CHAPTER

6 Operations Management

dantien/Fotolia

LEARNING OUTCOMES

That coffee you love so much at your local Starbucks location starts as coffee beans (berries) plucked from fields of coffee plants.[1] From harvest to storage to roasting to retail to cup, Starbucks understands the important role each value chain participant plays. Starbucks offers a selection of coffees from around the world, and its coffee buyers personally travel to the coffee-growing regions of Latin America, Africa/Arabia, and Asia/Pacific to select and purchase the highest-quality *arabica* beans. There are many potential challenges in "transforming" the raw material into the quality product and experience that customers expect at Starbucks—weather, shipping and logistics, technology, political instability, and so forth.

Although these operations management challenges are significant, the most challenging issue facing Starbucks today may be balancing its vision of the uniquely Starbucks coffee experience with the realities of selling a $5 latte in today's world. Starbucks products have become an unaffordable luxury for many. As revenues and profits declined during the economic downturn, CEO Howard Schultz realized that "the company needed to change almost everything about how it operates." Recessionary and competitive pressures forced Starbucks away from its "anti-fast-food" focus to become more streamlined. Stores implemented "lean" initiatives such as keeping items in the same place, moving drink toppings closer to where drinks are handed to customers, and altering the order of assembly. Stores witnessed increases of up to 20 percent in transactions.

Lean techniques have to be balanced with quality objectives. Starbucks sped up drink preparation using a model in which baristas produced as many drinks as possible, but later chose to reduce the speed of service to ensure the highest customer value experiences.

Think About It

What uncertainties does Starbucks face in its value chain? Can Starbucks manage those uncertainties? If so, how? If not, why not?

Every organization produces something, whether it's a good or a service. Some, like Starbucks, produce both a good and a service. Technology has changed how production is done. This chapter focuses on organizations' processes of operations management.

We also look at the important role that managers play in managing those operations.

WHY IS OPERATIONS MANAGEMENT IMPORTANT TO ORGANIZATIONS?

6.1 **Tell** What is operations management, and what is its role?

You've probably never given much thought to how organizations "produce" the goods and services that you buy or use. But it's an important process. Without it, you wouldn't have a car to drive or McDonald's fries to snack on, or even a hiking trail in a local park to enjoy. *Organizations need to have well-thought-out and well-designed operating systems, organizational control systems, and quality programs to survive in today's increasingly competitive global environment.* And it's the manager's job to manage those things.

What Is Operations Management?

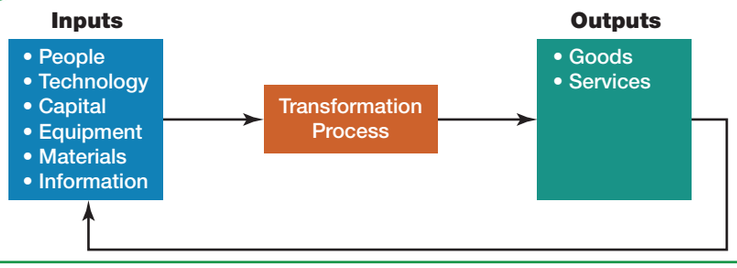
The term **operations management** refers to the design, operation, and control of the **transformation process** that converts such resources as labour and raw materials into goods and services that are sold to customers. Exhibit 6-1 portrays a simplified overview of the transformation process of creating value by converting inputs into outputs. The system takes inputs—people, technology, capital, equipment, materials, and information—and transforms them through various processes, procedures, and work activities into finished goods and services. These processes, procedures, and work activities are found throughout the organization. For example, department members in marketing, finance, research and development, human resources, and accounting convert inputs into outputs such as sales, increased market share, high rates of return on investments, new and innovative products, motivated and committed employees, and accounting reports.

As a manager, you'll need to be familiar with operations management concepts, regardless of the area in which you're managing, in order to achieve your goals more effectively and efficiently. Operations management focuses on several key competitive priorities: cost, quality, delivery, flexibility, and service.

Why is operations management so important to organizations and managers?

1. It encompasses processes in services and manufacturing organizations.
2. It is important in effectively and efficiently managing productivity.
3. It plays a strategic role in an organization's competitive success.

EXHIBIT 6-1 The Operations System



operations management
The study and application of the transformation process.

transformation process
The process that converts resources into finished goods and services.

RealPhotoItaly/Fotolia

Some economists think the shipping container has done more for global trade than every trade agreement signed over the past 50 years. One proposal sees containers made from carbon-fibre composites to lower cost, increase security, and enhance tracking.[6]

How Do Service and Manufacturing Firms Differ?

With a menu that offers more than 200 items made fresh each day, The Cheesecake Factory restaurants rely on a finely tuned production system. One food-service consultant says, "They've evolved with this highly complex menu combined with a highly efficient kitchen."[2]

All organizations produce goods or services through the transformation process. Simply stated, every organization has an operations system that creates value by transforming inputs into finished goods and services outputs. For manufacturers, the products are obvious: cars, cellphones, or food products. After all, **manufacturing organizations** produce physical goods. It's easy to see the operations management (transformation) process at work in these types of organizations because raw materials are turned into recognizable physical products. But that transformation process isn't as readily evident in **service organizations** because they produce nonphysical outputs in the form of services. For instance, hospitals provide medical and health care services that help people manage their personal health; taxi companies provide transportation services that move people from one location to another; cruise lines provide vacation and entertainment services; and residential plumbers and electricians ensure that we have running water and electricity where we live. All of these service organizations transform inputs into outputs. For example, look at your college. College administrators bring together inputs—instructors, books, academic journals, multimedia classrooms, and similar resources—to transform "unenlightened" students into educated and skilled individuals. Exhibit 6-2 illustrates the difference between goods and services.

The reason we're making this point is that the Canadian economy, and to a large extent the global economy, is dominated by the creation and sale of services. Most of the world's developed countries are predominantly service economies. In Canada, for instance, almost 78 percent of all economic activity is services, and in the United States it is nearly 77 percent.[3] In lesser developed countries, the services sector is less important. For instance, in Nigeria it accounts for only 33 percent of economic activity; in Laos, only 37 percent; and in Vietnam, 38 percent.[4,5]

EXHIBIT 6-2 Goods Versus Services

Goods	Services
Tangible—have a physical form	Intangible—are experienced
Can be stored in inventory	Production and consumption happen at the same time
Ownership is transferred	Ownership of service is not transferred to the customer
Can be produced independently of the customer	Customers are much more involved
Delays can be tolerated	Time is more important and delays are more challenging
Quality can be measured by defects or deviations in manufacturing	Quality is based on customer perceptions

manufacturing organizations
Organizations that produce physical goods.

service organizations
Organizations that produce nonphysical products in the form of services.

How Do Businesses Improve Productivity?

One jetliner has some 4 million parts. Efficiently assembling such a finely engineered product requires intense focus. Boeing and Airbus, the two major global manufacturers, have copied techniques from Toyota. However, not every technique can be copied because airlines demand more customization than do car buyers, and there are significantly more rigid safety regulations for jetliners than for cars.[7] Amazon purchased robotics company Kiva Systems as part of its push to speed delivery and reduce order costs. Amazon is using 1400 Kiva robots in three of its warehouses, which could save the company almost $900 million per year due to higher operating efficiency across its massive order fulfillment–centre network. Another interesting potential is for Amazon to begin selling robots to other companies. Prior to its purchase, Kiva was charging about $2 million for a kit of robots and another $20 million for large installations.[8]

Although most organizations do not make products that have 4 million parts, and most organizations are unable to function without people, *improving productivity has become a major goal in virtually every organization*. For countries, high productivity can lead to economic growth and development. Employees can receive higher wages and company profits can increase without causing inflation. For individual organizations, increased productivity gives them a more competitive cost structure and the ability to offer more competitive prices.

Kirsty Pargeter/Fotolia

The advent of robots that are cheap and safe enough to be used outside big factories is one factor in the rise of the robots. Amazon is imagining a world where drones will deliver products to customers. Companies have used robots as grips on film sets and panel installers at solar-power plants. Aerial robots—drones—are used by farmers to tend crops, by broadcasters to monitor traffic, and by architects to look for infrastructure in need of repair.[9]

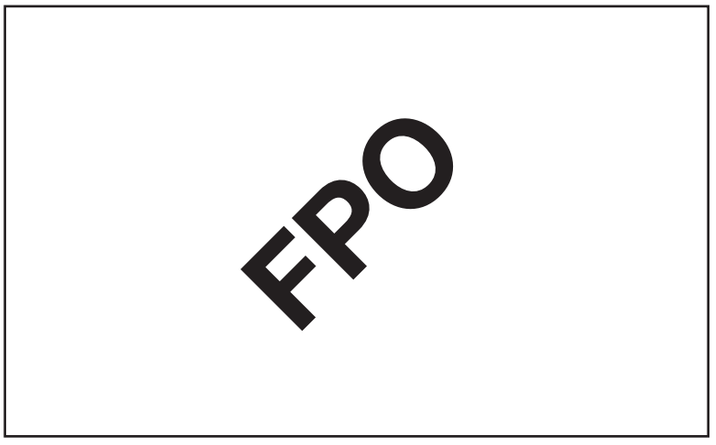
Over the past decade, Canadian businesses have made dramatic improvements to increase their efficiency. However, it is important to balance those improvements with effectiveness. For example, H.J. Heinz Company's frozen-food plant in Pocatello, Idaho, was the highest ranked factory for safety, cleanliness, and efficiency in 2011. In 2014, the plant was closed because of ineffective logistics, such as shipping frozen enchiladas more than 1000 miles away from San Diego to Idaho, and from there to distribution centres on the East Coast.[10] These changes impacted Canadian operations as well, with the century-old Leamington, Ontario, plant closed amid much acrimony in November 2013.

Organizations that hope to succeed globally are looking for ways to improve productivity. For example, Tim Hortons began offering double lanes in many of its drive-throughs to improve speed and accuracy. The two-lane system would likely be more effective if one lane was dedicated for coffee-only customers. McDonald's generates 70 percent of its revenues from drive-through customers and recently added a third high-speed window in many stores to counter the fact that the company's drive-through time of 189 seconds is longer than Wendy's (158 seconds) or Taco Bell (134 seconds).[11] According to a study from Gad Allon, a professor at Northwestern University in Chicago, "Every seven seconds of improvement amounts to an average gain of one percent of market share."[12] The Canadian Imperial Bank of Commerce, based in Toronto, automated its purchasing function, saving several million dollars annually.[13] And Skoda, the Czech car company owned by Germany's Volkswagen AG, improved its productivity through an intensive restructuring of its manufacturing process.[14]

Productivity = People + Operations Variables

Productivity is a composite of people and operations variables. To improve productivity, managers must focus on both. William Edwards Deming was an American statistician, professor, author, lecturer, and consultant.[15] He is widely credited with improving production in the United States during World War II, although he's probably best known for his work in Japan. From 1950 onward, he taught Japanese top managers how to improve product design and product quality, testing, and sales, primarily through applying statistical methods. Deming believed that managers, not workers, were the primary source of increased productivity. He outlined 14 points for improving management's productivity (see Exhibit 6-3 for a visual representation of Deming's work). A close look at these suggestions reveals Deming's understanding of the interplay between people and

EXHIBIT 6-3 The Deming Chain Reaction: Improved Quality and the Bottom Line



operations. High productivity can't come solely from good "people management." The truly effective organization will maximize productivity by successfully integrating people into the overall operations system. For instance, customer lines snaking out the door have been an issue for the burrito chain Chipotle. The fast-food chain, with six locations in Canada, recently sped up service by six transactions per hour by implementing a system to leverage the strengths of its employees.[16] Exhibit 6-4 illustrates the four pillars of its operations system.

Chiptole is a company that understands the important interplay between people and the operations system.

EXHIBIT 6-4 The Four Pillars of Chipotle's Operations System

Pillar	Purpose
Expediters	An extra person between cooks and cashiers
Linebackers	The people who patrol the countertops, serving-ware, and bins of food so that the people servicing customers never turn their backs on them
Mise en place	A zero tolerance policy for not having everything ready and in place for peak periods
Aces in their places	Having each branch's top servers in the most important positions at peak times

Source: Adapted from "The Deming Chain Reaction," The Deming Transformation Forum, http://www.transformationforum.org/Chain_Reaction.html.

What Role Does Operations Management Play in a Company's Strategy?

Modern manufacturing originated more than 100 years ago in the United States, primarily in Detroit's automobile factories. The success that U.S. manufacturers experienced during World War II led manufacturing executives to believe that troublesome production problems had been conquered. These executives focused, instead, on improving other functional areas, such as finance and marketing, and paid little attention to manufacturing. However, as Canadian and U.S. executives neglected production, managers in Japan, Germany, and other countries took the opportunity to develop modern, technologically advanced facilities that fully integrated manufacturing operations into strategic planning

What Is Value Chain Management and Why Is It Important?

6.2 **Define** What is the nature and purpose of value chain management?

1 What Is Value Chain Management?

Let's start from the beginning . . .

- Every organization needs customers to survive and prosper.
- Customers want value from the goods and services they purchase or use, and *they decide what has value.*
- Organizations must provide that value to attract and keep customers.
- **Value** is defined as the performance characteristics, features and attributes, and any other aspects of goods and services for which customers are willing to give up resources (usually money).

vector_master/fotolia

The following examples of **closely integrated work activities among many different players are brought to you by . . . VALUE CHAIN MANAGEMENT!**

- **Big management assignment due in one week and your computer crashes! NO!** Your custom-designed dream computer is built to your exact specifications and delivered three days later. Management assignment **DONE**!
- **Zero inventory warehousing**. Order processing that involves only one change of hands. It's happening at Siemens AG's Computed Tomography manufacturing plant in Forchheim, Germany, because its 30 supplier partners share responsibility with the plant for overall process performance.
- Black & Decker's handheld glue gun—**totally outsourced to the leading glue gun manufacturer**.[17]

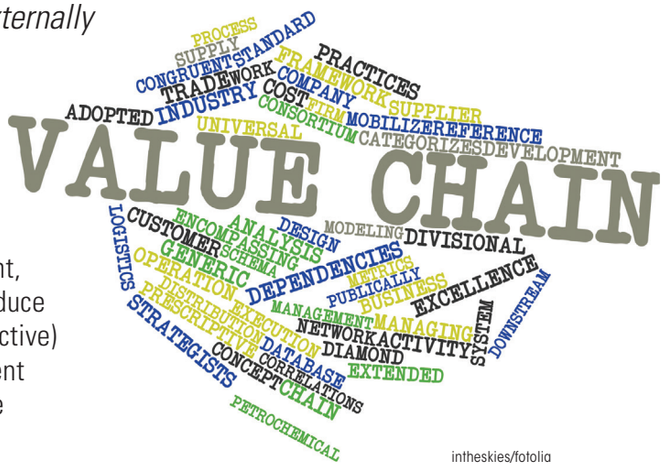

Marek Kosmal/fotolia

value
The performance characteristics, features, attributes, and other aspects of goods and services, for which customers are willing to give up resources.

- Value is provided to customers through transforming raw materials and other resources into some product or service that end users need or desire when, where, and how they want it.

That seemingly simple act of turning varied resources into something that customers value and are willing to pay for involves a vast array of interrelated work activities performed by different participants *(suppliers, manufacturers, and even customers)*—that is, it involves the **value chain**.[18]

- **Value chain management (VCM)** is *externally* oriented and focuses on both incoming materials and outgoing products and services. VCM is effectiveness oriented and aims to create the highest value for customers.[19]
  - Contrast VCM with supply chain management, which is efficiency oriented (its goal is to reduce costs and make the organization more productive) and *internally* oriented by focusing on efficient flow of incoming materials (resources) to the organization.



intheskies/fotolia

- **Who has the power in the value chain?**
  - Is it the supplier providing needed resources and materials? After all, suppliers have the ability to dictate prices and quality.
  - Is it the manufacturer that assembles those resources into a valuable product or service? A manufacturer's contribution in creating a product or service is critical.
  - Is it the distributor that makes sure the product or service is available where and when the customer needs it?

Actually, it's none of these!

In value chain management, **customers are the ones with the power.**[17]

value chain
The entire series of work activities that add value at each step from raw materials to finished product.

value chain management (VCM)
The process of managing the sequence of activities and information along the entire value chain.

- They define what value is and how it is created and provided.
- Using VCM, managers seek to find that unique combination in which customers are offered solutions that truly meet their needs and at a price that cannot be matched by competitors.[20]

Goals of Value Chain Management

- Sequence of participants work together as a team, each adding some component of value—*such as faster assembly, more accurate information, or better customer response and service*—to the overall process.[21]
- The better the collaboration among the various chain participants, the better the customer solutions.
- When value is created for customers and their needs and desires satisfied, everyone along the chain benefits.[22]

DURAND FLORENCE/SIPA/Newscom

2 How Does Value Chain Management Benefit Businesses?

- improved procurement (acquiring needed resources)
- improved logistics (managing materials, service, and information)
- improved product development (close relationships with customers leads to developing products they value)
- enhanced customer order management (managing every step to make sure customers are satisfied)[23]

nickylarson974/fotolia

beawolf/Fotolia

Ford's operations management allows it to produce cars that are greener and cleaner. A typical car is made with 100 kinds of plastic, and Ford has begun to replace many of these with plant-based materials. Seats are filled with foam made from soybeans; coconut husks are being used in sound-absorbing carpet underlay; and latex extracted from dandelion roots is producing natural rubber instead of synthetic rubber made from petroleum.

decisions. The competition's success realigned world manufacturing leadership. North American manufacturers soon discovered that foreign goods were being made not only less expensively but also with better quality. To counter this, they invested heavily in improving manufacturing technology, increased the corporate authority and visibility of manufacturing executives, and began incorporating existing and future production requirements into the organization's overall strategic plan.

Today, successful organizations recognize the crucial role that operations management plays as part of the overall organizational strategy to establish and maintain global leadership.[24] Organizations face many operational strategy issues: location, capacity, supply chain integration, choice of production process, quality management, control process, workforce composition, and organizational structure. Each of these operational variables must align with overall organizational strategy.

The strategic role that operations management plays in successful organizational performance can be seen clearly as more organizations move toward managing their operations from a value chain perspective, which we're going to discuss next.

6.3 **Describe** How is value chain management done?

HOW IS VALUE CHAIN MANAGEMENT DONE?

Supply Chain Management

A supply chain is the organizations that are involved in the production and delivery of a product or service. These include facilities such as factories, warehouses, distribution outlets, retail stores, and offices. Supply chains also include functions and activities, such as forecasting, purchasing, inventory management, information management, quality control, scheduling, procurement, distribution, delivery, and customer service. Supply chains are often referred to as value chains, indicating that value is added as goods and services progress through the chain.

Supply chain management is the coordination of activities across the supply chain. Exhibit 6-5 lists the key elements of supply chain management and some of the typical issues faced in each element.

Supply chains and value chains are susceptible to changes in environmental circumstances. The Japanese earthquake and tsunami in 2011 was one of the biggest supply chain disruptions in modern history. A study by AON Risk Solutions found that the percentage of companies reporting income loss due to supply chain disruption increased from 28 percent in 2011 to 42 percent in 2013. One startling statistic revealed that 60 percent of surveyed managers do not utilize supply chain risk management or do not consider their risk management practices to be effective. Operations executives at Cisco have learned to integrate supply chain design and risk management with proactive capabilities to keep the supply chain resilient, effective,

EXHIBIT 6-5 Elements of Supply Chain Management

Customers	Forecasting the quantity and timing of customer demand
Facilities	Location, capacity, operational design
Inventory	Meeting demand while managing inventory and safety stock
Production	Product/service design, controlling quality, scheduling work
Transportation	Method of transportation, route, logistics
Information	Information sharing, technology
Suppliers	Monitoring supplier quality, flexibility, maintaining relationships, evaluating suppliers

and as profitable as possible.[25] Protecting a supply chain from disruption involves increasing inventory, adding capacity at various locations, and using a mix of different suppliers. These tactics to increase supply chain resilience may undermine efforts to improve supply chain efficiency. Recurrent risks cause companies to focus on efficiency while managing demand fluctuations; disruptive risks require companies to increase costs to reduce risk. To balance both types of risk requires segmenting or regionalizing the supply chain.[26]

Like the diagram, the value chain contains hundreds of linked activities that ultimately provide value to the customer

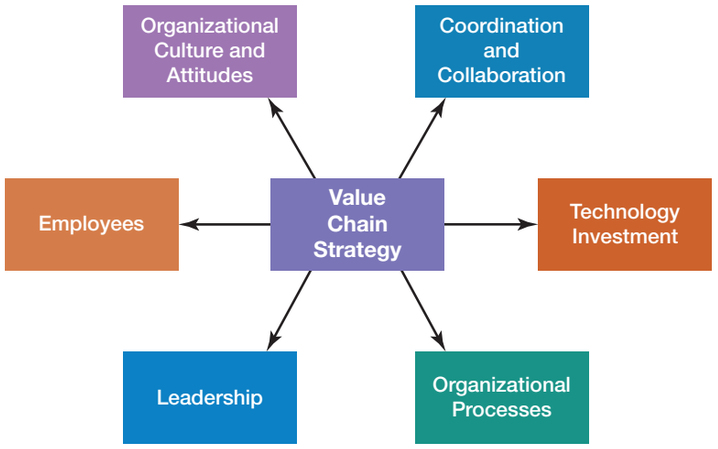
The dynamic, competitive environment facing contemporary global organizations demands new solutions.[27] Understanding how and why value is determined by the marketplace has led some organizations to experiment with a new **business model**—that is, a strategic design for how a company intends to profit from its broad array of strategies, processes, and activities. For example, IKEA, the home furnishings manufacturer, transformed itself from a small, Swedish mail-order furniture operation into the world's largest retailer of home furnishings by reinventing the value chain in the home furnishings industry. The company offers customers well-designed products at substantially lower prices in return for the customers' willingness to take on certain key tasks traditionally done by manufacturers and retailers—such as getting the furniture home and assembling it.[28] The company's adoption of a unique business model and willingness to abandon old methods and processes have worked well. It also helped that IKEA recognized the importance of managing its value chain.

What Are the Requirements for Successful Value Chain Management?

So what does successful value chain management require? Exhibit 6-6 summarizes the six main requirements. Let's look at each of these elements more closely.

1. **Coordination and collaboration.** For the value chain to achieve its goal of meeting and exceeding customers' needs and desires, comprehensive and seamless integration among all members of the chain is absolutely necessary. All partners in the value chain

EXHIBIT 6-6 Requirements for Successful Value Chain Management



business model
A strategic design for how a company intends to profit from its broad array of strategies, processes, and activities.

must identify things that they may not value but that customers do. Sharing information and being flexible as far as who in the value chain does what are important steps in building coordination and collaboration. This sharing of information and analysis requires open communication among the various value chain partners. BMW's South Carolina plant faced a shortage of workers knowledgeable about diesel engines. In Germany, industry commonly partners with schools to create an advanced industrial capacity and lower unemployment levels. In North America, these collaborative partnerships are less frequent. BMW's apprenticeship program allowed South Carolina to attract France's Michelin and Germany's Continental Tire to expand in the state.[29]

2. **Technology investment.** Successful value chain management isn't possible without a significant investment in information technology. The payoff from this investment is that information technology can be used to restructure the value chain to better serve end users.[30] For example, Rollerblade invested heavily in developing a website and used it to educate customers about its products. Although the company has chosen not to sell its products over the Web for fear of antagonizing its dealer network, managers remain flexible about the issue and would reconsider if they felt that value could be better delivered to customers by doing so.[31]

   What types of technology are important? According to experts, the key tools include a supporting enterprise resource planning software (ERP) system that links all of an organization's activities, sophisticated work planning and scheduling software, customer relationship management systems, business intelligence capabilities, and e-business connections with trading network partners.[32] For instance, Dell manages its supplier relationships almost exclusively online. The company has one website for customers and one for suppliers. The supplier website is the primary mode of communication between Dell and 33 of its largest suppliers. The company's investment in this type of information technology allows it to meet customers' needs in a way that competitors haven't been able to match.[33] Mercy Hospital in St. Louis has used medication-tracking to save US$600 000 per year in time lost from pharmacists, technicians, and nurses locating medications. Other hospitals are using RFID tags and mobile robots for delivery of meds to reduce the instances of drugs being misplaced or stolen.[34]

3. **Organizational processes.** Value chain management radically changes **organizational processes**—that is, the way organizational work is done.[36] Managers must critically evaluate all organizational processes from beginning to end by looking at core competencies—the organization's unique skills, capabilities, and resources—to determine where value is being added. Non-value-adding activities are eliminated. Questions such as "Where can internal knowledge be leveraged to improve the flow of material and information?" "How can we better configure our product to satisfy both customers and suppliers?" "How can the flow of material and information be improved?" and "How can we improve customer service?" should be asked for each process. For example, when managers at Deere & Company implemented value chain management in its Worldwide Commercial and Consumer Equipment Division, a thorough process evaluation revealed that work activities needed to be better synchronized and interrelationships between multiple links in the value chain better managed. They changed numerous work processes division-wide to improve these relationships.[37] Airlines have struggled with speeding up the boarding process, as delays are estimated to cost airlines more than $30 billion in the United States alone. Researchers at Clarkson University have proposed assigning seats to airline passengers based on the number of bags they carry. Each row of seats would balance customers with two bags, one bag, and no bags to shave off boarding time and distribute luggage more evenly throughout the plane.[38] United Air has boarded passengers by location, using what they call the "WilMA" (Window, Middle, Aisle) system, which is saving the airline four to five minutes per flight and almost $1 million annually.[39]

And the
Survey Says...[35]

22% of manufacturers introduced product innovations during a recent three-year time span.

58% of companies are looking to connect better with their suppliers.

56% of those companies hope to reduce procurement costs.

16% of employers prefer using employee referrals to locate quality employees.

12% of companies say that sustainability is among their top three supply chain priorities.

63% of those companies see sustainability as an opportunity for revenue growth.

64% of manufacturers say that they currently have wireless networks or intend to have them.

organizational processes
The way organizational work is done.

Three important conclusions can be made about how organizational processes must change:

- First, better demand forecasting is necessary and possible because of closer ties with customers and suppliers. For example, in an effort to make sure that Listerine was on the store shelves when customers wanted it, Walmart collaborated with product manufacturer Pfizer Consumer Healthcare on improving product demand forecast information. Through their mutual efforts, the partners boosted Walmart's sales of Listerine by $6.5 million. Customers also benefited because they were able to purchase the product when and where they wanted it.
- Second, selected functions may need to be done collaboratively with other partners in the value chain. This collaboration may even extend to sharing employees. For instance, CAE Aviation in Edmonton was facing a shrinking Canadian defence budget and needed to become more productive to compete internationally. The company changed from single-trade work groups to cross-functional teams, which required a cultural change to a participatory style of management.[40]
- Finally, new measures are needed for evaluating the performance of various activities along the value chain. Because the goal in value chain management is meeting and exceeding customers' needs and desires, managers need a better picture of how well value is being created and delivered to customers. For instance, the Canadian lamb chain was established in and effort to secure an increased supply of Canadian lamb to meet rising domestic demand. Processors, who slaughter, process, and package meat, encouraged farmers to diversify operations and increase lamb production.

4. **Leadership.** The importance of leadership to value chain management is plain and simple—successful value chain management is not possible without strong and committed leadership.[41] From top organizational levels to lower levels, managers must support, facilitate, and promote the implementation and ongoing practice of value chain management. Managers must make a serious commitment to identifying what value is, how that value can best be provided, and how successful those efforts have been. That type of organizational atmosphere or culture in which all efforts are focused on delivering superb customer value is not possible without a serious commitment on the part of the organization's leaders. Also, it is important that leaders outline expectations for what is involved in the organization's pursuit of value chain management. Ideally, articulating expectations should start with a vision or mission statement that expresses the organization's commitment to identifying, capturing, and providing the highest possible value to customers. For example, the Alberta Barley Commission was looking for a way to make people aware that barley was used for more than beer and animal feed, but is also a very healthy grain that could be used in baking due to its low glycemic index. They worked with the Good Earth Café, a coffee house and restaurant that differentiates itself by serving healthy alternatives to mainstream baked goods.[42] Throughout the organization, then, managers should clarify expectations regarding each employee's role in the value chain. Being clear about expectations also extends to partners. The Barley commission created promotional materials for the Good Earth Café and barley producer Hamilton's Milling helped out with recipe development and how bakers could best make use of barley for healthy baked goods. The barley commission worked with barley producers and food retailers to deliver better value to customers.

michaeljung/Fotolia

Canadian consumers purchased more than 12 million roses for Valentine's Day in 2010. Getting fresh roses to Canadian lovers takes speed, the right temperature, and skill. As with other perishable products, flowers require specific temperatures to maintain freshness and stay in bloom. Eighty percent of all flowers sold for Valentine's Day are shipped from Latin America, with 12 percent coming from U.S. production and 8 percent arriving from other locations.

5. **Employees/human resources.** We know from our discussions of management theories and approaches throughout this text that employees are the organization's most important resource. So, not surprisingly, employees play an important part in value chain management. Three main human resources requirements for value chain management are flexible approaches to job design, an effective hiring process, and ongoing training. Flexibility is the key description of job design in a value chain management organization. Traditional functional job roles—such as marketing, sales, accounts payable, customer service, and so forth—are inadequate in a value chain management environment.

   Instead, jobs need to be designed around work processes that link all functions involved in creating and providing value to customers. This type of flexible job

design supports the company's commitment to providing superb customer value.[43] In designing jobs for a value chain approach, the focus needs to be on how each activity performed by an employee can best contribute to the creation and delivery of customer value, which requires flexibility in what employees do and how they do it.

The fact that jobs in a value chain management organization must be flexible contributes to the second requirement: Flexible jobs require flexible employees. In a value chain organization, employees may be assigned to work teams that tackle a given process and are often asked to do different things on different days, depending on need. In an environment focusing on collaborative relationships that may change as customer needs change, employees' ability to be flexible is critical. Accordingly, the organization's hiring process must be designed to identify those employees who have the ability to quickly learn and adapt.

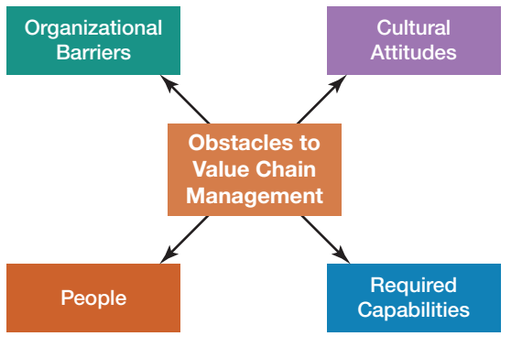
Finally, the need for flexibility also requires a significant investment in ongoing employee training. Whether the training involves learning how to use information technology software, how to improve the flow of materials throughout the chain, how to identify activities that add value, how to make better decisions faster, or how to improve any number of other potential work activities, managers must see to it that employees have the knowledge and tools they need to do their jobs. For example, Carswell, a division of Thomson Reuters Canada, uses training to grow leaders from within. The Toronto company developed an in-house leadership intern program for its 850 staff, as well as courses that teach new recruits about the business and their role in it, that included 90-minute sessions that help staff navigate the myriad resources available, especially online. As one of Canada's Top 100 employers, Carswell also uses internal training, cross-functional assignments, mentoring, and coaching directed at staff already in management or on their way there. An impressive 80 percent of those in the two-year internship program are promoted when finished.[44]

6. **Organizational culture and attitudes.** The last requirement for value chain management is having a supportive organizational culture and attitudes. Those cultural attitudes include sharing, collaborating, openness, flexibility, mutual respect, and trust. And these attitudes encompass not only the internal partners in the value chain but external partners as well. For instance, American Standard has chosen to practise these attitudes the old-fashioned way—with lots of face time and telephone calls. However, as we mentioned earlier, Dell has taken a completely different approach, as it works with its value chain partners almost exclusively through cyberspace.[45] Both approaches, however, reflect each company's commitment to developing long-lasting, mutually beneficial, and trusting relationships that best meet customers' needs.

What Are the Obstacles to Value Chain Management?

As desirable as value chain management may be, managers must tackle several obstacles in managing the value chain—organizational barriers, cultural attitudes, required capabilities, and people (see Exhibit 6-7).

EXHIBIT 6-7 Obstacles to Successful Value Chain Management



ORGANIZATIONAL BARRIERS Organizational barriers are among the most difficult obstacles to handle. These barriers include refusal or reluctance to share information, reluctance to shake up the status quo, and security issues. Without shared information, close coordination and collaboration is impossible. And the reluctance or refusal of employees to shake up the status quo can impede efforts toward value chain management and prevent its successful implementation. Finally, because value chain management relies heavily on a substantial information technology infrastructure, system security and Internet security breaches are issues that need to be addressed.

CULTURAL ATTITUDES Unsupportive cultural attitudes—especially trust and control—also can be obstacles to value chain management. The trust issue is a critical one—both lack of trust and too much trust. To be effective, partners in a value chain must trust each other.

There must be a mutual respect for, and honesty about, each partner's activities all along the chain. When that trust doesn't exist, the partners will be reluctant to share information, capabilities, and processes. But too much trust also can be a problem. Just about any organization is vulnerable to theft of intellectual property—that is, proprietary information that is critical to an organization's efficient and effective functioning and competitiveness. You need to be able to trust your value chain partners so your organization's valuable assets are not compromised.[46] Another cultural attitude that can be an obstacle is the belief that when an organization collaborates with external and internal partners, it no longer controls its own destiny. However, this just isn't the case. Even with the intense collaboration that is important to value chain management, organizations still control critical decisions such as what customers value, how much value they desire, and what distribution channels are important.[47]

elena.rudyk/Fotolia

Starbucks CEO Howard Schultz visits with coffee bean growers around the globe to discuss the importance of producing high-quality beans and establishing responsible growing practices. Schultz's personal visits with external partners illustrate his support of Starbucks's cultural attitudes of sharing, openness, collaborating, and mutual respect.

REQUIRED CAPABILITIES We know from our earlier discussion of requirements for the successful implementation of value chain management that value chain partners need numerous capabilities. Several of these—coordination and collaboration, the ability to configure products to satisfy customers and suppliers, and the ability to educate internal and external partners—are not easy. But they are essential to capturing and exploiting the value chain. Many of the companies we have described throughout this section endured critical and oftentimes difficult self-evaluations of their capabilities and processes in order to become more effective and efficient at managing their value chains.

PEOPLE The final obstacles to successful value chain management can be an organization's people. Without their unwavering commitment to do whatever it takes, value chain management will not be successful. If employees refuse to be flexible in their work—how and with whom they work—collaboration and cooperation throughout the value chain will be hard to achieve. In addition, value chain management takes an incredible amount of time and energy on the part of an organization's employees. Managers must motivate those high levels of effort from employees, which is not an easy thing to do.

WHAT CONTEMPORARY ISSUES DO MANAGERS FACE IN MANAGING OPERATIONS?

6.4 **Discuss** What are some contemporary issues in managing operations?

Redesigned milk jugs that have been adopted by Walmart and Costco are cheaper to ship, better for the environment, cost less, and keep the milk fresher. Experts say this type of redesign is "an example of the changes likely to play out in the Canadian economy over the next two decades. In an era of soaring global demand and higher costs for energy and materials, virtually every aspect of the economy needs to be re-examined and many products must be redesigned for greater efficiency."[48]

If you somehow thought that managing operations did not really matter in today's online 24/7 global economy, think again. It does matter . . . a lot. We're going to look at five contemporary issues that managers face in managing operations.

What Role Does Technology Play in Operations Management?

As we know from our previous discussion of value chain management, today's competitive marketplace has put tremendous pressure on organizations to deliver products and services that customers value in a timely manner. Smart companies are looking at ways to harness technology to improve operations management. Many fast-food companies are competing to see who can provide faster and better service to drive-through customers. With drive-through now representing a huge portion of sales, faster and better delivery can be a significant competitive edge. For instance, Wendy's added awnings to some of its menu boards and replaced some of the text with pictures. Others use confirmation screens, a technology that helped McDonald's boost accuracy by more than 11 percent. And technology used by two national chains tells managers how much food they need to prepare by counting vehicles in the drive-through line and factoring in demand for current promotional and popular staple items.[49]

Although an organization's production activities are driven by the recognition that the customer is king, managers still need to be more responsive. For instance, operations managers need systems that can reveal available capacity, status of orders, and product quality while products are in the process of being manufactured, not just after the fact. To connect more closely with customers, production must be synchronized across the enterprise. To avoid bottlenecks and slowdowns, the production function must be a full partner in the entire business system. Walmart is trying to compete with major online rivals like Amazon by offering speedy, same-day grocery delivery. To do so, Walmart is using "dark stores"—spaces that are used only for online order fulfillment. Its inaugural store in Mexico handles the same volume of orders as five regular Walmart stores.[50]

What makes such extensive collaboration possible is technology. Technology also allows organizations to control costs, particularly in the areas of predictive maintenance, remote diagnostics, and utility cost savings. For instance, Internet-compatible equipment contains embedded Web servers that can communicate proactively—that is, if a piece of equipment breaks or reaches certain preset parameters indicating that it is about to break, it asks for help. But technology can do more than sound an alarm or light up an indicator button. For instance, some devices have the ability to initiate email or signal a pager to a supplier, the maintenance department, or contractor describing the specific problem and requesting parts and service. How much is such e-enabled maintenance control worth? It can be worth quite a lot if it prevents equipment breakdowns and subsequent production downtime.

blueringmedia/Fotolia

Lowe's is battling with Home Depot for hardware superstore supremacy and has turned to technology to improve customer service. Lowe's is using satellites to gauge traffic at its 1900 stores, scanning images of parking lots to determine how many shoppers it can expect on an hourly basis. It can then analyze how many transactions are occurring at various traffic levels and adjust scheduling in accordance.

Managers who understand the power of technology to contribute to more effective and efficient performance know that managing operations is more than the traditional view of simply producing the product. Instead, the emphasis is on working together with all the organization's business functions to find solutions to customers' business problems.

How Do Managers Control Quality?

Quality problems are expensive. For example, even though Apple has had phenomenal success with its iPod, the batteries in the first three versions died after four hours instead of lasting up to 12 hours, as buyers expected. Apple's settlement with consumers cost close to $100 million. At Schering-Plough, problems with inhalers and other pharmaceuticals were traced to chronic quality control shortcomings, for which the company eventually paid a $500 million fine. And the auto industry paid $14.5 billion to cover the cost of warranty and repair work in one year.[54]

Many experts believe that organizations unable to produce high-quality products will not be able to compete successfully in the global marketplace. What is quality? When

TIPS FOR MANAGERS

Technology and the Manager's Job

What would the ideal factory of the future look like?[51] Experts at Georgia Tech's Manufacturing Research Center say that three important trends are driving what tomorrow's factories will look like. One trend is *globalization of the supply chain.* In the factories of the future, design and business processes will be performed where it is most efficient and effective to do so. For example, parts for Boeing's 787 Dreamliner are produced around the world and then come together in Boeing's US facilities. The second trend is *technology that simultaneously dematerializes the product while vastly increasing complexity.* The challenge for managing operations is that despite simplicity in products, the production process is becoming more complex. The third trend is *demographics and the impact on demand patterns.* Products will have shorter life cycles and more variety and choices. The key characteristic of the factory of the future will be its ability to change to accommodate whatever product is being produced in the needed time frame. And it will be particularly important that these factories be efficient and effective.

Given these trends, it is clear that technology will continue to play a key role in transformation processes that need to be collaborative, adaptive, flexible, and responsive. But keep in mind that technology is simply a tool. Future factories will also require a talented and skilled workforce and a clear understanding of managing operations processes. Those are the challenges facing managers who want their organizations to survive and thrive.

Technology allows the production of far more output with far fewer people. Consider the shift that has taken place in agriculture. The number of North American workers employed in agriculture was more than 35 percent a century ago, and currently sits at less than 2 percent.[52] Agriculture is adapting quickly to technology. Farmers use global positioning systems to plant straighter rows and use "prescriptive planting" technology to collect data on crops and soil and adjust planting depth and distance between crop rows. Data-driven planting is expected to increase worldwide crop production by about $20 billion per year.[53]

you consider a product or service to have quality, what does that mean? Does it mean that the product doesn't break or quit working—that is, it is reliable? Does it mean that the service is delivered in the way that you intended? Does it mean that the product does what it is supposed to do? Or does quality mean something else? Exhibit 6-8 provides a description of several quality dimensions. We are going to define quality as the ability of a product or service to reliably do what it is supposed to do and to satisfy customer expectations.

HOW IS QUALITY ACHIEVED? How quality is achieved is an issue managers must address. A good way to look at quality initiatives is with the management functions—planning, organizing, leading, and controlling—that need to take place.

When *planning for quality,* managers must have quality improvement goals and strategies and plans to achieve those goals. Goals can help focus everyone's attention toward some objective quality standard. For instance, Caterpillar's goal is to apply quality improvement techniques to help cut costs.[55] Although this goal is specific and challenging, managers and employees are partnering together to pursue well-designed strategies to achieve the goals, and are confident they can do so.

When *organizing and leading for quality,* it is important for managers to look to their employees. For instance, at the Moose Jaw, Saskatchewan, plant of General Cable Corporation, every employee participates in continual quality assurance training. In addition, the plant manager believes wholeheartedly in giving employees the information they need to do their jobs better. He says, "Giving people who are running the machines the information is just paramount. You can set up your cellular structure, you can cross-train your people, you can use lean tools, but if you don't give people information to drive improvement, there's no enthusiasm." Needless to say, this company shares production data and financial performance measures with all employees.[56]

EXHIBIT 6-8 What Is Quality?

Product Quality Dimensions
1. Performance—Operating characteristics
2. Features—Important special characteristics
3. Flexibility—Meeting operating specifications over some period of time
4. Durability—Amount of use before performance deteriorates
5. Conformance—Match with pre-established standards
6. Serviceability—Ease and speed of repair or normal service
7. Aesthetics—How a product looks and feels
8. Perceived quality—Subjective assessment of characteristics (product image)
Service Quality Dimensions
1. Timeliness—Performed in the promised period of time
2. Courtesy—Performed cheerfully
3. Consistency—Giving all customers similar experiences each time
4. Convenience—Accessibility to customers
5. Completeness—Full service, as required
6. Accuracy—Performed correctly each time

Sources: Based on J. W. Dean and J. R. Evans, *Total Quality: Management, Organization, and Society* (St. Paul, MN: West Publishing Company, 1994); H. V. Roberts and B. F. Sergesketter, *Quality Is Personal* (New York: The Free Press, 1993); D. Garvin, *Managed Quality: The Strategic and Competitive Edge* (New York: The Free Press, 1988); and M. A. Hitt, R. D. Ireland, and R. E. Hoskisson, *Strategic Management*, 4th ed. (Cincinnati: South-Western Publishing, 2001), p. 121.

Organizations with extensive and successful quality improvement programs tend to rely on two important people approaches: cross-functional work teams and self-directed or empowered work teams. Because achieving product quality is something that all employees from upper to lower levels must participate in, it is not surprising that quality-driven organizations rely on well-trained, flexible, and empowered employees.

Finally, managers must recognize when *controlling for quality* that quality improvement initiatives are not possible without having some way to monitor and evaluate their progress. Whether it involves standards for inventory control, defect rate, raw materials procurement, or other operations management areas, controlling for quality is important.

P Cox/Alamy

Italian carmaker Ferrari competes successfully in the global marketplace by developing and producing high-quality cars in terms of design, performance, and reliability.

Delcan is one of Canada's 50 Best Managed Companies[57] and is a leader in quality management and control. Delcan provides quality management of some of the world's most impressive infrastructure programs and has won numerous industry quality awards.

Quality improvement success stories can be found globally. For example, at a Delphi assembly plant in Matamoros, Mexico, employees worked hard to improve quality and made significant strides. For instance, the customer reject rate on shipped products is now 10 ppm (parts per million), down from 3000 ppm—an improvement of almost 300 percent.[58] Quality initiatives at several Australian companies, including Alcoa of Australia, Wormald Security, and Carlton and United Breweries, have led to significant quality improvements.[59] At Valeo Klimasystemme GmbH of Bad Rodach, Germany, assembly teams build different climate-control systems for high-end German cars, including Mercedes and BMW. Quality initiatives by those teams have led to significant improvements.[60]

WHAT QUALITY GOALS MIGHT ORGANIZATIONS PURSUE? To publicly demonstrate their commitment to quality, many organizations worldwide have pursued challenging quality goals. The two best-known are the following:

1. ISO 9000/9001 is a series of international quality management standards established by the International Organization for Standardization (www.iso.org), which set uniform guidelines for processes to ensure that products conform to customer requirements. These standards cover everything from contract review to product design to product delivery. The **ISO 9000** standards have become the internationally recognized standard for evaluating and comparing companies in the global marketplace. In fact, this type of certification can be a prerequisite for doing business globally. Achieving ISO 9000 certification provides proof that a quality operations system is in place. As of 2013, more than 1 million certifications had been awarded to organizations in 175 countries. Almost 9000 Canadian businesses are ISO 9000 certified,[61] and the town of Ajax, Ontario, was the first fully registered municipality in North America to have ISO 9000 certification.[62] Ajax strives to achieve excellence in the delivery of services to its residents and business owners.
2. More than 30 years ago, Motorola popularized the use of stringent quality standards through a trademarked quality improvement program called Six Sigma.[63] Very simply, **Six Sigma** is a quality standard that establishes a goal of no more than 3.4 defects per million units or procedures. What does the name mean? Sigma is the Greek letter that statisticians use to define a standard deviation from a bell curve. The higher the sigma, the fewer the deviations from the norm—that is, the fewer the defects. At one sigma, two-thirds of whatever is being measured falls within the curve. Two sigma covers about 95 percent. At six sigma, you're about as close to defect-free as you can get.[64] It is an ambitious quality goal! Although it is an extremely high standard to achieve, many quality-driven businesses are using and benefitting from it. Other companies pursuing Six Sigma include BMW, Dow Chemical, 3M Company, American Express, Kraft, Sony Corporation, Nokia Corporation, and Johnson & Johnson.[65] Although manufacturers seem to make up the bulk of Six Sigma users, service companies such as financial institutions, retailers, and health care organizations are beginning to apply it. What impact can Six Sigma have? Let us look at an example.

   Staples's Lean Six Sigma program has been the impetus for dozens of improvements that have generated tens of millions of dollars in benefit for Staples and produced a tenfold return on the company's investment in the process improvement program:

   - improved lease negotiations and enhanced architecture and construction processes that have shaved four weeks off the time needed to open a new store
   - streamlined the item-order cycle that freed space and generated inventory savings of $3.3 million
   - reconfigured the loading dock layout to eliminate extra handling of merchandise, efforts that improved on-time to due-date performance by 21 percent
   - achieved a 50 percent reduction in budget for freight distribution and fulfillment centres[66]

tashatuvango/Fotolia

The National Quality Institute (NQI) has certification and training programs and annually recognizes organizations with the Canada Awards for Excellence. While the NQI has made significant advances in promoting Canadian quality improvements, other developed countries are moving faster in this area, giving them a competitive advantage over Canada.

Although it is important for managers to recognize that many positive benefits come from obtaining ISO 9000 certification or Six Sigma, *the key benefit comes from the quality improvement journey itself.* In other words, the goal of quality certification should be having work processes and an operations system in place that enable organizations to meet customers' needs and employees to perform their jobs in a consistently high-quality way.

ISO 9000
A series of international quality standards that set uniform guidelines for processes to ensure that products conform to customer requirements.

Six Sigma
A quality standard that establishes a goal of no more than 3.4 defects per million units or procedures.

How Are Projects Managed?

A **project** is a one-time-only set of activities with definite beginning and ending points.[67] Projects vary in size and scope, from a NASA space shuttle launch to a wedding. **Project management** is the task of getting the activities done on time, within budget, and according to specifications. Project management has actually been around for a long time in industries such as construction and movie making, but now it has expanded into almost every type of business. What explains the growing popularity of project management? It fits well with a dynamic environment and the need for flexibility and rapid response. Organizations are increasingly undertaking projects that are somewhat unusual or unique, have specific deadlines, contain complex interrelated tasks requiring specialized skills, and are temporary in nature. These types of projects do not lend themselves well to the standardized operating procedures that guide routine and continuous organizational activities.[68] Managing projects tends to happen in one of four key areas: people, communications, change, and risk. Often a project charter is used, which outlines the project scope, objectives, constraints, and assumptions. In project management, one key aspect is the need to make tradeoffs in the areas of cost, time, and scope—known as the *triple constraint.*

In the typical project, team members are temporarily assigned to and report to a project manager, who coordinates the project's activities with other departments and reports directly to a senior executive. The project is temporary: It exists only long enough to complete its specific objectives. Then it is wound down and closed up; members move on to other projects, return to their permanent departments, or leave the organization. If you were to observe a group of supervisors or department managers for a few days, you would see them regularly detailing what activities have to be done, the order in which they are to be done, who is to do each, and when they are to be completed. What the managers are doing is called scheduling. The following discussion reviews some useful scheduling devices.

HOW DO YOU USE A GANTT CHART? The **Gantt chart** is a planning tool developed around the turn of the century by Henry Gantt. The idea behind the Gantt chart is relatively simple. It is essentially a bar graph, with time on the horizontal axis and activities to be scheduled on the vertical axis. The bars show output, both planned and actual, over a period of time. The Gantt chart visually shows when tasks are supposed to be done and compares the assigned date with the actual progress on each. This simple but important device allows managers to detail easily what has yet to be done to complete a job or project and to assess whether it is ahead of, behind, or on schedule. Exhibit 6-9 shows a Gantt chart that was developed for building a community hockey arena. Time is expressed in months across the bottom of the chart. Major activities are listed down the left side (see Exhibit 6-9 for more details). The planning comes in deciding what activities need to be done to get the arena built, the order in which those activities need to be done, and the time that should be allocated to each activity. The blue shading represents actual progress made in completing each activity.

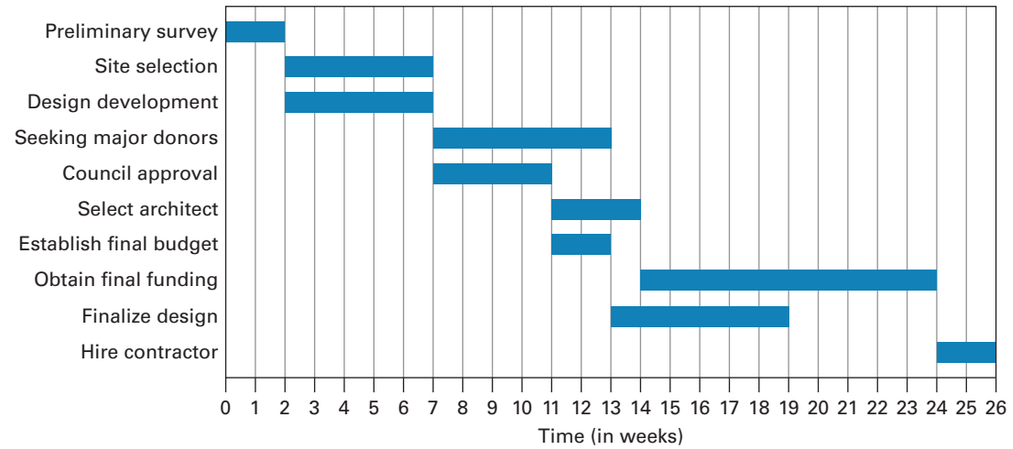
A Gantt chart, then, actually becomes a managerial control device as the manager looks for deviations from the plan. In this case, most activities were completed on time. If, for example, the "seeking major donors" activity was two weeks behind, the manager might want to take some corrective action to make up the lost time and to ensure that no further delays will occur. At this point, the manager can expect that the arena will be built at least two weeks late if no corrective action is taken.

project
A one-time-only set of activities with a definite beginning and ending point.

project management
The task of getting project activities done on time, within budget, and according to specifications.

Gantt chart
A planning tool that shows in bar graph form when tasks are supposed to be done and compares that with the actual progress on each.

EXHIBIT 6-9 Gantt Chart for Building a Community Hockey Arena



WHAT IS A PERT NETWORK ANALYSIS? Gantt and load charts are helpful as long as the activities or projects being scheduled are few and independent of each other. But what if a manager had to plan a large project—such as a complex reorganization, the launching of a major cost-reduction campaign, or the development of a new product—that required coordinating inputs from marketing, production, and product design personnel? Such projects require coordinating hundreds or thousands of activities, some of which must be done simultaneously and some of which cannot begin until earlier activities have been completed. If you are constructing a shopping mall, you obviously cannot start erecting walls until the foundation has been laid. How, then, to schedule such a complex project? Use PERT.

A PERT network is a flowchart-like diagram that depicts the sequence of activities needed to complete a project and the time or costs associated with each activity. With a PERT network, a project manager must think through what has to be done, determine which events depend on one another, and identify potential trouble spots (see Exhibit 6-10). PERT also makes it easy to compare the effects alternative actions will have on scheduling and costs. PERT allows managers to monitor a project's progress, identify possible bottlenecks, and shift resources as necessary to keep the project on schedule.

To understand how to construct a PERT network, you need to know three terms: *events, activities*, and *critical path.* Let us define these terms, outline the steps in the PERT process, and then develop an example.

EXHIBIT 6-10 Developing PERT Charts

Developing a PERT network requires the manager to identify all key activities needed to complete a project, rank them in order of dependence, and estimate each activity's completion time. This procedure can be translated into five specific steps:

1. Identify every significant activity that must be achieved for a project to be completed. The accomplishment of each activity results in a set of events or outcomes.
2. Ascertain the order in which these events must be completed.
3. Diagram the flow of activities from start to finish, identifying each activity and its relationship to all other activities. Use circles to indicate events and arrows to represent activities. The result is a flowchart diagram that is called the PERT network.
4. Compute a time estimate for completing each activity, using a weighted average that employs an optimistic time estimate (t_o) of how long the activity would take under ideal conditions, a most-likely estimate (t_m) of the time the activity normally should take, and a pessimistic estimate (t_p) that represents the time that an activity should take under the worst possible conditions. The formula for calculating the expected time (t_e) is then
$$t_e = \frac{t_o + 4t_m + t_p}{6}$$
5. Finally, using a network diagram that contains time estimates for each activity, the manager can determine a schedule for the start and finish dates of each activity and for the entire project. Any delays that occur along the critical path require the most attention because they delay the entire project. That is, the critical path has no slack in it; therefore, any delay along that path immediately translates into a delay in the final deadline for the completed project.

- **Events** are end points that represent the completion of major activities. Sometimes called milestones, events indicate that something significant has happened (such as receipt of purchased items) or an important component is finished. In PERT, events represent a point in time.
- **Activities**, on the other hand, are the actions that take place. Each activity consumes time, as determined on the basis of the time or resources required to progress from one event to another.
- The **critical path** is the longest or most time-consuming sequence of events and activities required to complete the project in the shortest amount of time.[69]

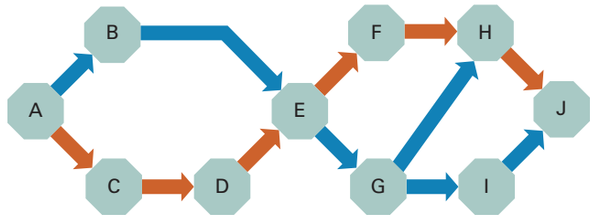
Let us apply PERT to a construction manager's task of building a hockey arena. As a construction manager, you recognize that time really is money in your business. Delays can turn a profitable job into a money loser. Accordingly, you must determine how long it will take to complete the arena. You have carefully dissected the entire project into activities and events. Exhibit 6-11 outlines the major events in the arena construction project and your estimate of the expected time required to complete each activity. Exhibit 6-12 depicts the PERT network based on the data in Exhibit 6-11.

HOW DOES PERT OPERATE? Your PERT network tells you that if everything goes as planned, it will take just over 32 weeks to build the arena. This time is calculated by tracing the network's critical path: A C D E F H J. Any delay in completing the events along this path will delay the completion of the entire project. For example, if it took six weeks instead of four to get city council approval for the arena (event E), the entire project would be delayed by two weeks (or the time beyond that expected). But a one-week delay for

EXHIBIT 6-11 Major Activities in Building a Community Hockey Arena

Activity	Immediate Predecessor(s)	Time (weeks)
A. Needs analysis/survey	None	2
B. Determine location for hockey arena	A	5
C. Develop preliminary design	A	5
D. Source donations to support funding base	C	6
E. Obtain council approval	B, D	4
F. Select architect	E	3
G. Establish final budget	E	2
H. Secure outstanding funding	F, G	10
I. Finalize arena design	G	6
J. Hire contractor	H, I	2

EXHIBIT 6-12 A PERT Network for Building a Community Arena



events
End points that represent the completion of major activities.

activities
Actions that take place.

critical path
The longest or most time-consuming sequence of events and activities required to complete a project in the shortest amount of time.

establishing the final budget (event G) would have little effect because that event is not on the critical path. By using PERT, the construction manager would know that no corrective action would be needed. Further delays in installing the brick, however, could present problems—for such delays may, in actuality, result in a new critical path. Now back to our original critical path dilemma.

Slack time is the time difference between the critical path and all other paths. What use is there for slack? If the project manager notices some slippage on a critical activity, perhaps slack time from a noncritical activity can be borrowed and temporarily assigned to work on the critical one. As you can see, PERT is both a planning and a control tool. Not only does PERT help estimate the times associated with scheduling a project, but it also gives clues about where controls should be placed. Because any event on the critical path that is delayed will delay the overall project (making it not only late but also probably over budget), attention needs to be focused on the critical activities at all times.

As stated at the beginning of this chapter, it is the manager's job to manage the organization's operating systems, organizational control systems, and quality programs. That is the only way organizations will survive in today's increasingly competitive global economy.

VLLev/Fotolia

St. John's regional health centre in Missouri was running operating rooms at 100 percent capacity. Emergency cases—about 20 percent of the full load—were causing the hospital to bump long-scheduled surgeries. Doctors often waited several hours to perform routine surgeries, and staff members regularly worked unplanned overtime. The solution was to leave an operating room empty. Crazy idea? The empty room added much needed slack to the system. After implementing the idea, the hospital was able to reduce the number of surgeries performed at night by 45 percent and increase overall surgical volume by 11 percent.[70]

How Does Lean Manufacturing Work?

Lean manufacturing and just-in-time (JIT) production are concerned with the timing of flow and parts through the operations system and ensuring it is using very little "fat" (e.g., excess inventory, employees, or space). The JIT approach was developed at Toyota to schedule production with low levels of inventory. But JIT and lean are philosophies that have principles to eliminate disruptions and waste and make the system as flexible as possible.

If lean principles are implemented poorly, it may negatively affect product quality. However, the lean philosophy will alter a company's fundamental definition of quality to focus on those things that are defined by the customer as adding value. If a particular process or feature does not add value for the customer, it should be eliminated. The end user defines "quality" as it relates to the product or service. If the customer receives a product that includes all those features (s)he defines as valuable, it must also be available when (s)he wants it. A customer would forgo a product with an additional feature if it means that the product is not produced quickly enough.

Kovalenko Inna/Fotolia

A mining alliance in Australia is applying lean principles to coal mining. It is using modular building design to save time and money in construction of processing plants. Engines in the alliance's $5-million trucks are being replaced just-in-time rather than as prescribed by manufacturers, which has increased productivity by 13 percent. Some mines are even using Formula One–style pit stops to improve refuelling of trucks and other vehicles.[71]

How to Decide About Outsourcing

Managers have a decision whether to develop products and service in-house (known also as **insourcing**) or by outsourcing them to another organization. **Outsourcing** is commonly referred to as **offshoring**, which features relocation of an operational process such as manufacturing to another country, typically in India, China, Malaysia, or other parts of Asia and Africa. **Onshoring** would relocating within the same country to low-cost cities, while **nearshoring** is usually relocating to a country nearby, perhaps one sharing the same border and a market with many geographic, economic, and political similarities. This is becoming more common for Canadian and American companies.

slack time
The time difference between the critical path and all other paths.

insourcing
Developing products and services in-house.

outsourcing
Relocation of an operational process such as manufacturing to another country.

offshoring
Relocation of an operational process to a country not connected by land.

onshoring
Relocating to lower-cost cities within the same country.

nearshoring
Relocating to a nearby country, perhaps one sharing the same border and a market with many geographic, economic, and political similarities.

Marc Xavier/Fotolia

Otis Elevator relocated its plant from Mexico to South Carolina to save money and help fill orders faster by putting the manufacturing of elevators closer to the engineers who design them and their customers. The reshoring initiative has not gone easily, with production delays, a backlog of orders, and customer cancellations.[73]

Outsourcing offers many advantages, including cost savings, external expertise, and an ability to grow more rapidly. Globalization and the Internet have allowed companies to focus on their core competencies and farm out the rest of their operational processes or functional activities, such as IT, accounting, and technical support. This may provide companies with better access to technology, faster speed to market, increased operational flexibility, and lower risk exposure.

Recently there has been a backlash against companies using outsourcing, leading companies to bring back production of goods to the home country, or **reshoring**. Rising energy prices, wage inflation, and customer demand are some of the factors leading Canadian and U.S. companies to bring back the production of goods bound for domestic markets. Firms that reshore successfully take the time to understand the domestic market in terms of labour, utility services and rates, taxation, government support, transportation costs, and product demand.[72] In Ontario, plant closures and an aging workforce have depleted the pool of skilled manufacturing workers.

reshoring
Companies that bring back production of goods to the home country.

6 Review and Apply

Summary of Learning Outcomes

6.1 What is operations management, and what is its role? Operations management is the transformation process that converts resources into finished goods and services. Manufacturing organizations produce physical goods. Service organizations produce nonphysical outputs in the form of services. Productivity is a composite of people and operations variables. A manager should look for ways to successfully integrate people into the overall operations systems. Organizations must recognize the crucial role that operations management plays as part of their overall strategy in achieving successful performance.

For Starbucks, recessionary and competitive pressures forced Starbucks away from its "anti-fast-food" focus to become more streamlined. Stores implemented "lean" initiatives such as keeping items in the same place, moving drink toppings closer to where drinks are handed to customers, and altering the order of assembly. Stores witnessed increases of up to 20 percent in transactions.

6.2 What is the nature and purpose of value chain management? The value chain is the sequence of organizational work activities that add value at each step from raw materials to finished product. Value chain management is the process of managing the sequence of activities and information along the entire product chain.

The goal of value chain management is to create a value chain strategy that meets and exceeds customers' needs and desires and allows for full and seamless integration among all members of the chain.

Four benefits from value chain management include improved procurement, improved logistics, improved product development, and enhanced customer order management.

Lean techniques have to be balanced with quality objectives. Starbucks has sped drink preparation using a model in which baristas produced as many drinks as possible, but later chose to reduce the speed of service to ensure the highest customer value experiences.

6.3 How is value chain management done? The six main requirements for successful value chain management include coordination and collaboration, investment in technology, organizational processes, leadership, employees or human resources, and organizational culture and attitudes. The obstacles to value chain management include organizational barriers (refusal to share information, reluctance to shake up the status quo, or security issues), unsupportive cultural attitudes, lack of required capabilities, and employees unwilling or unable to do it.

6.4 What are some contemporary issues in managing operations? Companies are looking at ways to harness technology to improve their operations management by extensive collaboration and cost control. ISO 9000 is a series of international quality management standards that set uniform guidelines for processes to ensure that products conform to customer requirements. Six Sigma is a quality standard that establishes a goal of no more than 3.4 defects per million units or procedures. Project management involves getting a project's activities done on time, within budget, and accomplished to specifications. A project is a one-time-only set of activities that has a definite beginning and ending point in time. Popular project scheduling tools include Gantt charts, load charts, and PERT network analysis. Lean manufacturing and just-in-time are philosophies about minimizing waste. Organizations need to decide if outsourcing is right for them and consider the various options, such as offshoring, onshoring, and nearshoring.

SNAPSHOT SUMMARY

6.1 Why Is Operations Management Important to Organizations?
- What Is Operations Management?
- How Do Service and Manufacturing Firms Differ?
- How Do Businesses Improve Productivity?
- What Role Does Operations Management Play in a Company's Strategy?

6.2 What Is Value Chain Management and Why Is It Important?

6.3 How Is Value Chain Management Done?
- Supply Chain Management
- What Are the Requirements for Successful Value Chain Management?
- What Are the Obstacles to Value Chain Management?

6.4 What Contemporary Issues Do Managers Face in Managing Operations?
- What Role Does Technology Play in Operations Management?
- How Do Managers Control Quality?
- How Are Projects Managed?
- How Does Lean Manufacturing Work?
- How to Decide About Outsourcing

MyManagementLab Study, practise, and explore real management situations with these helpful resources:
- **Interactive Lesson Presentations:** Work through interactive presentations and assessments to test your knowledge of management concepts.
- **PIA (Personal Inventory Assessments):** Enhance your ability to connect with key concepts through these engaging self-reflection assessments.
- **Study Plan:** Check your understanding of chapter concepts with self-study quizzes.
- **Simulations:** Practise decision making in simulated management environments.

Discussion Questions

1. What is operations management, and what strategic role does it play?
2. Do you think manufacturing or service organizations have greater need of operations management? Explain.
3. What are supply and value chains? What is value chain management? What is the goal of value chain management?
4. What types of organizational benefits does value chain management provide? What obstacles stand in the way of successful value chain management?
5. Explain why managing productivity is important in operations management.
6. Select a company you are familiar with. Describe its value chain. Be as specific as possible in your description. Evaluate how it "uses" the value chain to create value.

WHAT IS MY NEGOTIATION STYLE?

Listed in Exhibit 6-13 are seven characteristics related to a person's negotiating style. Each characteristic demonstrates a range of variation. Indicate your own preference by selecting a point along the 1-to-5 continnuum for each characteristic.

EXHIBIT 6-13 What Is My Negotiation Style?

Approach	Confrontational	1 2 3 4 5	Collaborative
Personality	Emotional	1 2 3 4 5	Rational
Formality	High	1 2 3 4 5	Low
Communication	Indirect	1 2 3 4 5	Direct
Candidness	Closed	1 2 3 4 5	Open
Limited	Limited	1 2 3 4 5	Many
Willingness to use power	Low	1 2 3 4 5	High

Source: Based on R. Fisher and W. Ury, *Getting to Yes* (New York: Penguin, 1981); and J. W. Salacuse, "Ten Ways That Culture Affects Negotiating Style: Some Survey Results," *Negotiation Journal* (July 1998), pp. 221–239.

Analysis and Interpretation

People differ in the way they handle negotiations. Exhibit 6-13 attempts to tap the key dimensions that differentiate preferences in negotiation style. Add up the scores for the seven items. Your score will range between 7 and 35. Research indicates that negotiation style is influenced by a number of factors—including the situation, your cultural background, and your work occupation. Nevertheless, experts in negotiation generally recommend individuals use a style that will result in a high score on this test. That is, they favour collaboration, rationality, a direct communication style, and so on. We think it best to consider your total score in a situational context. For instance, while a high total score may generally be favourable, the use of an informal style may be a handicap for North Americans or Europeans when negotiating with Nigerians, who favour high formality. Similarly, Latin Americans tend to show their emotions in negotiation. So if you're negotiating with Brazilians or Costa Ricans, a more emotional approach on your part may be appropriate or even expected.

Practising the Skill

1. Negotiate with a course instructor to raise the grade on an exam or paper on which you think you should have received a higher grade.
2. The next time you purchase a relatively expensive item (e.g., automobile, apartment lease, appliance, jewellery), negotiate a better price and gain some concessions such as an extended warranty, smaller down payment, maintenance services, or the like.

Developing Management Skills

Diversity Matters

One of the key challenges in organizations today is the lack of female representation in the executive ranks. Lack of diversity can be approached as an operations management challenge to be overcome. The operational measure of *control* can be utilized if the company was to implement key performance indicators for gender diversity and then move toward making the necessary changes to meet the metrics. Monitoring such metrics serves as a tool for defining and directing priorities for action.

Indicators could be developed for the following:

- the proportion of women in the company's levels of management and among new recruits
- pay levels and attrition rates between men and women working in similar functions
- the ratio of women promoted to women eligible for promotion

Operations management uses policies, procedures, and processes to ensure gender diversity change occurs. Employers could enact policies that would encourage women to grow into management careers, such as flexible working hours and career breaks like maternity leave. During the breaks the company could maintain contact to enable easy reintegration into the workforce. Human resources processes may need to be adapted to ensure women are not held back in their professional development. Operations managers are adept at reengineering processes as needed, and could implement coaching, network-building, or mentoring programs to raise awareness of the limitations that are imposed on women.[74]

Hey, You're the Boss Now!

BEING A GOOD PROJECT MANAGER

Managing any project requires good negotiation skills. You will typically have to work across vertical and horizontal levels in an organization, deal with people over whom you have no formal authority, and negotiate schedules, deadlines, work assignments, and the like with people possibly both inside and outside the organization.

You can be more effective at negotiating if you use the following five recommended behaviours:

- *Begin with a positive overture.* Studies on negotiation show that concessions tend to be reciprocated and lead to agreements. As a result, begin bargaining with a positive overture—perhaps a small concession—and then reciprocate the other party's concessions.
- *Address problems, not personalities.* Concentrate on the negotiation issues, not on the personal characteristics of the individual with whom you're negotiating. When negotiations get tough, avoid the tendency to attack this person. Remember, it is that person's ideas or position you disagree with, not him or her personally. Separate the people from the problem, and do not personalize differences.
- *Pay little attention to initial offers.* Treat an initial offer as merely a point of departure. Everyone must have an initial position. These initial offers tend to be extreme and idealistic. Treat them as such.
- *Emphasize win–win solutions.* Inexperienced negotiators often assume that their gain must come at the expense of the other party. That does not need to be the case. Assuming a zero-sum game means missed opportunities for trade-offs that could benefit both sides. So if conditions are supportive, look for an integrative solution. Frame options in terms of the other party's interests and look for solutions that can allow this person, as well as yourself, to declare a victory.

- *Create an open and trusting climate.* Skilled negotiators are better listeners, ask more questions, focus their arguments more directly, are less defensive, and have learned to avoid words or phrases that can irritate the person with whom they are negotiating (such as "generous offer," "fair price," or "reasonable arrangement"). In other words, they are better at creating the open and trusting climate that is necessary for reaching a win–win settlement.[75]

3BL: The Triple Bottom Line

Lean production is geared toward eliminating waste to increase efficiency. Waste is something that uses resources without creating value. Imagine a company that sold highlighters and dry erase markers that used hundreds of different types of blister packs for packaging. If the company reduced the number of packages by half, it would eliminate not only the waste in extra packaging, but would reduce setup time for packaging, cut tooling costs, and reduce warehouse costs. That is the power of lean.

THINKING STRATEGICALLY ABOUT 3BL

Lean thinking applies also to companies in the service sector, even though customers are often involved in the provision of the service. Canadian Tire is a company that has successfully applied lean techniques in its distribution centres and wondered if it could do the same with the company's recruitment.

Liza Provenzano, Associate Vice-President of Human Resource Operations, looked at every aspect of their heavy recruitment workload, from the time a manager indicated the need for a new hire to the time that new recruit walked in the door, and found a lot of variations in workload, delays, duplication, and unnecessary steps.[76] The Canadian Tire team met weekly, using a large whiteboard to brainstorm ideas that could change the company's HR processes.

Ontario's Institute for Competitiveness and Prosperity has called lean retailing a best practice that "achieves highly efficient operations through a relentless drive to reduce waste of time and resources."[77] The results for Canadian Tire were impressive: Recruitment time fell by 25 percent, the number of steps in the hiring process was cut in half, turnover rates fell, and the cost per hire dropped 34 percent.

Your Essential Management Reading List

Learning from key management experts can help you understand today's management theory and practice. What follows is a list of some influential operations management books and two useful Twitter hashtags to watch:

- *The Goal*—Eliyahu Goldratt
- #pmot—Project Managers on Twitter is a useful hashtag used by professionals willing to share their experiences and insight
- #ftpm—The First Time Project Managers hashtag is useful for those just getting started or who are project managers "by accident"

Team Exercises

Be the Consultant

As marketing director for Done Right, a regional home-repair chain, you've come up with a plan you believe has significant potential for future sales. Your plan involves a customer information service designed to help people make their homes more environmentally sensitive. Then, based on homeowners' assessments of their homes' environmental impact, your firm will be prepared to help them deal with problems or concerns they may uncover. You are really excited about the competitive potential of this new service. You envision pamphlets, in-store appearances by environmental experts, and contests for consumers and school kids.

After several weeks of preparations, you make your pitch to your boss, Nick Castro. You point out how the market for environmentally sensitive products is growing and how this growing demand represents the perfect opportunity for Done Right. Nick seems impressed by your presentation, but he's expressed one major concern. He thinks your workload is already too heavy. He does not see how you are going to have enough time to start this new service *and* still be able to look after all of your other assigned marketing duties.

People in the class should form pairs. One will play the marketing director; the other will play the role of Nick Castro. Nick seems convinced you cannot handle your present responsibilities and start the new service. Negotiate a solution.

Business Cases

Apple and the Supply Chain

When the iPhone 5 was launched in 2012, it was labelled as Apple's most aggressive production-and-launch schedule given its scale, speed, and complexity. In just over a month it was selling in 100 countries at a rate of 3.7 million per week in the model's first three months.[78] One of Apple's largest suppliers is Flextronics International, a contract manufacturer based in Singapore with about 28 million square feet of factory space spread across four continents, including a plant in an

industrial area south of Kuala Lumpur. Flextronics is one of Apple's top 10 suppliers, employing about 150 000 workers in 30 countries.[79]

To meet Apple's supply chain requirements, Flextronics had to put its own supply chain into overdrive, seeking 1500 men to make cameras. Companies use an informal, unregulated network of thousands of recruiters and subagents who fan out into the farm fields and impoverished cities of Indonesia, Cambodia, Myanmar, and Vietnam. Because jobs are difficult to find, the 1500 positions were basically sold as brokers took fees from families, representing as much as a year or more of wages. Often the workers had to take loans that would take years to pay off. Since the workers owed money to recruiters, the companies would keep their passports to guarantee they paid up. This practice led many migrant workers to be trapped abroad for months or even years because of seized passports, debts, and interest.[80]

On the assembly lines the number of failures was growing. Apple was rejecting 7 out of every 10 cameras. Because of the high failure rate at Flextronics's Bukit Raja facility, Apple removed it from its supply chain. Production was shut down and the workers were terminated on "grounds of redundancy." The workers were instructed not to leave the hostel and were told nothing for weeks on end. Many of the workers' visas had expired, and they were vulnerable to arrest if they left the hostel. Some Flextronics recruits who left the hostel were shaken down for cash by local police. Soon the workers ran out of cash and food, and eventually they smashed windows and threw things out of the building. Police arrived, but rather than arresting the men, they ordered Flextronics to send food and expedite the process of returning the workers to their villages.[81]

Apple has been aggressively investigating claims of "bonded labour" such as the case in Kuala Lumpur. To do so requires a substantial auditing of its supply chain to uncover the abuse of migrant workers. Apple initiated a program to mandate reimbursement to employees who were charged excessive recruitment fees, which has funnelled $16.4 million back to contract workers since 2008.[82]

Ernst and Young released a report in 2014 titled *Human Right and Professional Wrongs*, along with the following five recommendations for companies such as Apple:[83]

1. Use third-party certifiers and auditors more strategically to source out unethical practices.
2. Tighten procurement systems to prevent working with factories that have not had their social compliance status assessed.
3. Establish stronger social compliance expectations with agents.
4. Maintain longer relationships with a smaller number of suppliers.
5. Incorporate human rights agreements prior to commencing manufacturing operations or offshoring agreements.

Discussion Questions

1. Discuss the Flextronics case from a value chain management perspective. How did it happen? Why did it happen?
2. What can managers learn about managing operations from this situation?
3. Although enforcement of worker safety in Kuala Lumpur is clearly lax, government officials clearly do not want global businesses withdrawing from the country and driving it deeper into poverty. Discuss.

Dreamliner Nightmare

The 787 Dreamliner was born out of desperation.[84] The year was 2003 and Boeing had just lost its title as the world's largest plane manufacturer to European rival Airbus. Boeing's then CEO had just resigned in a defense-contract scandal. And the company's stock price had plunged to its lowest price in a decade. Remember, this was two years after the 9/11 terrorist attacks, and financially troubled airlines were reluctant to invest in new equipment. Boeing needed something revolutionary to win back customers. The Boeing 787 program descended from Boeing's lean philosophy. Boeing initially consulted with 20 international systems suppliers, leading to the selection of carbon-fibre materials for the Dreamliner. Composites provided many benefits: reduced weight leading to 20 percent fuel reduction; enhanced modularity of the plane reducing assembly time by 75 percent; ability to withstand higher pressure and suffer less corrosion; and higher cabin humidity leading to a more comfortable interior cabin.[85] During the Dreamliner's development, Boeing's board was primarily focused on keeping costs down. It was this priority focus that allowed Boeing to devise a unique approach in which suppliers would become partners and would finance and produce entire sections of the 787, taking on greater risk and also benefitting from a larger share of revenue from each jet sold. Boeing would manufacture 30 percent of each 787 and outsource the remainder. Main suppliers would build large sections of the plane that would be flown to Boeing's factory to be assembled in three days and delivered to customers.

The result was a technologically advanced aircraft that would be built by a global network of suppliers in three days, compared with a month the traditional way. And it was Boeing's first aircraft built with lightweight composite materials (graphite, titanium, carbon fibre) rather than traditional metals, making the 787 a lighter and more efficient aircraft than previous models. Why was this so revolutionary? The 787 could fly farther, burn less fuel, and offer more passenger comforts than what was currently available. The 787 had built-in sensors designed to help counter the effects of turbulence, making for a smoother flight. And it was designed to have more humid air, quieter engines, improved lighting, and the largest windows in the industry. Of course, airlines were eager to save money and entice customers, and ordered a record number of the planes.

Despite its innovative features (or, as some critics said, maybe because of), the 787 faced many production setbacks and delays (the plane was originally scheduled to be delivered in May 2008). These delays were due to several issues, including design and manufacturing challenges—coordinating that many global suppliers, using new materials in the plane, and

EXHIBIT 6-14 e-Enabled Supply Chain Process

Design eCollaboration	Source eSourcing	Procurement eProcurement
• Build teams across functional enterprise boundaries in secure, virtual workplaces • Manage complex projects and project documentation electronically • Share data with secure, format-neutral tools	• Trading partner directory • Integrated suite of sourcing tools • Develop and manage requests for information and requests for quotes • Conduct real-time online negotiations • Integrated to enterprise requirements and procurement systems	• Host procurement onramp and electronic catalogues • Suppliers manage customer purchase orders and other transaction documents via the Web • Establish integrated "machine-to-machine" connections with the Boeing supply chain

Source: Adapted from L. M. Applegate, J. S. Valacich, M. E. Vatz, and C. Schneider (2006), "Boeing's e-Enabled Advantage," *Harvard Business Publishing*, retrieved from each case collection.

assembling the sophisticated components. However, three years after its first expected delivery date, Boeing handed over the first 787 on a rainy and blustery day in Everett, Washington, to Japan's All Nippon Airways Co. on September 26, 2011. The chief executive of Boeing's commercial airplanes division said, "Today . . . will always be remembered as the dawn of a new day in commercial aviation."

Boeing utilized what was called a Global Collaborative Environment (GCE), a virtual environment for constant collaboration. This new e-enabled environment (see Exhibit 6-14) would integrate every aspect of Boeing's and the suppliers' operations through information technology. Each partner was provided with the same tools, technologies, and processes to collaborate electronically.[86]

In the 787's first year of service, at least four aircraft suffered some type of electrical problem. Although such problems are not unusual, especially in the first year of a newly designed aircraft, a number of incidents, including an electrical fire aboard an All Nippon Dreamliner plane and a similar fire aboard a landed 787 at Boston's Logan International Airport, led the U.S. Federal Aviation Administration (FAA) to order a review of the design and manufacture of the Dreamliner. There obviously was concern over what the FAA found, because it proceeded to ground the entire Boeing 787 fleet. Aviation safety investigators focused their attention on the 787's lithium-ion batteries, manufactured by a Japanese company GS Yuasa of Kyoto. Boeing's team immediately set to work to solve the issue because a grounded fleet is a *big* problem! In mid-March 2013, Boeing announced that it had come up with solutions for the Dreamliner problems. The 787's chief engineer said, "We may never get to a single root cause." But the engineers had looked at some 80 potential problems that could lead to a battery fire, categorized them into four groups, and come up with solutions for each group. A major part of the "fix" was a battery enclosure made of stainless steel, not designed to contain a fire, but to prevent the battery from ever having a fire to begin with by quickly starving any flame of oxygen. With the fix in place and approved by the FAA, a team of Dreamliner technicians fanned out around the globe modifying the 787's batteries. By the end of April 2013, the Dreamliner fleet went back into service.

Discussion Questions

1. What role does innovation play in managing an organization's operations?
2. Describe the operations management issues that the Dreamliner team faced. Could these issues have been avoided? Why or why not?
3. Is a global network of suppliers the future of operations management? Discuss.
4. What other lessons about operations management can you see in this story?