions or they can increase margins and therefore profitability. Turning to the demand side, many of the same e-business techniques can increase the speed and decrease the cost of fulfilling customer orders. This, too, may decrease operating costs. Better servicing of customer orders may also provide an opportunity to charge premium prices. For instance, the North American division of Japanese automobile manufacturer Nissan is trying to become the first to offer build-to-order cars over the Internet. The eventual goal, not expected to be fully accomplished until 2006, is to allow consumers to order their car and have it built within six days after the necessary parts are delivered. The car will then be shipped to a dealer for delivery. This type of custom production will require total integration of a supply chain that consists of thousands of parts manufacturers in a way that causes each one to make and ship exactly the right part at exactly the right time. This is obviously a major challenge for the original equipment manufacturer, Nissan, and for each one of its suppliers.[7]

Whether it focuses on physical products, services, or information products, a value chain should no longer be viewed as a simple linear entity. In its linear form it is made up of a complex set of interlocking activities. Often the assumption is that the majority of the activities are carried out internally by a somewhat self-contained business entity interacting with an external environment. This is recognizable as an "old economy" perspective, one that leads to vertical integration. As the chain evolves, it becomes a network of fluid partnerships that constantly rearrange themselves to accomplish necessary tasks in the most economical manner. This network is a "new economy" concept in which overall value is optimized, not the value of one link in the chain.

It is also important to recognize that businesses in a network are not simply free-floating entities, in constant motion like tiny fish in a pond. They move with a purpose, each to accomplish the task at which it is most proficient. Therefore we need to understand the tasks that must be accomplished, not at the high level of a Porter-like value chain, but at the granular level of daily business tasks that must be understood, automated where possible, and integrated into a chain that seamlessly delivers value to the customer. In order to do this, we need to explore three separate but related concepts:

- The supply chain
- The value chain
- The integrated value chain or net

As we examine these concepts we will recognize them as an evolutionary hierarchy in which firms like Herman Miller need to begin by getting their supply chain in order and then moving on to higher levels of integration and systemwide effectiveness.

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[7]Chuck Moozakis, "Nissan Wants to Be Like Dell," January 8, 2002, www.internetwk.com.

**TABLE 2.1 Supply Chain Management Processes**

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|---|
| 1. Selecting and qualifying desired suppliers |
| 2. Establishing and managing inbound logistics |
| 3. Designing and managing internal logistics |
| 4. Establishing and managing outbound logistics |
| 5. Designing work flow in product-solution assembly |
| 6. Running batch manufacturing |
| 7. Acquiring, installing, and maintaining process technology |
| 8. Order processing, pricing, billing, rebates, and terms |
| 9. Managing (multiple) channels |
| 10. Managing customer services such as installation and maintenance to enable product use |

Source: Rajendra K. Srivastava, Tasadduq A. Shervani, and Liam Fahey, "Marketing, Business Processes, and Shareholder Value: An Organizationally Embedded View of Marketing Activities and the Discipline of Marketing," *Journal of Marketing,* 1999, p. 170. Used with permission by American Marketing Association.

## The Supply Chain

A **supply chain** maps the physical movement of goods from initial production through assembly and the distribution process to the final customer. Table 2.1 lists the business processes that are involved in managing the supply chain. As you look at the processes, which have an operations management flavor, keep in mind that a single enterprise may have dozens or even hundreds of suppliers whose activities must be coordinated.

Because supply chain management is such a complex task, enterprises can realize large cost savings from integrating and improving it, with best-in-class companies spending 5–6 percent less of their total revenue on supply chain costs than their median industry counterparts. They can also realize major improvements in process elements ranging from inventory (25–60% improvement) to overall productivity (10–16 percent improvement).[8]

Though this level of performance improvement is significant, it may not represent the best a company can do. According to consultants at McKinsey:

> In reality, most of the changes that suppliers implement don't add much value from the customer's point of view. A supplier, for example, might typically cut its inventory by reducing the variety of its products—which isn't very helpful for the customer or for the customer's customer. Neither is making (or assembling to order) products that the supplier formerly delivered from stock, since that approach intermittently increases delivery times. Even so, the cause isn't hopeless; by mastering the demand-supply chain, suppliers can design mutually beneficial supply chain systems for particular customers.[9]

[8]Scott Stephens, "Supply Chain Council and Supply Chain Operations Reference (SCOR) Model Overview," PowerPoint presentation, May 2000, www.supply-chain.org.

[9]Jan Holmström, William E. Hoover, Jr., Perttu Louhiluoto, and Antti Vasara, "The Other End of the Supply Chain," *McKinsey Quarterly* 1, 2000, p. 62.

They distinguish between the order penetration point (OPP), which is the place in the supply chain where information about customer requirements reaches the manufacturer, and the value-offering point (VOP), the place where the supplier fulfills demand in the customer's demand chain. The closer the value-offering point is to the customer's use or even demand planning, the better for the customer. If the supplier is not careful, the result can be increased costs, especially of inventory. The supplier can turn this potential problem into a benefit, however, if it receives access to the customer's planning system, allowing it to better manage its own production and inventory systems. The classic example is Dell Computer and its build-to-order model, which we discuss later in the chapter. The principle applies in low-technology markets also, as McKinsey's example of a Finnish distributor of industrial fasteners illustrates:

> The Finnish subsidiary of the German Würth Group, which had worldwide 1998 revenues of more than $3.6 billion, is called Würth Oy. It sells businesses varieties of 28,000 fasteners as well as other kinds of assembly products such as nuts, bolts, screws, and screwdrivers. Demand for these products generally comes from the customers' maintenance, repair, and assembly operations. This demand drives the customers' inventory management systems, which in turn drive purchasing.
>
> Relatively small products like those handled by Würth Oy can be expensive because job lots are small and purchases are therefore frequent, requiring much paperwork. Ordering and handling costs, such as conducting quality checks, making up receipts, and unpacking, are substantial; a recent study found that for a typical industrial customer, such expenses amounted to more than $18 per order line—the price of many order lines themselves. As a result, the customer must choose between ordering fasteners in relatively large lots and holding unnecessary inventory, on the one hand, or paying the higher cost of many small orders, on the other.
>
> The original value proposition of the company was its ability to offer appropriate fastener and assembly solutions by meeting face-to-face with the metal engineering companies that needed them (an offer to purchasing). But over the past ten years, just-in-time success stories from Japan and the United States prompted Finnnish customers to streamline their purchasing operations. Würth began to locate its stores next to the assembly lines of its customers—a move that reduced their purchasing and materials-handling costs and improved their operations. Today, Würth Oy operates these stores for upward of 1,000 customers in Finland. Its field sales force replenishes the stores twice a week on average, totally eliminating the customers' purchasing and handling costs, and an additional 10,000 customers have borrowed the idea and now operate their own on-site stores. The heart of this new value proposition is an offer to planning; by collaborating with customers on the shop floor, where they carry out maintenance and plan changes in their assembly line operations, Würth's representatives can find out exactly which products they will need and which to keep on hand. Typical industrial customers save a minimum of $12 in purchasing and handling costs of each item they order. Thanks to those savings, Würth can charge a 40 percent ($7.25) premium over the price of the lowest cost . . . competitor's average order line. Setting up and managing in-plant stores is complex, however, and expensive. Even with the price premium, it would probably have been impossible to make a profit solely by moving the VOP, but doing so also gave Würth a chance to move the OPP and thus to make the company's own supply chain much more efficient. . . . Indeed, Würth gathers information on its customers' needs so early and accurately that it is now considering a plan to move the OPP back to its own suppliers for high-risk items (those with just a handful of customers). . . . Cases like this show the enormous advantages available even to suppliers of commodity goods. Meanwhile, Würth's competitors have been forced to cut prices, which has in turn forced them

to cut costs by cutting services—thus further eroding the value these companies offer their customers.[10]

By following this approach, both supplier and customer win. But it requires that the supplier take a broader perspective, looking at the customer's demand chain as well as its own supply chain. This is another example of managing business processes beyond corporate boundaries, and moves us toward the concept of a value chain.

## The Value Chain

In order to create optimal value, a company must examine the entire supply chain, from initial production to final consumption, in order to understand where costs are incurred in the process. Figure 2.3 shows average supply chain costs, other costs, and profit for each member of the publishing chain for a typical trade book. The bottom line is that supply chain costs make up $8.49 of the $25 price of a book sold in a chain retail book store. Although large chains may perform the distribution themselves, the function remains and the costs are still incurred. Only the prospect of electronic publishing offers real opportunity to change the economics of the publishing industry.

A major experiment in electronic publishing for the popular fiction market was undertaken on March 14, 2000, when the Stephen King novella *Riding the Bullet* was published online as a copublication of Scribner and Philtrum Press, King's regular publisher, and Simon & Schuster Online. The 66-page story about a hitchhiking Maine man who accepts a ride with a Mustang-driving ghost shows King in top form but was too short to be economical in print format. King has used innovative methods before, publishing *The Green Mile* in serial form. "I'm curious to see what sort of response there is and whether or not this is the future," said King.[11]

The book shortened the traditional year-long publishing cycle by an unspecified amount of time. It was made available via a network of participating vendors to readers' computers, specialized electronic readers, or personal digital assistants.

Over 400,000 orders were received during the first 24 hours, an unexpectedly high response and one that caused congestion on the sites of major vendors like Amazon.com and Barnesandnoble.com. Some sites were charging $2.50 for the download and experiencing sales of as much as 400 units an hour, but major sites like Barnesandnoble.com and Amazon.com offered the publication free for one day and two weeks, respectively. The U.S. sites were joined by a Canadian site, Chapters Online, and a British bookseller, Waterstone's, who also offered free downloads. Hackers were also active. They broke into the official Web site and posted the book for free on rogue sites.

The economics of the effort were not made public. According to the *New York Times*, in traditional retail markets the first-day sales of best-selling authors can run between 30,000 and 75,000 copies at prices of $25 to $27. Authors like King are known

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[10]Source: This excerpt was taken from Jan Holmström, William E. Hoover, Jr., Perttu Louhiluoto, and Antti Vasara, "The other end of the supply chain," The *McKinsey Quarterly*, 2000 Number 1. The full article can be found on www.mckinseyquarterly.com. Copyright © 2000 McKinsey & Company. All rights reserved. Used by permission.

[11]"Stephen King and Simon & Schuster to Publish New Story Exclusively on Ebook," Press Release, March 8, 2000, www.simonandschuster.com.

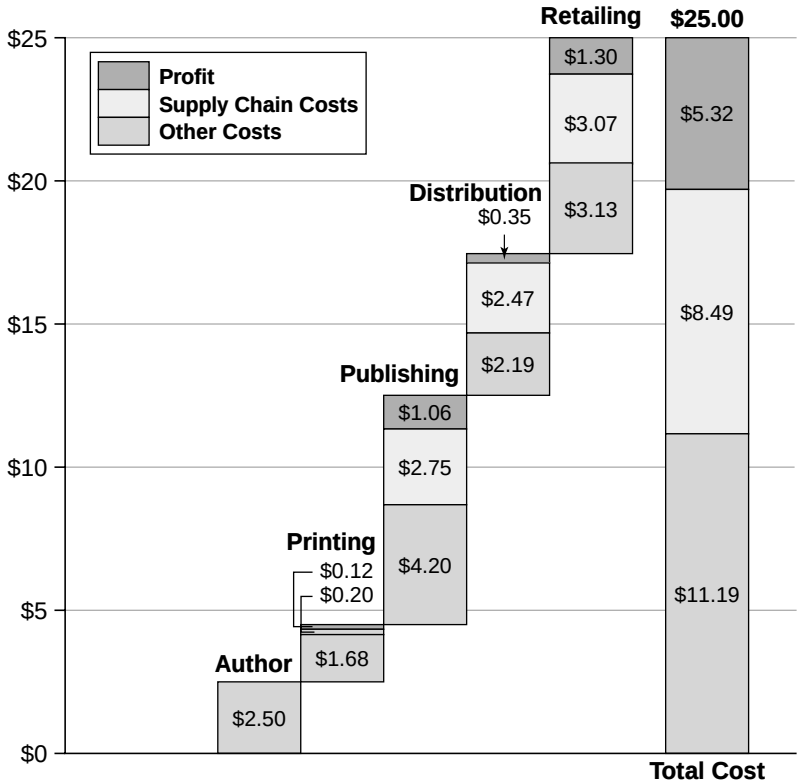


**FIGURE 2.3 Cost Elements of a Typical Trade Book**

Sources: Reprinted with permission from *strategy+business*, a quarterly management magazine published by Booz Allen Hamilton.

to receive advances that run into seven figures. In this case he received a "minimal" advance and "more than 50 percent of the profits from the sales."[12] There was little revenue left to cover the unknown costs of the publishers, so it is not clear whether the venture was profitable from their standpoint. The president of Simon & Schuster expressed pleasure at the volume of sales saying, "I don't think anybody could have anticipated how many people were out there who are willing to accept the written word in a paperless format."[13] King also appeared pleased even though he noted that *Riding the Bullet* was hacked and posted for free within 24 hours. After querying fans on his official Web site and finding that 94 percent of them wanted the electronic version and said they would pay for it, he announced that he would post *The Plant* in installments, charging $1 for each installment and pulling the posting if too many people stole it.

*Publishers' Weekly,* an authoritative industry source, noted that "he plans to offer the e-book without the help of Simon & Schuster, his old-media publisher, raising new questions about the ability of powerful authors to become powerful new media self-publishers."[14]

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[12]Doreen Carvajal, "Long Line Online for Stephen King E-Novella," *New York Times,* March 16, 2000, www.nytimes.com.

[13]Ibid.

The offering of the initial installment in March 2000 seemed to go well, with over 120,000 paid downloads. By the second installment in the fall, the number dropped to 40,000 and King later announced that he would discontinue the experiment, providing the last installment free of charge. Several observers suggested that *The Plant* simply failed to fulfill the promise of the e-book format, with no interactivity or links to related material of interest.[15]

In spite of this high-profile failure, companies in every industry will continue to look for ways in which they can squeeze costs out of traditional channels of distribution. Consultants at Bain & Company liken it to a Swahili game called Jenga. In this game, each player must remove as many blocks as possible from a tower, using them to build additional structures, all without causing the original structure to come crashing down. This seems an apt analogy. They identify four key factors in this effort:

- Cost of information
- Transaction costs
- Fragmentation of the customer marketplace
- Standardization of products

Together information and transaction costs typically account for over 40 percent of total costs. Economists characterize these costs as "friction" in channels of distribution and they offer ripe targets for cost reduction in value chains.

The higher the information and transaction costs and the more fragmented the market, the more vulnerable it is to aggregators. Additionally, if products are standardized, customers can realize major savings in search costs by conducting transactions over the Web. Amazon.com is an example in the B2C market. As seen in the discussion of book publishing, information and transaction costs are high in relation to total value of this standardized product and both the supplier and customer markets are highly fragmented. Amazon.com acts as an aggregator, saving search time and cost for the customer.

Integrated value chains represent an important step in managing both the supply-facing and the customer-facing sides of the business. However, the concept variously described as "virtual value chain" or "value net" takes the concept a step further.

## The Virtual Value Chain

Dell Computers is one of the classic examples of creating a **virtual value chain** in Internet space, one that is not a series of links but a network of interconnected enterprises, both supplier and customer. Before Dell's direct model became a force in the industry, the market for personal computers met all four of the categories established by Bain. Search and transaction costs were high, especially for the small

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[14]Calvin Reid, "King to Self-Publish New E-Book in July," June 19, 2000, www.PublishersWeekly.com. Additional sources: "Chapters Online Extends Digital Delivery Strategy with Free Download of New Stephen King Story at chapters.ca," Press Release, March 14, 2000, www.glassbook.com; "Waterstone's Fires the First Shot," Press Release, March 22, 2000, www.glassbook.com.

[15]Anastasia Ashman, "Stephen King Uproots 'The Plant,'" *Internet World News*, November 29, 2000, www.internetworld.com.

business or individual customer. The fragmented market ranged from the individual customer buying a single unit to the very large corporation which might purchase several hundred computers each month. Even very large customers tended to settle for a standard product because it was cheaper to buy in a large, standardized lot. By recognizing that individual computer users had different needs, even though they might be sitting in adjacent cubicles, Dell was on the way to reinventing the value chain in the PC industry.

Figures 2.4a and b are Bain & Company's representation of the traditional value chain in the personal computer industry versus the Dell value chain. It is particularly important to note that distribution does not exist as a separate step in Dell's just-in-time (JIT) production environment. The flexible manufacturing approach allows Dell to customize a computer for an individual customer. It also allows Dell to ship directly to customers, increasing inventory turns, decreasing inventory obsolescence, and decreasing the number of hands that touch each machine. The system is the delight of customers who receive their made-to-order computer, loaded with software, about a week after the order is placed over the Internet or by telephone. One consumer did note with awe, however, "Do you realize they got my money before they even made my computer?" That is why Dell has a negative cash-conversion cycle of five days; it receives money for product sold before it has to pay suppliers for components used in the manufacturing process.[16]

Dell Chairman and CEO Michael Dell identifies strong customer relationships as one of the key elements of competitive advantage in the Internet economy. (The other two are speed and business focus.) Dell has developed its direct sales model, which was initially focused on the B2B market, into a direct relationship model that produces unusually close ties with its customers. Dell's story is best told in the words of Michael Dell, who has become a leading advocate of value chain integration:

> . . . when the guy whose computer isn't working calls in from Singapore, our IT people don't have to spend the first 30 minutes just figuring out what configuration of hardware and software he's using. Selling direct allows us to keep track of the company's total PC purchases, country by country—and that's valuable information we can feed back to them. We sometimes know more about a customer's operations than they do themselves.[17]

The company has built features into its manufacturing system that make life much easier for customers. He uses Eastman Chemical as an example:

> Eastman Chemical . . . has their own unique mix of software, some of it licensed from Microsoft, some of it they've written themselves, some of it having to do with the way their network works. Normally, they would get their PCs, take them out of the box, and then some guy carrying a walkie-talkie and diskettes and CD-ROMs would come to each employee's desk to hook the system up and load all that software. Typically, this takes an hour or two—and costs $200 to $300—and it's a nuisance. . . . When a machine comes down the assembly line and says, "I'm an Eastman Chemical analyst workstation, configuration number 14," all of a sudden a few hundred megabytes of data [unique to Eastman Chemical] come rushing through

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[16]Source: Reprinted by permission of *Harvard Business Review*. From "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," by Joan Margretta, *Harvard Business Review*, March–April 1998. Copyright © 1998 by the Harvard Business School Publishing Corporation; all rights reserved.

[17]Ibid.

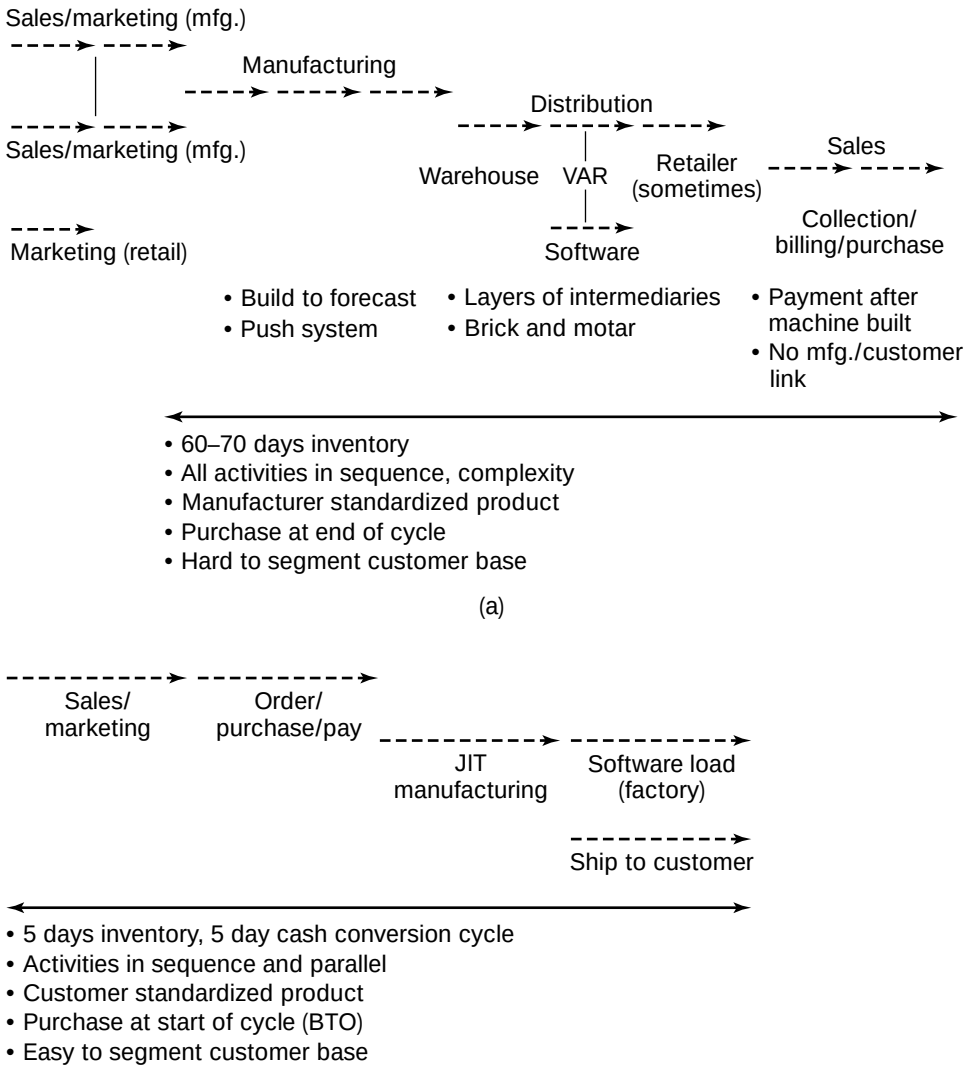


**FIGURE 2.4**

(a) A Traditional Computer Manufacturer and (b) Dell.
Source: Bob Becheck and Chris Zook, *The Jenga Phenomenon: How eCommerce is Reassembling Industry*," Bain & Company, December 1, 1999.

> the network and onto the workstation's hard disk. . . . If the customer wants, we can put an asset tag with the company's logo on the machine, and we can keep an electronic register of the customer's assets. . . . What happens to the money our customer is saving? They get to keep most of it. We could say, "Well, it costs you $300 to do it, so we'll charge you $250." But instead we charge $15 or $20, and we make our product and our service much more valuable.[18]

[18]Source: Reprinted by permission of *Harvard Business Review*. From "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," by Joan Margretta, *Harvard Business Review*, March–April 1998. Copyright © 1998 by the Harvard Business School Publishing Corporation; all rights reserved.

The results in sales alone can be striking. According to an interview with Fred Buehler, director of electronic business for Eastman Chemical:

> . . . Eastman opted for what it and Dell term a "bulldoze"—sweeping out Eastman's hodgepodge of computers for what are now 10,000 Dell machines. Eastman was thrilled with the results and today is looking beyond hardware. It wants to be—surprise—an e-commerce company. So ten Eastman executives have spent the past couple of years traveling back and forth between Tennessee and Texas to study Dell's system.[19]

The use of the Internet to build customer relationships extends to the provision of service. Dell connects customers directly into their own service and support databases. Large customers are also given

> . . . access to Dell's knowledge-base of trouble-shooting and [expert system] diagnostic tools over the Web. . . . [They also have] instant access to dedicated support personnel and online tools that are based on natural-language search engines. Finally, [Dell] created customer-to-customer relationships using a collaborative public forum over the Web that links customers together to share and solve common technical issues. Soon, Dell will extend this "virtual support" chain even further by linking people managing corporate helpdesks together.[20]

This system, which Dell calls a "virtual value chain," has advantages for both Dell and its customers. He continues:

> It increases customer satisfaction and customer loyalty by reducing support costs. And many routine service kinds of inquiries that would normally occur over the phone can now happen on the Internet. For instance, order status calls, which can cost up to $13 a call, can be handled over the Internet for essentially no cost at all.[21]

Dell's Web site is a focal point of customer relationship activities, and has been especially important in developing its small business and customer segments, which otherwise might not be economical. But for all large customers—and an increasing number of smaller accounts—the focal point of the relationship is Dell's Premier Pages (see Figure 2.5):

> . . . large customers . . . [are] not going to go to a public web site and order 50,000 PCs. So we've created a special web site for each and every customer. We have more than 19,000 of these Premier Pages which allow us to essentially take all aspects of the relationship with a specific customer online—from the account contacts to the special pricing that's been designated for them, to the nondisclosure of product information, to the quarterly review that we have with them to make sure that we're meeting their performance requirements, to the technical support information, and of course commerce. For small businesses, we can create one of these on the phone in about three or four minutes. So when Biggo Tires in Cleveland calls us and says, "We want a Premier Page too, because we're going to buy 50 computers a year," we can set one of these up for them in a few minutes. This allows Dell's sales and support organizations to provide higher value-added activities and focus their attention on delivering solutions.[22]

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[19]"Dell's Big New Act," December 6, 1999, www.fortune.com.

[20]"The Dell Advantage," Michael Dell Keynote Address, San Francisco, March 3, 1999, www.dell.com.

[21]"Building a Competitive Advantage in an Internet Economy," Michael Dell's Address to the Detroit Economic Club, November 1, 1999, www.dell.com.

[22]"The Dynamics of the Connected Economy," Michael Dell Keynote Address, Atlanta, Georgia, June 25, 1999, www.dell.com.


**FIGURE 2.5 Set-Up for a Dell Premier Page**

Source: Used with permission by Dell Computer Corporation.

The virtual value chain concept extends to the supplier side of the organization, where suppliers also have their own individualized Web pages. According to Michael Dell:

> We're highly consolidated in our supplier base. We have about 25 suppliers which provide almost 85 percent of our materials. We have a site that only our suppliers can access called valuechain@dell.com. All aspects of the relationship—such as real-time feeds from our manufacturing lines about quality, cost data, product roadmaps, inventory information, and order demand information—are included in valuechain@dell.com. This allows us to bring our suppliers inside our business and treat them as if they were part of our company. This is an illustration of the virtually integrated business, in which suppliers and customers are connected in real time.[23]

The system that keeps Dell's inventory turning at high velocity relies on a level of trust that is not present in most supplier-manufacturer relationships. Dell practices rigorous supplier certification, and recommends that its suppliers do the same with their own suppliers. Not all relationships reach the level of the one with Sony, which is remarkable for the level of trust Dell displays:

> With a supplier like Sony, which makes very good, reliable monitors, we figure there's no need for us to have any inventory at all. We are confident in putting the Dell name on them, and they work fine. We don't even take these monitors out of the box to test them because we've gotten them to under 1,000 defects per million.

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[23]"The Dynamics of the Connected Economy," Michael Dell Keynote Address, Atlanta, Georgia, June 25, 1999, www.dell.com.

> So what's the point in having a monitor put on a truck to Austin, Texas, and then taken off the truck and sent on a little tour around the warehouse, only to be put back on another truck. That's just a big waste of time and money, unless we get our jollies from touching monitors, which we don't.
>
> So we went to Sony and said, "Hey, we're going to buy two or three million of these monitors this year. Why don't we just pick them up every day as we need them?" . . . We tell Airborne Express or UPS to come to Austin and pick up 10,000 computers a day and go over to the Sony factory in Mexico and pick up the corresponding number of monitors. Then while we're all sleeping, they match up the computers and the monitors, and deliver them to the customer.[24]

There are measurable benefits from integrating the value chain in this manner. Some of the metrics during the late 1999 to early 2000 time period include:

- Dell received about 40 percent of its orders online; online sales amounted to $40 million daily (24/7/365, as Michael Dell is fond of pointing out).
- There is a 20 percent higher close rate on sales from customers who have used Dell's Web site.
- 75 percent of order status queries and one-third of technical support activities took place on the Web, lowering costs and increasing customer satisfaction at the same time.
- Dell operated with only about six days of inventory as compared to about sixty days for leading competitors. That results in an inventory turn of about sixty times a year as opposed to five or six times for European and Asian competitors. In an industry where the value of inventory declines at about 1 percent per week, this is important avoidance of costs of obsolescence. Working capital is freed for other uses, and the demand chain is not clogged with unwanted machines that have to be sold at distress prices.
- Dell achieved a return on invested capital of 292 percent. The main reason is that it can keep its level of manufacturing assets low, equal to about six or seven weeks of cash flow.
- Supplier-related efforts resulted in a 40 percent increase in component quality, and the Web was being used to take quality measurements, increasingly in real time, down to the level of suppliers' suppliers.

Dell continues to grow at a higher rate than the rest of the industry, moving into new geographical areas including China and becoming an important player in the consumer and government segments.[25]

The effects of integration are visible to Dell's customers, who are increasingly modeling their own efforts on Dell's. In mid-2000 Eastman Chemical formally introduced

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[24]Joan Margretta, "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," *Harvard Business Review,* March–April 1998, p. 76. Used with permission.

[25]"The Dell Advantage," Michael Dell Keynote Address, San Francisco, March 3, 1999; "The Dynamics of the Connected Economy," Michael Dell Keynote Address, Atlanta, Georgia, June 25, 1999; "Building a Competitive Advantage in an Internet Economy," Michael Dell's Address to the Detroit Economic Club, November 1, 1999, all at www.dell.com; Paul McCougall, "Dell: Beyond the Box?" *Information Week,* May 22, 2000, www.zdnet.com; Neal E. Boudette, "Michael Dell Stays Focused As He Guides an Online Giant," June 14, 2000, www.wsj.com.

its own e-business initiative. Components of that initiative illustrate the complexity of relationships in virtual value chains:

> Eastman revealed the first of its e-business initiatives when it teamed with Global Logistics Technologies Inc. to form ShipChem.com, a Web-based logistics service provider for the chemical industry. Global Logistics, a 10-month-old startup backed by Federal Express Corp., develops Internet systems for the transportation industry. With the birth of ShipChem.com, Eastman outsourced its logistics operations to its Web offspring. "The beauty of this model is that, for us, it's a double whammy," [Mark] Kopp [director of digital business ventures] says. "We get efficiencies by moving our logistics to a new company and benefit from the revenue ShipChem will produce as well." Another motivator: "Frankly, we did this to preempt others from doing it."[26]

Another aspect of Eastman.com is customized pages which enable customers to track orders, get technical help, and view past orders. Eastman based its effort directly on Dell's premier pages.

The transformation that is occurring has the following chronology. A old-economy supply chain is transformed into a value chain when the focus becomes the customer as well as the supplier. That value chain becomes integrated (or "virtual," in Michael Dell's words) when information flows freely across organizational boundaries to support production and distribution activities, all of which are focused on creating value for the customer. A final word from Michael Dell: "Virtual integration means you're basically stitching together a business with partners that are treated as if they're inside the company. You're sharing information in a real-time fashion."[27]

### Aspects of the Virtual Value Chain

As this application makes clear, integrating the complex value chain process and moving it to the Web is a formidable task. Jeffrey Rayport and John Sviokla suggest three stages that provide a conceptual understanding of how to move through the process. Figure 2.6 shows their three steps with some highlights from the value chain development of consumer snack maker Frito-Lay and business services provider FedEx.

The first step in creating a value chain is for the enterprise to provide **visibility** (translate that as relevant information) of all activities in the supply chain to all employees who need it. Frito-Lay created visibility for its supply chain when it gave handheld order-entry computers to its route salespersons. Inside the retail store, the reps were able to use the devices to record store-level inventory data, which was immediately transmitted to Frito-Lay headquarters by satellite. This system not only improved management's ability to forecast demand and inventory levels, it also permitted reps to make price changes in the field to respond to local market conditions. Data about competitor promotional activity was also collected in the field and transmitted to headquarters. Although the initial investment was substantial, Frito-Lay's director of information systems reported that it paid back the cost every

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[26]Eric Chabrow, "Seeking the Deeper Path to E-Success," *Information Week*, March 6, 2000, www.techweb.com.

[27]Joan Margretta, "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," *Harvard Business Review*, March–April 1998, p. 75.

| | | |
|---|---|---|
| Late 1980s—**Frito-Lay** gives handheld computers to route sales people and builds data warehouse. Store-level data transmitted daily to central information system. | Late 1990s—With parent company PepsiCo and Tropicana Products unit, consolidates system to monitor and maintain store-level inventory and to develop common promotions. | 2000—Builds knowledge management portal to make customer knowledge consistent and available and to foster collaboration among employees. |
|  | | |
| **Visibility** | **Mirroring** | **More Value to Customers** |
| Enterprises are able to "see" supply chain processes more clearly through their information systems. | Enterprises create a parallel system in which information "mirrors" the physical activities of the supply chain. | Enterprises use information to deliver value to customers in different ways and to create new value. |
| Early 1980s—**FedEx** launches Digital Assisted Dispatch System to transmit information to couriers on the road. | Middle 1990s—Introduces software that allows customers to manage shipping from desktops and follows with variety of e-business tools. | 2002—Announces ability to track FedEx shipments from wireless devices. |

**FIGURE 2.6 Creating a Virtual Value Chain**

year in savings on inventory that had gone stale on retail shelves or in the distribution pipeline.

A system developed at the Massachusetts Institute of Technology (MIT) and now in field testing offers the next generation of tracking technology. It uses a microchip tag to hold an electronic product code, presumably an expansion of the current Universal Product Code now captured in physical bar codes. The tag is put onto cartons or pallets of goods and wireless readers are mounted on forklift trucks, walls, and store shelves. The merchandise is automatically tracked as it moves from point to point. When MIT conducted the first test in October 2001, an electronic tag was affixed to a pallet of Bounty paper towels at a Procter and Gamble factory in Cape Girardeau, Missouri. It successfully tracked the pallet's progress to a Sam's Club warehouse in Tulsa, Oklahoma. The developers say that the new technology will not only give more precise data about the location of merchandise but also avoid the time and possible errors inherent in manual scanning.[28]

FedEx pioneered visibility for its service operations when it introduced COSMOS (Customer Operations Service Master Online System) in 1979. The following year it added DADS (Digital Assisted Dispatch System) to transmit package pickup requests to couriers while they were on the road. In 1986 it added Super Tracker, a handheld barcode scanning system, and became able to manage its package delivery operations in real time.

[28]Margie Semilof, "Bar Codes in a Chip," November 19, 2001, www.internetweek.com.

The second stage in Rayport and Sviokla's model is called **mirroring,** the ability to create information systems that provide a complete picture of the supply chain at a given point in time. Leading-edge companies like Frito-Lay and FedEx have not only created systems that provide a complete real-time view of their supply chains but have shared this data with their customers. In 1992 FedEx began providing software to customers that allowed them to schedule shipments and track packages using dial-up connections. In 1994, the company debuted www.fedex.com, the corporate Web site on which customers could access many services including real-time package scheduling and tracking. Customers were able to see the FedEx information in real time, providing a degree of control that led to increased customer satisfaction. For FedEx, it greatly decreased the number of routine inquiries to the telephone call center and substantially reduced the cost of that function.

At Frito-Lay, mirroring takes the form of electronic sharing of store-level inventory and pricing data with the retailer. By ensuring that the manufacturer and the customer have precisely the same data, the system substantially reduces procurement costs and errors. The company provides a rather technical description of its system and the benefits to its "retail trading partners" at http://www.frito-lay.com/edi/index.html.

The direct customers of Frito-Lay are, of course, retail grocery outlets of various kinds. Beyond the cost and time savings that the information-driven store replenishment system provides, Frito-Lay is able to offer services like merchandising plans tailored to local conditions, tailored promotional programs, and other types of merchandising incentives. The corporate knowledge portal introduced in 2000 makes it easier to deliver these benefits in the field. Frito-Lay's information system has been merged with that of its parent company, Pepsico, and its Tropicana Products unit since the late 1990s, and that offers further opportunities for integrated promotional programs.

FedEx also delivers new types of value to customers in various ways. In recent years it has become an integral part of many Web sites, allowing customers to schedule shipments without leaving the site. It offers specialized services on its own Web site including the free FedEx Global Trade Manager. This service helps small and medium-size businesses deal with some of the difficulties of international commerce by allowing shippers to identify and prepare appropriate import/export forms.[29]

The kind of integrated value chains exemplified by Frito-Lay and FedEx have five key characteristics:

- They are customer-centric, focusing on customer needs as well as supply chain and logistics issues.

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[29]Jeffrey F. Rayport and John J. Sviokla, "Exploiting the Virtual Value Chain," *Harvard Business Review,* November/December 1995, pp. 75–85; Ronald Fink, "Data Processing: PepsiCo," *Financial World,* September 29, 1992, p. 52; Julia King and Thomas Hoffman, "The Next IT generation," April 6, 1998, www.computerworld.com; Julia King, "Pepsi CIO Aims to Join New Economy," July 10, 2000, www.computerworld.com; Esther Shein, "The Knowledge Crunch," May 1, 2001, www.cio.com; www.frito-lay.com; Joanie M. Wexler, "Cosmos2: Fedex's Next Generation," *Computerworld,* February 11, 1991, p. 29; Alice LaPlante, "Federal Express Gives Clients On-Line Access to Tracking System," *InfoWorld,* November 16, 1992, p. 108; Monua Janah and Clinton Wilder, "Special Delivery," October 27, 1997, www.informationweek.com; Mike Drummond, "Wireless at Work," February 2001, www.business2.com; www.fedex.com.

- They encompass both the demand chain and the supply chain, from customers' customers to suppliers' suppliers.
- They are designed to compete as an extended enterprise, bringing customers and suppliers into the system through real-time information flows.
- They increase value added by provision of information and customer service and support.
- They offer the opportunity to create specialized value propositions for individual customers.[30]

Cambridge Technology Partners suggests that a simple economic proposition drives this activity:

> **Customer-perceived value** = (quality + utility) ÷ price[31]

In the Internet economy each of the components of customer-perceived value has taken on a special meaning. Product quality is unquestionably important. However, the stark truth is that many companies have mastered the art of product quality. They spent much of the last 10 to 15 years learning to produce products at or near the six-sigma level of quality (no more than 3.4 defects per million, according to the American Society for Quality). That kind of quality has become expected and even standard in many applications. It is necessary, but no longer sufficient. Bix Norman, the originator of the SQA concept at Herman Miller, says: "A product's a product. . . . It isn't about product, it's about simplicity and how fast you can get it. . . . If you looked at our industry from a customer's viewpoint of what it was like to buy and get office furniture, you'd find that it was just a big, huge pain."[32]

That leaves utility and price as determinants of value. Cambridge Technology Partners says:

> The Utility dimension of the model has become a predominant factor in all kinds of purchasing decisions—consumer as well as business-to-business. Utility is a broad-based term that encompasses speed, usefulness, and convenience. Without question, speed and convenience are driving more purchasing decisions today than ever before, sometimes relegating cost to a third or even fourth consideration. Note also that of the three factors that determine customer-perceived value, quality and utility are highly subjective and often based on perceptual rather than objective criteria.[33]

Quality, as a purely tangible or measurable product characteristic, is under the control of the vertically integrated old-economy manufacturer. The factors that make up utility—speed, usefulness, and convenience—require the cooperation of the entire value chain. Information is at the core of all value chain activities, and the Internet provides the common platform that ties all the players together. Linearity

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[30]John H. Dobbs, "Competition's New Battleground: The Integrated Value Chain," Cambridge Technology Partners, nd, www.ctp.com, p. 5.

[31]Ibid., p. 7.

[32]David Bovet and Joseph Martha. *Value Nets: Breaking the Supply Chain to Unlock Hidden Profits*, New York: Wiley, 2000, p. 171.

[33]John H. Dobbs, "Competition's New Battleground: The Integrated Value Chain," Cambridge Technology Partners, nd, www.ctp.com, p. 8.

is out and flexible relationships are in. Mercer Management Consulting calls this system a "value net."

Its definition is, "Value nets are networks that simultaneously connect customer needs to component sources, product assembly, rapid delivery, and support services—all woven together to drive higher levels of customer satisfaction and profitability. These nets encompass customer choice, value creation, and delivering on promises."[34]

Although they are a logical next step from an integrated value chain, virtual value chains or nets are an extension, not a radical departure. They imply an even more fluid organization than the relative stability implied by the value chain. Mercer is specific about three more characteristics that are required to move from a physical value chain to a value net:

- Value nets are agile and scalable. Major growth or changes in process can be accommodated without tearing out the old system and rebuilding it from scratch.
- The flow of information is severely compressed, often from weeks or months to hours or days.
- Information flow and analysis for decision making both occur in real time on extranets that link customers, manufacturers, and suppliers.[35]

### The Cisco Case History

Many firms are moving in the direction of a value net. Dell, of course, is an excellent example. However, it has a rather small and stable set of suppliers. It can also deliver a complete product, a personal computer, to the customer. Cisco Systems is a leader in the integrated value chain space that confronts a more complex selling and customer relationship situation. Figure 2.7 represents the value net Cisco has created.

Cisco, which bills itself as "the worldwide leader in networking for the Internet" (www.cisco.com) sells thousands of items in 19 product categories as of mid-2000, ranging from "access concentrators" to "wireless." Customers must order the right set of items which they will then configure into their own unique network. Once again, the story is best told by Cisco, in this case Amir Hartman and John Sifonis, both managing directors in Cisco's Internet Business Solutions Group. Their book, *Net Ready,* has unique insights into the grounds for Cisco's success in creating its value net:

> What makes the Cisco story so revolutionary is not what it sells, but the process by which it enables anyone doing business with the company—customers, partners, vendors, and suppliers—to create value with the Net. . . . Cisco has seized on the drivers of Net Readiness—leadership, governance, competencies, technology—and integrated them so seamlessly within the process of the company that it cannot be separated from the Net culture in which it operates . . . [so] the Web is the glue for the

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[34]David M. Bovet and David G. Frentzel, "The Value Net: Connecting for Profitable Growth," *Supply Chain Management Review,* Fall 1999, p. 97, www.supplychainlink.com.

[35]David Bovet and Joseph Martha. *Value Nets: Breaking the Supply Chain to Unlock Hidden Profits,* New York: Wiley, 2000, pp. 5–7.

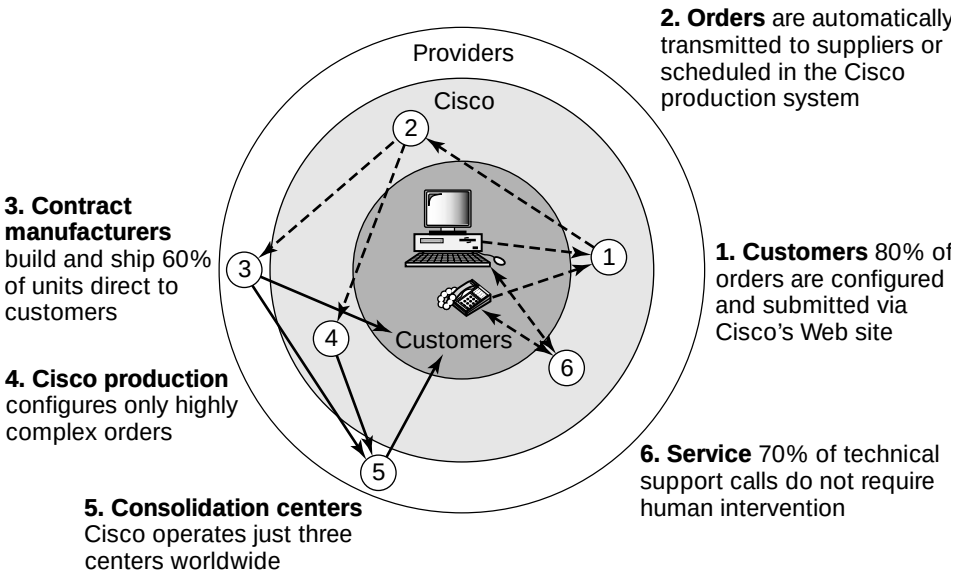


**FIGURE 2.7 Cisco's Value Net**

Source: Amir Hartman and John Sifonis with John Kador, *Net Ready: Strategies for Success in the E-conomy*. New York: McGraw-Hill, 2000, pp. 237–269. Used with permission.

internal workings of the company. It swiftly connects Cisco with its web of partners, making the community of suppliers, contract manufacturers, and assemblers look like one brand to the outside world. . . . Via the company's intranet, outside contractors directly monitor orders from Cisco customers and ship the assembled hardware to buyers—often without Cisco having its fingerprints on an order. By outsourcing production of 70 percent of its products, Cisco has quadrupled output without building new plants and has cut the time it takes to get a new product to market by one fiscal quarter. . . . Eight out of ten customer requests for technical support are filled electronically—at satisfaction rates that eclipse those involving human interaction. Using the network for tech support allows Cisco to save more money than its nearest competitor spends on research and development. . . .

Perhaps the best known of Cisco's Internet business solutions is its suite of networked commerce agents that enables users to configure, price, route, and submit electronic orders directly to Cisco. . . . The Pricing and Configuration agents allow more than 10,000 authorized representatives of direct customers and partners to configure and price Cisco products online. . . . Customers walk through an intuitive series of steps to pick the product they want and all the related accessories for that product, such as memory, power supply, and cable. Customers are prompted to modify orders until they specify a workable configuration. . . . Order Placement allows customers to drop their selections into a "shopping cart" in Cisco's virtual marketplace. Order Status lets users check on an order using a purchase order or sales order number. This application even connects users directly to Federal Express's tracking services to determine in real time exactly where their order is in the shipping process. Service Order Agent lets users find information about specific service orders. . . . Invoice Agent provides controllers, finance officers, and accounts payable staff with rapid, easy, online access to track their invoices with Cisco. . . .

CCO (Cisco Connection Online) is Cisco's Internet storefront. It is the company's comprehensive resource for customers, suppliers, resellers, and business partners. CCO is essentially a portal to information stored in Cisco's ERP (enterprise resource planning) databases, legacy systems, and client-server systems around

the world, a storehouse of more than 1.5 million Web pages. . . . To make Net Readiness a common element of its entire value chain, Cisco is making it possible for its largest customers and resellers to integrate their enterprise applications directly into Cisco's own back-end systems, using the Web as the bridge. The new strategy takes hold just as the staggering success and bottom-line benefits of CCO are beginning to sink in. The site, which automates product ordering and customer support activities, is on track to save the company a little more than $350 million per year in operating expenses. Cisco dedicates most of its efforts to making better customers out of its existing customers, but it also has its sights set on customers who have not yet purchased products online because of the lack of back-end integration. Taking the strategy a step further, Cisco is encouraging its suppliers to Webify their supply-chain processes to further integrate the value chain on behalf of Cisco's customers. . . .

Cisco's Net Readiness looks inward as well as outward. Whereas CCO addresses the needs of Cisco customers, partners, suppliers, and employees, Cisco Employee Connection (CEC) is limited to information and services that address the unique needs of individual Cisco employees. CEC includes dozens of initiatives designed to make all internal and human resources processes exploit a common self-service model using the Net as a collaborative platform. . . . Perhaps the most visible employee services application is Metro, the travel expense reporting application that allows employees to easily report expenses. Expenses charged with a corporate American Express card automatically appear on the individual's electronic expense account form. Only two auditors are needed to audit expenses for more than 15,000 Metro users per month. . . .

CEC applications . . . provide employees with the following benefits:

*Ubiquitous communications.* Every one of Cisco's employees around the globe is connected through the Cisco network. . . .

*Streamlined business process.* CEC's interactive tools reduce the time that employees spend handling repetitive tasks and streamline routine business processes. . . .

*Integrated business systems.* The CEC home page serves as the launching pad for dozens of Web-based information sources and services, all of which share the same navigational tools and a common user interface. . . .

The measurable savings that Cisco has realized from the CEC-driven Workforce Optimizations Solutions amounts to more than $58 annually. . . . Cisco is grateful for the savings, but cost avoidance is not the justification for CEC. The true justification for CEC is customer service. CEC is justified by giving Cisco employees better access to information and to each other. These applications have allowed Cisco to scale its infrastructure without adding armies of bodies, a fact that keeps Cisco nimble and responsive to customers. The result is more responsive employees, the measure of which is revenues per employee. The average Cisco employee drives more than $668,000 in revenue. Additionally, the productivity gains from better information flow (estimated conservatively at 1 percent per employee, or 30 minutes per week) add more than $100 million in savings. Because of the three core initiatives, (CCO, MCO [Manufacturing Connection Online], and CEC), Cisco has been able to cut costs in excess of $800 million across the organization. . . .

More than its innovative use of technology, Cisco has developed an E-cosystem that makes itself as transparent as possible. Cisco is an outside-in company. Its E-culture results in its passionate focus on the customers, its commitment to driving value through E-business, and its willingness to empower Cisco people to take risks. The transparency encourages Cisco people to share knowledge, not hoard it. It inspires the company to team up with outsiders to acquire and retain intellectual assets.

Finally, Cisco vindicates the notion that you do not have to be a born-on-the Web company—you don't have to have a "dot com" at the end of your name—to make it in

> the E-conomy. Although Cisco is by no means a refugee from the industrial revolution, many companies of Cisco's vintage have been steamrollered by the E-conomy. At the same time, others like Cisco are well on their way to transforming themselves into thorough Net Ready E-businesses.[36]

In spite of its success in transforming into an e-business, the Internet upheaval that began in 2000 did not leave Cisco untouched. There has been much speculation about the root cause of the economic downturn and whether the linkages of the new value chains might have contributed to the speed and ferocity of the decline in the market for technology products. Whether they did, or whether many firms simply ignored early warning signs that the value chains should have provided, one thing is clear. This was the first major economic downturn of the networked economy, and many firms, including Cisco, have undergone a painful experience. Exactly what has been learned will become more clear in time, and it is doubtful that businesses will again be caught so unprepared for the movements of normal economic cycles.

The economic upheaval may have slowed business integration for a time, but it did not stop it. It made it even more clear that management vision and organization-wide execution are necessary to create an integrated value chain and transform it into an internal and external value net that benefits all parties. Many kinds of supporting services are required as companies undergo these kinds of transformations. Most of these are specialized and beyond the scope of this book. However, three types of processes and their enabling software need to be understood in order to have a satisfactory grasp of the scope and nature of value chain integration.

### Integration Processes: EDI, ERP, and Web Services

Electronic Data Interchange, the oldest of the processes, provides a way of automating the supply chain. Enterprise resource planning is a broader term that describes systems stretching back into the production process and forward into the order processing and distribution systems. Web services is a new entry into the process automation space. Let us briefly discuss each.

**Electronic Data Interchange (EDI)** has been available and in use by large corporations and their suppliers for over two decades. The term is representative of the process; essentially EDI enables paperless transaction processing. In spite of the benefits of speed, error reduction, and lowered costs that it offers, several issues have slowed its adoption. The status of EDI as of 1998 was described by *Network* magazine:

> For the past 20 years, EDI has enabled companies to exchange information using standard, rigidly formatted electronic transactions. In a traditional EDI transaction, information for a purchase order is keyed in to the system, which produces an electronic purchase order. The order is sent either directly to the seller, or through an electronic mailbox provided by a Value-Added Network (VAN). The seller receives the electronic purchase order and translates the data into the form needed by the seller's order-entry application. Then, an electronic acknowledgment is sent to the

[36]Amir Hartman and John Sifonis with John Kador, *Net Ready: Strategies for Success in the E-conomy.* New York: McGraw-Hill, 2000, pp. 5–7. Used with permission.

buyer, indicating that the transmission has been received, and the seller's order-entry system generates internal instructions to the warehouse, plant, or service center regarding order fulfillment. Additionally the order-entry application may feed into the invoicing application so that an electronic invoice can be prepared. Monies are exchanged via an Authorized Clearing House (ACH).

While the number of EDI-subscribing companies has steadily increased over the years, EDI's cost and set-up difficulties have prevented the realization of its forecasted subscribers. . . . [Beginning in 1998] EDI is predicted to have a 24 percent annual growth rate each year so that by 2002, subscribers should number approximately 665,000 worldwide. . . . In 1998 IDC says the market for EDI network services will exceed $1 billion and surpass $2.38 billion by 2002. Transactions are predicted to rise from slightly less than 1.6 billion messages in 1997 to more than 6 billion by 2002. . . .

EDI costs include hardware, setup, transaction service, and mapping, which refers to the transfer of information from EDI documents to the business' internal systems. According to The EDI Group (Oak Park, IL), off the shelf packages for microcomputers cost $800 to $3,000. For mini- and mainframe computers, packages cost $10,000 to $30,000 plus maintenance. VANs charge for every character transmitted, plus they add fees for mailboxes and other services. When the fees for mapping are added in, which is as expensive as custom programming, EDI can become a costly solution for smaller companies.[37]

The universal platform provided by the Internet has fueled growth in EDI that seemed unlikely prior to the Internet although corporations have expressed concerns about security when moving from a closed VAN environment to the open environment of the Internet. However, leaders in the supply chain arena like Wal-Mart and GE require that their suppliers be EDI-compliant, using software that interfaces smoothly with their internal systems. That represents the second key issue. Speedy transfer of data between companies is only part of the picture. Internal processes must also be automated in order to achieve the full benefit of an integrated value chain. Enterprise resource planning is the technique most often used to achieve information integration inside the organization.

**Enterprise resource planning (ERP)** is the name given to modular software systems that are aimed at automating all business processes within an organization. Such a system requires nothing less than creating a digital record of every business transaction in a totally integrated enterprise-wide system.

At a very high level the basic modules include order processing, production planning and scheduling, inventory control, distribution, and customer relations management. The Cahners Business Publishing Manufacturing Systems site estimated that some ERP systems model as many as 1,100 process flows within a business. Their goal is to tie together systems that have formerly run independently, often on mainframe computers, into an integrated system that gives a complete view of corporate activity from the perspective of the relevant decision maker. The human resources professional needs one view of personnel data; the manufacturing planner needs to see the same data through a different lens.

An ERP models and tracks the internal processes of a business. The current challenge is to marry those internal systems (the organizational back-end) to

[37]Hanna Hurley, "EDI Takes to the Internet," *Network*, October 1, 1998, www.cma.zdnet.com. Used with permission.

Web-enabled systems (front-end) that interface with both suppliers and customers. These are the integrated information systems that support an integrated value chain.

If this sounds like a large order, it is. According to *Purchasing* magazine:

> ERP doesn't come cheap. Like most software, ERP is priced based on the functionality of the system needed and the number of "seats" or users who will access it. These systems may also require companies to convert data, tweak existing systems, and overhaul networking infrastructure. In addition, the complexity of ERP (and the threat of a failed installation) generally demand that companies hire a cadre of consultants and technical gurus whose fees can run as high as five to 10 times the price of the software.
>
> All this can add up quickly, with top-of-the-line ERP software packages costing tens of millions of dollars. Chevron alone has spent nearly $160 million [as of mid-1998] implementing ERP solutions over the past five years.
>
> "It's not unusual for the big, complex deals to be $50,000 to $75,000 per concurrent user," says Chris Jones, vice president and research director for the manufacturing and logistics division of The Gartner Group, a Stamford, Conn.–based research house. Jones emphasizes that the cost of ERP installations can vary by more than 20% depending on the scope and complexity of the installation. . . . The typical ERP implementation takes between two and three years. Larger, more complex installations can stretch to five or six years. In addition, most of these systems aren't very user-friendly, requiring companies to spend significant time up front establishing rules for using the system and training employees to follow them.[38]

Many companies began their ERP installation as a solution for the problems of Y2K (the advent of the year 2000, which posed a number of issues for existing computer systems). Others see it as a necessary part of becoming an e-business. Nestle S.A. provides a good example:

> The Swiss candymaker wanted to impose law and order—a strong arm of financials, supply-chain management, inventory management and other enterprise resource planning applications that would literally force its collection of more than 500 fiefdoms around the world to act as a single-minded e-business. That's why Nestle [in June 2000] inked a contract with SAP [German ERP vendor] for more than $200 million. . . . During the first three years of the deal, Nestle may spend an additional $80 million on consulting, maintenance, and software upgrades. . . . Nestle will deploy . . . applications and enterprise portals to each of its 230,000 employees in 500 facilities in 80 countries. Rollout to the largest facilities will take about three years, with others to follow. . . .
>
> After the deployment, each Nestle employee will work from a browser-based start page customized to his or her job function. . . . SAP has designed more than 300 . . . roles, ranging from clerical to executive. The roles mandate precise steps for executing a business process that must be followed in order every time. For example, an invoice for an order can't be referred to accounts payable until the system shows the order was received. . . .
>
> Roles are also used to manage system security, ensuring that only employees with specific roles can access specific information. For example, sales and marketing reports might be generated only for executives and automatically displayed on

[38]Tim Minahan, "Enterprise Resource Planning: Strategies Not Included," July 16, 1998, www.purchasingonline.com.

> only their start pages. . . . Nestle plans to create as many as five data centers around the world. Each facility will install mySAP.com financials, accounts-payable and -receivable, planning production management procurement, direct procurement, supply-chain, demand planning, fulfillment, and business-intelligence capabilities. One quick benefit will be that "sales information from retailers will let us see on a global basis for the first time how effective our promotional activity is, and will enable us to decrease overstocking and spoilage caused by having products sitting around on grocery shelves," [Claude] Dispaux [Nestle's senior VP of group information systems] says.[39]

The need for integration is compelling, but the difficulties of implementing—as well as the costs associated with—EDI and ERP have given rise to another set of technologies aimed at the same issues. This set of technologies has come to be known by the entirely nondescriptive name of Web services.

**Web services** is an emerging discipline and many companies are eager to sell software and services to this market. Consequently, there is a great deal of hype and considerable confusion over just what the term means. The basic idea, however, is to enable different computer systems—read that as various elements in the supply chain—to communicate with one another using accepted protocols (e.g., HTML) and programming languages (e.g., XML—see the Tech Topics box). This should eliminate the need for expensive software and systems integration required for both EDI and ERP.

The basic toolkit for Web services includes a messaging protocol, definitions of the interfaces that programmers need to write applications that communicate with customer or supplier applications, and a directory of Web services for programmers. Using these components, programmers can construct applications that can locate and communicate with other applications without extensive custom programming and systems integration. Notice that this list does not include security protocols, and this is a concern to managers who are considering allowing suppliers and customers access to their internal records.

Many possible applications could make use of Web services. Life Time Fitness of Eden Prairie, Minnesota, is building a member services portal using Web services technology. The portal will give each member access to his or her own personalized page on which to create workout schedules, develop workout plans, and chart his or her fitness progress. Instead of doing the custom programming necessary to create applications in-house, Life Time Fitness will partner with vendors who specialize in elements like interactive scheduling software.

In the B2B marketplace Bekins Co., a Hillside, Illinois, trucking company is using Web services technology to obtain bids for the less-than-truckload lots that it subcontracts to other truckers. Its order-management system resides on a legacy system (the term for an old system, often one using a mainframe computer). The new system allows other truckers to use a Web browser to view descriptions of available jobs and bid for them over the Internet.

Web services technology can be used to tie together incompatible applications inside the enterprise or, as in these examples, to make internal systems visible and accessible to outsiders. The necessary pieces of the technology will gradually

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[39]Steve Kinicki, "Nestle Taps SAP for E-Business," *InformationWeek*, June 26, 2000, www.techweb.com. Used with permission.

Tech Topics

## HTML and XML

**Hypertext Markup Language (HTML)** is the common language of the Internet, allowing documents to be transmitted over various platforms in a seamless manner. Markup languages are programming systems that use tags (commands inserted in documents) to describe the content of a document and the way it should be formatted on the screen. According to Webopedia, "HTML defines the structure and layout of a Web document by using a variety of tags and attributes." The following is an example of this paragraph in HTML.

```
<html>

<head>
<meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<meta name="GENERATOR" content="Microsoft FrontPage 4.0">
<meta name="ProgId" content="FrontPage.Editor.Document">
<title>New Page I</title>
</head>

<body>

<p><span style="font-size:12.Opt;font-family:&quot;Times New Roman&quot;;
mso-fareast-font-family:&quot; Times New Roman&quot;;mso-ansi-language:
EN-US; mso-fareast-language:
En-US;mso-bidi-language:AR-SA">Hypertext Markup Language (HTML) is the
common language of the Internet, allowing documents to be transmitted
over various platforms in a seamless manner.  Markup languages are
programming systems that use tags (commands inserted in documents) to
describe the content of a document and the way it should be formatted on
the screen.  According to Webopedia, &quot;HTML, defines the
structure and layout of a Web document by using a variety of tags and
attributes.&quot;  The following is an example of this paragraph in
HTML:</span></p>

</body>

</html>
```

**Extensible Markup Language (XML)** is an open standard (essentially programmers can invent their own tags) used for defining data elements on a Web page or a document. Data items like "account," "balance due," etc. can be defined, allowing the XML document to function like a database record. The document exists, and can be filled in with data.

Following are examples of XML and HTML tags.[40] Note that the XML statements define data content, whereas the HTML lines deal with fonts and boldface. XML defines "what it is," and HTML defines "how it looks."

```
XML
<firstName>Maria</firstName>
<lastName>Roberts</lastName>
<dateBirth>10-29-52</dateBirth>

HTML
<font size="3">Maria Roberts</font>
<b>October 29, 1952</b>
```

[40] www.techweb.encyclopedia.com.

become standardized in B2B marketplaces but it may take until 2005 to know whether Web services will fulfill their promise of ease and economy and be widely accepted.[41]

### A Final Word on Integration

EDI, ERP, or Web services may be necessary for many organizations to tie together their own complex business processes and/or to permit integration with suppliers and customers. However, it is important to recognize that these technologies do not solve all business problems. In particular, they cannot make a poorly functioning business process work effectively. As has been true from the beginning of the computer age, imposing any automation technology on poorly functioning business processes only exacerbates difficulties. Process redesign is a necessary first step in implementing any process automation and system integration project.

One author states the requirements in strong terms:

> Those organizations that continue to rely on traditional planning, control, production and communication systems will fail to prosper. Unable to face the challenges posed by globalization, dramatically shortened production cycles and a sharply increased demand for cost-effectiveness, they will struggle to compete—falling behind their more aggressive and innovative competitors. Those organizations that move to create leaner, more streamlined IT and organizational structures, and meet the challenge of reworking and redefining traditional work processes will succeed.[42]

## The Benefits of an Integrated Value Chain or Net

Moving from a linear supply chain to a web of interlocking partnerships that work together to create maximum customer value is one of the fundamental tenets of the new economy. The dominant characteristics of these new organizational modes can be summarized as the four Vs of business transformation:

- **Velocity.** Customers demand better products and services and expect to receive them more quickly and with complete accuracy.
- **Visibility.** Transparency of information between customers and all value chain members creates a self-service model that speeds flows and improves customer satisfaction.
- **Variability.** Customers want products manufactured and delivered according to their individual requirements.
- **Volume.** Achieving profitable scale and scope in an environment that requires marketing to individual customers is essential.[43]

Achieving these outcomes requires relentless focus on the needs of the consumer, achieving internal efficiencies of time and cost, and managing across organizational boundaries to achieve maximum impact.

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[41]Paul McDougall, "Decoding Web Services," October 1, 2001, www.informationweek.com; "Meta Report: What Are Web Services, Anyway?" January 16, 2002, www.internet.com.

[42]Wayne Janzen, "Tapping ERP to Extend Value Chain Benefits," *Enterprise Systems Journal*, September 1, 1999, www.zdnet.com.

[43]Kevin P. O'Brien, "Value-Chain Report," April 3, 2000, www.industryweek.com.

## Summary

**The supply chain of the past cannot meet the requirements of the Internet economy. Neither can a "one size fits all" product that is pushed through channels using conventional techniques of marketing promotion and pricing. In some cases, such as configuring internal and external networks, the final product is inherently a custom proposition. In others, such as office furniture systems, prospering in a competitive marketplace requires meeting customer needs in an individualized manner.**

**The supply chain has evolved into a virtual value chain made up of interconnected relationships. Each member contributes its core capability and the final product is delivered to the customer as a single strong and recognizable brand. This represents a revolution in business organization and management that few enterprises have yet achieved. As examples throughout this chapter have emphasized, it is an achievement that can be years in the making.**

**Enterprises will often begin by creating information systems that allow them to visualize all aspects of the value chain, first as a snapshot in time and then in real time. They can then progress to the creation of information systems that fully mirror the activities of the value chain. That information will first be of use to management in controlling, forecasting, and planning. It will generate additional value if it is shared with customers. That will be the first step in delivering value to customers in ways that are faster and more convenient. It can be followed by the creation of entirely new kinds of customer value.**

**None of this is easy. It is likely to require reengineering of existing business processes and major projects to integrate internal systems and to communicate across organizational boundaries with both suppliers and customers.**

**In spite of the complexity of these undertakings, this is clearly the direction in which all enterprises need to be moving with a sense, not of deliberation, but of urgency.**

## Key Terms

bar code
business process
channel of distribution
customer-perceived value
electronic data interchange
enterprise resources planning
HTML
mirroring
supply chain
transaction costs
value chain
value-added network
variability
velocity
virtual value chain
visibility
volume
Web services
XML

## Discussion Questions

1. Differentiate between three key concepts—supply chain, value chain, and integrated value chain or net.
2. Marketing has three core processes—one of which is supply-facing, one of which is essentially internal, and one of which is customer-facing. Do you agree with this statement? Be prepared to explain why or why not.
3. What stages is an enterprise likely to go through en route to a virtual value chain?
4. Discuss integrative elements Dell has employed on (a) the supply side and (b) the customer side. What role do Premier Pages play in Dell's virtual value chain?
5. John Chambers, the president and CEO of Cisco Systems, refers to its business model as the "global networked business." Based on the case history in this chapter, what are some of the elements of the business model he is describing?

6. How does the combined use of EDI and ERP facilitate the development of an integrated value chain?
7. What potential advantages does Web services offer over EDI and ERP?

## Exercises

1. Select an industry (e.g., automotive) or a specific company (e.g., Ford) and identify elements of its value chain. Where can information be used to decrease costs or increase customer satisfaction or both? You may find the Free Content Databases links and the additional reference links for this chapter on the student Web site useful in carrying out this assignment.
2. Think about how you bought the text and other material for this class. It might have been through the college bookstore, a local supplier, over the Internet, or some combination of all three. Identify the elements of the value chain that were necessary to get these products to you, the final customer.
3. Spend some time on the Web site for your school, college, or department. How is that organizational unit using its Web site to help students visualize institutional processes, mirror activities carried on in the physical world, and increase the strength of relationships with students and potential students? What more could it do in each of these areas?