7 Operations Management and Quality

Passengers and Airlines: Friends, or Foes? [1]

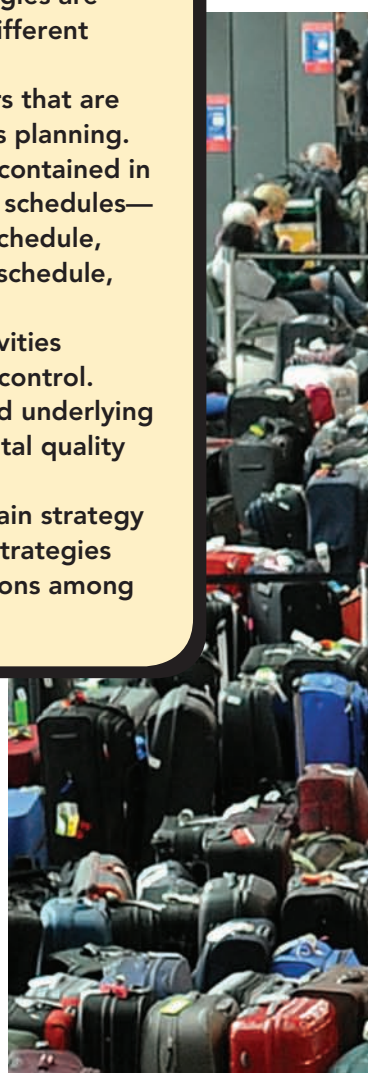
Poor treatment by airlines has customers in an uproar, as the many services that go into their flight experiences continue to deteriorate. Disturbances include everything from higher fares, inconvenient scheduling activities and discourteous airline personnel before getting to the airport, then to unpleasant surprises at the airport such as overbooked flights, rude gate agents, additional baggage fees, long waits, and inaccurate information. While airlines continue to eliminate onboard services, those that remain are available, increasingly, only with add-on fees. Because planes land late, departing passengers miss their connecting flights and are left stranded, often with little or no assistance from airline personnel. As to the customers' problems—the airlines don't seem to care.

How would you feel after landing, to discover your bag isn't there? Airlines lose 26 million passengers' bags annually due to theft, mishandling, and labeling errors. Even worse, imagine being stranded for eight hours awaiting takeoff on a crowded runway without food, water, and air conditioning. While the overtaxed bathrooms are unfit for further use, passengers are not allowed off the plane. Little wonder that passengers are increasingly vocal, irritated, and sometimes even violent.

Airline scheduling, too, has become increasingly abusive to customers. Consider, for example, four friends who scheduled a trip together from Chicago to New York, booking airline reservations four months in

After reading this chapter, you should be able to:

1. **Explain the meaning of the term *production* or *operations*.**
2. **Describe the three kinds of utility that operations processes provide for adding customer value.**
3. **Explain how companies with different business strategies are best served by having different operations capabilities.**
4. **Identify the major factors that are considered in operations planning.**
5. **Discuss the information contained in four kinds of operations schedules—the master production schedule, detailed schedule, staff schedule, and project schedule.**
6. **Discuss the two key activities required for operations control.**
7. **Identify the activities and underlying objectives involved in total quality management.**
8. **Explain how a supply chain strategy differs from traditional strategies for coordinating operations among firms.**



advance. Before departure, the airline rescheduled their flights three times, including one assignment that separated the group onto different planes, and placed a child and mother on different flights. After each involuntary rescheduling, passengers faced the hassle of revising their personal non-airline arrangements (hotels, land travel, personal appointments, job absences, etc.), then re-revising them, then again re-re-revising them at considerable inconvenience and even added costs. In contrast, if the travelers had requested those same changes, the airline would have imposed a $50 service fee on each passenger for each rescheduling, for a total charge of $600.

As the list of service complaints grows, so too are the feelings of helplessness and frustration among customers. Little wonder, then, the number of passengers on U.S. airlines in

WHAT'S IN IT FOR ME?

If, like the thousands of airline customers disrupted by inconvenience and mistreatment, you've ever been disappointed in a good or service that you bought, you'll find it easy to relate to the topics in this chapter. We'll explore the numerous ways companies align their operations processes with their business plans, and discuss how these decisions contribute to a firm's ability to create a high-quality product. Gaining an appreciation for the many steps it takes to bring high-quality goods and services to market will help make you a smarter consumer and more effective employee. And if you're a manager, understanding that production activities are pliable and should be reoriented to better support new business strategies will help you redefine your company and its marketplace over time.

MyBizLab Where you see MyBizLab in this chapter, go to **www.mybizlab.com** for additional activities on the topic being discussed.

Ben Stansall/AFP/Getty Images/Newscom

2009 dropped, with fewer flyers than any time since 2004, as poor economic conditions were aided by equally poor service quality in the airlines industry. With so many complaints, it is hardly a surprise that one 2010 poll shows that more U.S. passengers hold a negative, rather than positive view of airlines.

Why is all this happening? The airlines say they have to cut services and start charging for "extras" to stay profitable, or else go out of business.

Our opening story continues on page 188.

1 **Explain the meaning of the term *production* or *operations*.**

What Does *Operations* Mean Today?

Although you're not always aware of it, as a customer you are constantly involved in business activities that provide goods and services to customers. You wake up to the sound of your favorite radio station, and on your bus ride to work or school you are texting on a cell phone. Your instructors, the bus driver, the messaging provider, and the morning radio announcer all work in **service operations** (or **service production**). They provide intangible and tangible service products, such as entertainment, transportation, education, and communications services. Firms that make only tangible products—radios, cell phones, buses, textbooks—are engaged in activities for **goods operations** (or **goods production**).

The term **operations** (or **production**) refers to all the activities involved in making products—goods and services—for customers. In modern societies, much of what we need or want, from health care to fast food, is produced by service operations. As a rule, managers in the service sector give more consideration to the human element in operations (as opposed to the equipment or technology involved) because success or failure depends often on provider-customer contact. As we saw with airlines in the opening story, employees who deal directly with customers affect customer feelings about the service. As we will see, a key difference between goods and services operations is the customer's involvement in the latter.

Although companies are typically classified as either goods producers or service providers, the distinction is often blurred. Consider General Electric. When you think of GE, you most likely think of appliances and jet engines. However, GE is not just a goods producer. According to its annual report, GE's "growth engines"—its most vibrant business activities—are service operations, including media and entertainment (NBC Universal), consumer and commercial finance, investment, transportation services, and health care information, which account for over 80 percent of the company's revenues.[2]

Gain hands-on experience through an interactive, real-world scenario. This chapter's simulation entitled Improving a Business is located at www.**mybizlab**.com.

2 **Describe the three kinds of utility that operations processes provide for adding customer value.**

Creating Value Through Operations

To understand a firm's production processes, we need to know what kinds of benefits its production provides, both for itself and for its customers. Production provides businesses with economic results: profits, wages, and goods purchased from other companies. At the same time, it adds customer value by providing **utility**—the ability of a product to satisfy a want or need—in terms of form, time, and place:

- Production makes products available: By converting raw materials and human skills into finished goods and services, production creates *form utility*, as when

Len Wilcox/Alamy

AF archive/Alamy

General Electric (GE) can be classified as both a goods producer (for example, of the GE Wind Turbine, shown here) and a service provider (for example, of media and entertainment shows such as *Saturday Night Live*).

Regal Cinemas combines building materials, theater seats, and projection equipment to create entertainment.

- When a theater offers midday, afternoon, and evening shows seven days a week, it creates *time utility*; that is, it adds customer value by making products available when consumers want them.
- When a theater offers a choice of 15 movies, all under one roof at a popular location, it creates *place utility*: It makes products available where they are convenient for consumers.

Creating a product that customers value, then, is no accident, but instead results from organized effort. **Operations (production) management** is the systematic direction and control of the activities that transform resources into finished services and goods that create value for and provide benefits to customers. In overseeing production, **operations (production) managers** are responsible for ensuring that operations activities create what customers want and need.

As Figure 7.1 shows, operations managers draw up plans to transform resources into products. First, they bring together basic resources: knowledge, physical materials, information, equipment, the customer, and human skills. Then they put them to effective use in a production facility. As demand for a product increases, they schedule and control work to produce the required amount. Finally, they control

Service Operations (Service Production) activities producing intangible and tangible products, such as entertainment, transportation, and education

Goods Operations (Goods Production) activities producing tangible products, such as radios, newspapers, buses, and textbooks

Operations (Production) activities involved in making products—goods and services—for customers

Utility product's ability to satisfy a human want or need

Operations (Production) Management systematic direction and control of the activities that transform resources into finished products that create value for and provide benefits to customers

Operations (Production) Managers managers responsible for ensuring that operations activities create value and provide benefits to customers

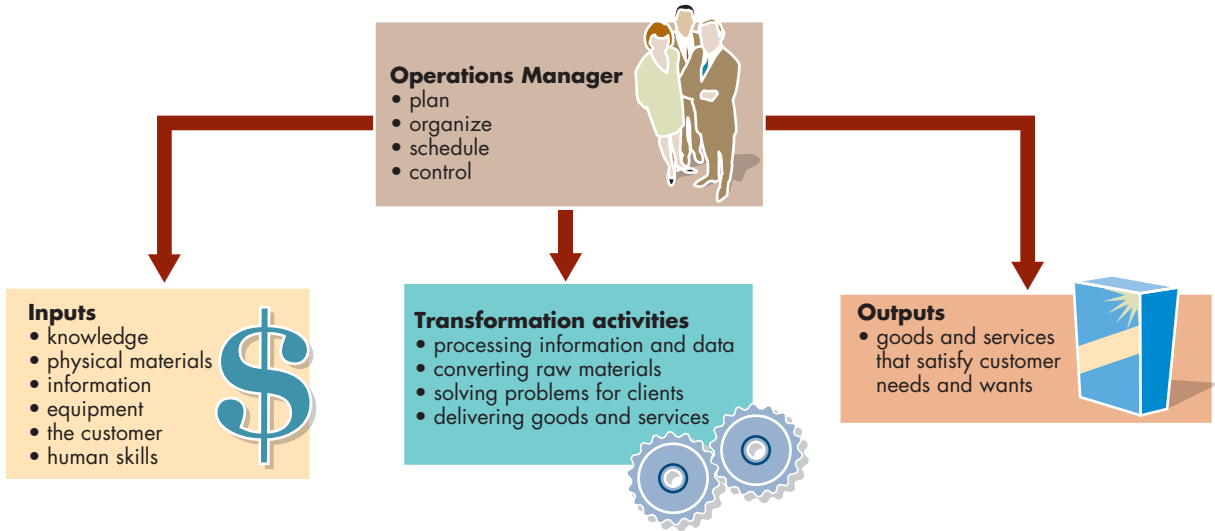


Figure 7.1 The Resource Transformation Process

costs, quality levels, inventory, and facilities and equipment. In some businesses, the operations manager is one person. Typically, different employees work together to complete these different responsibilities.

Some operations managers work in factories; others work in offices, restaurants, hospitals, and stores. Farmers are operations managers who create utility by transforming soil, seeds, fuel, and other inputs into soybeans, milk, and other outputs. They may hire crews of workers to plant and harvest, opt instead for automated machinery, or prefer some combination of workers and machinery. These decisions affect costs and determine the kinds of buildings and equipment in operations and the quality and quantity of goods produced.

Differences between Service and Goods Manufacturing Operations

Both service and manufacturing operations transform raw materials into finished products. In service operations, however, the raw materials, or inputs, are not things like glass or steel. Rather, they are people who have either unsatisfied needs or possessions needing care or alteration. In service operations, finished products or outputs are people with needs met and possessions serviced.

Thus, there are several obvious differences between service and manufacturing operations. Four aspects of service operations can make them more complicated than simple goods production. These include (1) interacting with customers, (2) the intangible and unstorable nature of some services, (3) the customer's presence in the process, and (4) service quality considerations.

Interacting with Customers

Manufacturing operations emphasize outcomes in terms of physical goods—for example, a new jacket. But the products of most *service* operations are really combinations of goods and services—both making a pizza *and* delivering (serving) it. Service workers need different skills. For example, gas company employees may need interpersonal skills to calm frightened customers who have reported gas leaks. Thus, the job includes more than just repairing pipes. In contrast, factory workers who install gas pipes in manufactured homes without any customer contact don't need such skills.

Services Can Be Intangible and Unstorable

Two prominent characteristics—*intangibility* and *unstorability*—set services apart from physical goods:

- **Intangibility.** Often, services can't be touched, tasted, smelled, or seen, but they're still there. An important satisfier for customers, therefore, is the *intangible* value they receive in the form of pleasure, gratification, or a feeling of safety. For

example, when you hire an attorney, you purchase not only the intangible quality of legal expertise but also the equally intangible reassurance that help is at hand.

- **Unstorability.** Many services—such as trash collection, transportation, child care, and house cleaning—can't be produced ahead of time and then stored for high-demand periods. If a service isn't used when available, it's usually wasted. Services, then, are typically characterized by a high degree of *unstorability*.

Customers' Presence in the Operations Process Because service operations transform customers or their possessions, the customer is often present in the operations process. To get a haircut, for example, most of us have to go to the barbershop or hair salon. As physical participants in the operations process, customers can affect it. As a customer, you expect the salon to be conveniently located (place utility), to be open for business at convenient times (time utility), to provide safe and comfortable facilities, and to offer high-quality grooming (form utility) at reasonable prices (value for money spent). Accordingly, the manager sets hours of operation, available services, and an appropriate number of employees to meet customer requirements. But what happens if a customer, scheduled to receive a haircut, also asks for additional services, such as highlights or a shave when he or she arrives? In this case, the service provider must quickly adjust the service activities to provide customer satisfaction. High customer contact has the potential to affect the process significantly.

Intangibles Count for Service Quality Consumers use different measures to judge services and goods because services include intangibles, not just physical objects. Most service managers know that quality of work and quality of service are not necessarily the same thing. Your car, for example, may have been flawlessly repaired (quality of work), but you'll probably be unhappy with the service if you're forced to pick it up a day later than promised (quality of service).

Operations Processes

To better understand the diverse kinds of production in various firms and industries, it is helpful to classify production according to differences in operations processes. An **operations process** is a set of methods and technologies used to produce a good or a service. Banks, for example, use two processes—document shredding and data encryption—to protect confidential information. Automakers use precision painting methods (equipment and materials) to produce a glittering paint finish.

We can classify goods production into broad groupings, by asking whether its operations process has a "make-to-order" or a "make-to-stock" emphasis. We can classify services according to the extent of customer contact required.

Goods Production Processes: Make-to-Order versus Make-to-Stock Processes Clothing, such as evening gowns, is available either off-the-shelf in department stores or custom-made at a designer/tailor shop. The designer/tailor's **make-to-order operations** respond to one-of-a-kind gown requirements, including unique patterns, materials, sizes, and shapes, depending on customers' unique characteristics. **Make-to-stock operations**, in contrast, produce standard gowns in large quantities to be stocked on store shelves or in displays for mass consumption. The production processes are quite different for the two settings, including procedures for designing gowns; planning for materials purchases; equipment and work methods for cutting, sewing, and assembling gowns; and employee skills for production.

Operations Process set of methods and technologies used to produce a good or a service

Make-to-Order Operations activities for one-of-a-kind or custom-made production

Make-to-Stock Operations activities for producing standardized products for mass consumption

Trinity Mirror/Mirrorpix/Alamy

Because service operations transform customers or their possessions, the customer is often present in the operations process.

Service Production Processes: Extent of Customer Contact

In classifying services, we may ask whether a service can be provided without customers being present in the production system. In answering this question, we classify services according to *extent of customer contact*.

Low-Contact Systems Consider the postal delivery operations at your local U.S. post office. Postal employees gather mail, sort it, and send it on its journey to addressees. This operation is a **low-contact system**: Customers are not in contact with the post office while the service is performed. They receive the service—mail sent and mail received—without setting foot in the processing center. Gas and electric companies, auto repair shops, and lawn-care services are other examples of low-contact systems.

High-Contact Systems Think about your local public transit system. The service is transportation, and when you purchase transportation, you board a bus or train. For example, the Bay Area Rapid Transit (BART) system, which connects San Francisco with outlying suburbs is, like all public transit systems, a **high-contact system**: To receive the service, the customer must be part of the system. Thus, managers must worry about the cleanliness of trains and the appearance of stations. By contrast, a firm that ships coal is not concerned with the appearance of its trains since no paying passengers are riding on them. It's a low-contact system.

3 Explain how companies with different business strategies are best served by having different operations capabilities.

Business Strategy as the Driver of Operations

There is no one standard way for doing production. Rather, it is a flexible activity that can be molded into many shapes to give quite different operations capabilities for different purposes. How, then, do companies go about selecting the kind of production that is best for them? They adopt the kind of production that best achieves the firm's larger business strategy.

The Many Faces of Production Operations

Consider the four firms listed in Table 7.1. Two are in goods production (Toyota and 3M), and two are in services. These companies have contrasting business strategies and, as we shall see, they have chosen different operations capabilities. All four firms have been successful, but they've taken quite different operations paths to get there. Each company has identified a business strategy that it uses for attracting customers in its industry. For Toyota, *quality* was chosen, more than 35 years ago, as the strategy for competing in selling autos. Save-A-Lot grocery stores, in contrast to others in the grocery industry, offer customers *lower prices*. The *flexibility* strategy at 3M emphasizes new product development in an ever-changing line of products for home and office. FedEx captures the overnight delivery market by emphasizing delivery *dependability*, first and foremost.

Business Strategy Determines Operations Capabilities

Successful firms design their operations to support the company's business strategy.[3] In other words, production operations are adjusted to support the firms' target markets. Since our four firms use different business strategies, we should expect to see differences in their operations, too. The top-priority **operations capability (production capability)**—the special ability that

TABLE 7.1 Business Strategies That Win Customers for Four Companies

Company	Strategy for Attracting Customers	What the Company Does to Implement Its Strategy
Toyota	Quality	Cars perform reliably, have an appealing fit and finish, and consistently meet or exceed customer expectations at a competitive price
Save-A-Lot	Low price	Foods and everyday items offered at savings up to 40 percent less than conventional food chains
3M	Flexibility	Innovation, with more than 55,000 products in a constantly changing line of convenience items for home and office
FedEx	Dependability	Every delivery is fast and on time, as promised

TABLE 7.2 Operations Capabilities and Characteristics for Four Companies

Operations Capability	Key Operations Characteristics
Quality (Toyota)	• High-quality standards for materials suppliers • Just-in-time materials flow for lean manufacturing • Specialized, automated equipment for consistent product buildup • Operations personnel are experts on continuous improvement of product, work methods, and materials
Low Cost (Save-A-Lot)	• Avoids excessive overhead and costly inventory (no floral departments, sushi bars, or banks that drive up costs) • Limited assortment of products, staples, in one size only for low-cost restocking, lower inventories, and less paperwork • Many locations; small stores—less than half the size of conventional grocery stores—for low construction and maintenance costs • Reduces labor and shelving costs by receiving and selling merchandise out of custom shipping cartons
Flexibility (3M)	• Maintains some excess (expensive) production capacity available for fast startup on new products • Adaptable equipment/facilities for production changeovers from old to new products • Hires operations personnel who thrive on change • Many medium- to small-sized manufacturing facilities in diverse locations, which enhances creativity
Dependability (FedEx)	• Customer automation: uses electronic and online communications tools with customers to shorten shipping time • Wireless information system for package scanning by courier, updating of package movement, and package tracking by customer • Maintains a company air force, global weather forecasting center, and ground transportation for pickup and delivery, with backup vehicles for emergencies • Each of 30 automated regional distribution hubs processes up to 45,000 packages per hour for next-day deliveries

production does especially well to outperform the competition—is listed for each firm in Table 7.2, along with key operations characteristics for implementing that capability. Each company's operations capability matches up with its business strategy so that the firm's activities—from top to bottom—are focused in a particular direction.

Low-Contact System level of customer contact in which the customer need not be part of the system to receive the service

High-Contact System level of customer contact in which the customer is part of the system during service delivery

Operations Capability (Production Capability) special ability that production does especially well to outperform the competition

For example, because Toyota's top priority focuses on quality, its operations—the resource inputs for production, the transformation activities, and the outputs from production—are devoted first and foremost to that characteristic. Its car designs and production processes emphasize appearance, reliable performance, and desirable features at a reasonable price. All production processes, equipment, and training are designed to build better cars. The entire culture supports a quality emphasis among employees, suppliers, and dealerships. Had Toyota instead chosen to compete as the low-price car in the industry, as some successful car companies do, then a cost-minimization focus would have been appropriate, giving Toyota's operations an altogether different form. Toyota's operations support its chosen business strategy, and did it successfully until problems arose in 2008. Before that downfall the company had more than 35 consecutive years of increasing sales for which quality was the foundation for greatness.

Expanding into Additional Capabilities Finally, it should be noted that excellent firms learn, over time, how to achieve more than just one competence. Our four example firms eventually became excellent in several capabilities. FedEx, for example, in addition to dependability, is noted for world-class service quality and cost containment, too. But in the earlier start-up years, its primary and distinguishing capability, which set it apart from the competition, was dependability, the foundation upon which future success was built.

4 Identify the major factors that are considered in operations planning.

Operations Planning

Let's turn now to a discussion of production activities and resources that are considered in every business organization. Like all good managers, we start with planning. Managers from many departments contribute to decisions about operations. As Figure 7.2 shows, however, no matter how many decision makers are involved, the process is a logical sequence of decisions.

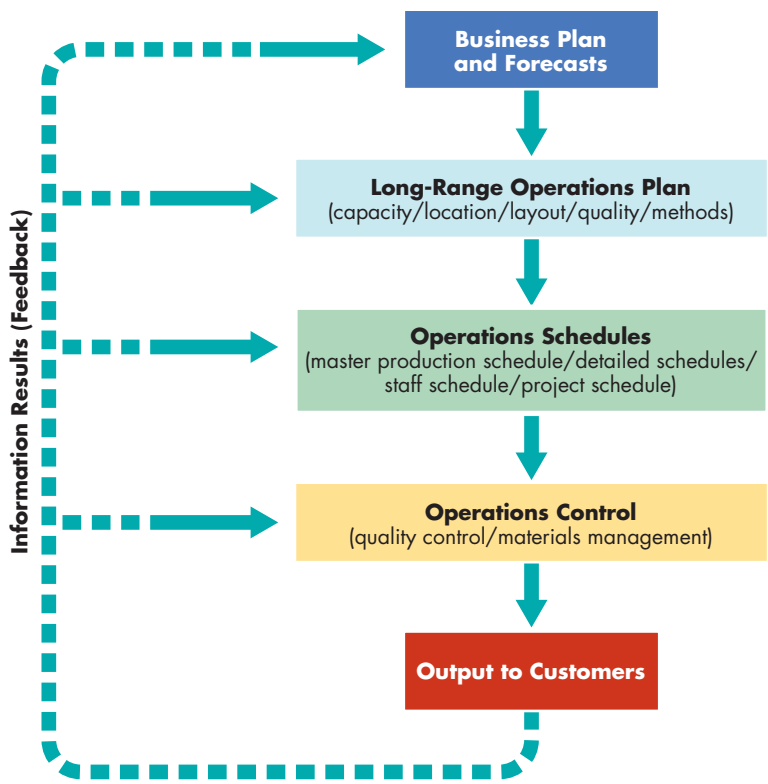


Figure 7.2 Operations Planning and Control

ENTREPRENEURSHIP AND NEW VENTURES

A Better Path to Planning Meals (and Better Eating, Too)

Want to eat better at home, while saving time and money, too? Folks at Bradenton, FL, are doing exactly that, using Erika Vitiene's newly launched online meal-planning venture, *Grocery Dash*. Vitiene has used her personal shopping experience, together with carefully developed meal-planning steps, to design the *grocerydash.com* website where subscribers get help for their at-home dinner planning.

Vitiene's motivation is to save over-burdened moms the time and money ordinarily spent on planning meals—deciding on menus, exploring grocery aisles to compare prices and staying within budget—and meal preparation. Every family's meal planner, eventually, feels the challenge of finding new and different dishes, instead of serving "the same old thing, week after week." Although new meal ideas provide greater variety, they also require more time searching for and using different recipes, and buying new ingredients at the right price.[4]

While the website doesn't use formal terms such as "methods improvement" and "process flowchart," its contents nevertheless reflect Erika's intuitive understanding of the sequence of steps for improving the "meal planning" process: It identifies the meal planner (the user who will gain better meal planning), the planner's objectives (good meals at lower cost and time savings), and provides information resources such as ready-made menus, lists of ingredients, and local stores currently offering the ingredients at reduced prices. Menus for seven dinners are displayed weekly, along with their recipes, lists of ingredients, and an aisle-by-aisle shopping list, all arranged around the price specials at local grocery stores. The menus are based on the USDA food pyramid for better nutrition, and recipes minimize the use of processed ingredients. Subscribers can download additional free resources—printable grocery lists, a freezer guide showing how long food will keep (and a list of foods that do not freeze well), and a pantry checklist for an up-to-date inventory of foods on hand at home.[5]

Erika used her system a long time, and proved its effectiveness to herself—saving 25 to 50 percent on her grocery bill—before presenting it online. Although originally intended for moms, and with a subscription price at $4.95 per month, *grocerydash.com* can also become a valued resource to singles, students, and others whose busy schedules and tight budgets can benefit from nutritious ready-planned meals at lower cost, instead of just fast foods.[6]

MyBizLab

Grant Jefferies/MCT/Newscom

The business plan and forecasts developed by top managers provide guidance for long-term operations plans. Covering a two- to five-year period, the operations plan anticipates the number of plants or service facilities and the amount of labor, equipment, transportation, and storage needed to meet future demand for new and existing products. The planning activities fall into five categories: *capacity*, *location*, *layout*, *quality*, and *methods planning*.

Capacity Planning

The amount of a product that a company can produce under normal conditions is its **capacity**. A firm's capacity depends on how many people it employs and the number and size of its facilities. A supermarket's capacity for customer checkouts, for instance, depends on its number of checkout stations. A typical store has excess capacity—more cash registers than it needs—on an average day, but on Saturday morning or during the three days before Thanksgiving, they'll all be running at full capacity.

Capacity amount of a product that a company can produce under normal conditions

Long-range capacity planning considers both current and future requirements. If capacity is too small for demand, the company must turn away customers—a situation that cuts into profits and alienates both customers and salespeople. If capacity greatly exceeds demand, the firm is wasting money by maintaining facilities that are too large, keeping excess machinery online, or employing too many workers.

The stakes are high in capacity decisions: While expanding fast enough to meet future demand and to protect market share from competitors, the costs of expanding must also be considered. When markets are growing, greater capacity is desirable. In troubled times, however, existing capacity may be too large and too expensive to maintain, requiring a reduction in size. To open her start-up "green laundry," for example, Deborah Dower found plenty of empty commercial space was available in the sagging 2010 economy. Business slowdowns forced other Sacramento, CA, area firms to abandon excess capacity, making space available at below-market prices for Dower's Paradise Laundry, with its motto, "Wash Green. Save Green." Encouraged by a favorable public response, and a willingness to take a financial risk, Dower has expanded capacity by opening a second Paradise Laundry.[7]

Location Planning

Because location affects production costs and flexibility, sound location planning is crucial for factories, offices, and stores. Depending on its site, a company may be able to produce low-cost products, or it may find itself at a cost disadvantage relative to its competitors.

Consider the reasons why Slovakia has become known as "Detroit East." With the worldwide slowdown in car sales, Slovakia's auto production is suffering. Still, as recently as 2008 it produced more cars per capita—including Volkswagen SUVs, Peugeot Citroens, and Kias—than any other country. Its auto factories are well-positioned to resume high-volume production as the worldwide economy improves. The central European country is an ideal place to produce cars. It has a good railroad system and nearby access to the Danube River, meaning economical transportation for incoming materials and outgoing cars once auto factories are in operation. The area also has skilled, hard-working laborers, and wages lower than those of surrounding countries.[8]

In contrast to manufacturing, consumer services concentrate on being located near customers. Thus, fast-food restaurants, such as Taco Bell and McDonald's, are located in areas with high traffic, such as dormitories, hospital cafeterias, and shopping malls. At retail giant Wal-Mart, managers of the company's huge distribution centers regard Wal-Mart outlets as their customers. To ensure that truckloads of merchandise flow quickly to stores, distribution centers are located near the hundreds of Wal-Mart stores that they supply, not near the companies that supply them.

Layout Planning

Layout is the physical location or floor plan for machinery, equipment, customers, service stations, and supplies. It determines whether a company can respond efficiently to demand for more and different products or whether it finds itself unable to match competitors' speed and convenience. Among the many layout possibilities, two well-known alternatives—*custom-products layouts and same-steps layouts*—are presented here to illustrate how different layouts serve different purposes for operations.

Custom-Products Layouts In a **custom-products layout**, which is well suited to *make-to-order shops* (or *job shops*) specializing in custom work, equipment and people are grouped according to function. Kinko's Copy Centers, for example, use custom-products layouts to accommodate a variety of custom jobs. Specific activities, such as photocopying, computing, binding, photography, and laminating, are performed in separate, specialized areas of the store.

The main advantage of custom-products layouts is flexibility—at any time, the shop can process individual customer orders, each requiring different kinds of

work. Depending on its work requirements, a job may flow through three activity areas, another through just one area, and still others through four or more work zones. Machining, woodworking, and dry cleaning shops, as well as health clinics and physical fitness studios, are among the many facilities using custom-products layouts.

Same-Steps Layouts A **same-steps layout** is set up to make one type of product in a fixed sequence of production steps. All units go through the same set of steps. It is efficient for large-volume make-to-stock operations that mass-produce many units of a product quickly, often using an **assembly line**: A partially finished product moves step by step through the plant on conveyor belts or other equipment, often in a straight line, as it passes through each stage until the product is completed. Automobile, food-processing, and television-assembly plants use same-steps layouts, as do mail-processing facilities, such as UPS or FedEx.

Same-steps layouts are efficient because the work skill is built into the equipment, allowing unskilled labor to perform simple tasks. But they are often inflexible, especially where they use specialized equipment that's hard to rearrange for new applications.

Quality Planning

Every operations plan includes activities for ensuring that products meet the firm's and customers' quality standards. The American Society for Quality defines **quality** as the combination of "characteristics of a product or service that bear on its ability to satisfy stated or implied needs."[9] Such characteristics may include a reasonable price and dependability in delivering the benefits it promises.

Planning for quality begins when products are being designed. Early in the process, goals are established for both performance and consistency. **Performance** refers to how well the product does what it is supposed to do. For loyal buyers of Godiva premium chocolates, performance includes such sensory delights as aroma, flavor, color, and texture. "Truly fine chocolates," observes master chocolatier Thiery Muret, "are always fresh, contain high-quality ingredients like cocoa beans and butter … and feature unusual textures and natural flavors." The recipe was designed to provide these features. Superior performance helps Godiva remain one of the world's top brands.[10]

In addition to performance, quality also includes **consistency**—the sameness of product quality from unit to unit. Business travelers using Courtyard by Marriott, for example, enjoy high consistency with each overnight stay, which is one reason Courtyard by Marriott is among the best-selling brands in the lodging industry. This is achieved by maintaining the same features at all of Marriott's nearly 700 U.S. locations. Designed for business travelers, most guest rooms include a Courtyard Suite with high-speed Internet access, meeting space, and access to an exercise room, restaurant and lounge, swimming pool, and 24-hour access to food. The layout of the suites is identical at many locations, the rooms are always clean, and check-in/checkout procedures are identical so that lodgers know what to expect with each overnight stay. This consistency is achieved by monitoring for uniformity of materials and supplies, encouraging conscientious work, training employees, and maintaining equipment.

Custom-Products Layout physical arrangement of production activities that groups equipment and people according to function

Same-Steps Layout physical arrangement of production steps designed to make one type of product in a fixed sequence of activities according to its production requirements

Assembly Line a same-steps layout in which a product moves step by step through a plant on conveyor belts or other equipment until it is completed

Quality combination of "characteristics of a product or service that bear on its ability to satisfy stated or implied needs"

Performance dimension of quality that refers to how well a product does what it is supposed to do

Consistency dimension of quality that refers to sameness of product quality from unit to unit

In addition to product design, quality planning includes employees deciding what constitutes a high-quality product—for both goods and services—and determining how to measure these quality characteristics.

Methods Planning

In designing operations systems, managers must identify each production step and the specific methods for performing it. They can then reduce waste and inefficiency by examining procedures on a step-by-step basis—an approach called *methods improvement*.

Improving Process Flows Improvements for operations begin by documenting current production practices. A detailed description, often using a diagram called a *process flowchart*, is helpful in organizing and recording information. The flowchart identifies the sequence of production activities, movements of materials, and work performed at each stage of the process. It can then be analyzed to isolate wasteful activities, sources of delay, and other inefficiencies in both goods and services operations. The final step is implementing improvements.

Improving Customer Service Consider, for example, the traditional checkout method at hotels. The process flowchart in Figure 7.3 shows five stages of customer activities. As is widely known among guests and employees, hotel checkout can be time consuming for customers standing in line to pay. They become impatient and annoyed, especially during popular checkout times when lines are long. Other hotel tasks are disrupted, too, as employees, called to assist with surging checkout lines, are reassigned from their normal jobs that are left until later. An improved checkout method was developed that avoids wasting time in line for customers and reduces interruptions of other staff duties as well. It saves time by eliminating steps 1, 2, 3A, and 5. Customers now scan their bills on television in the privacy of their rooms any time before departure. If the bill is correct, no further checkout is required, and the hotel submits the charges against the credit card that the customer submitted during check-in.

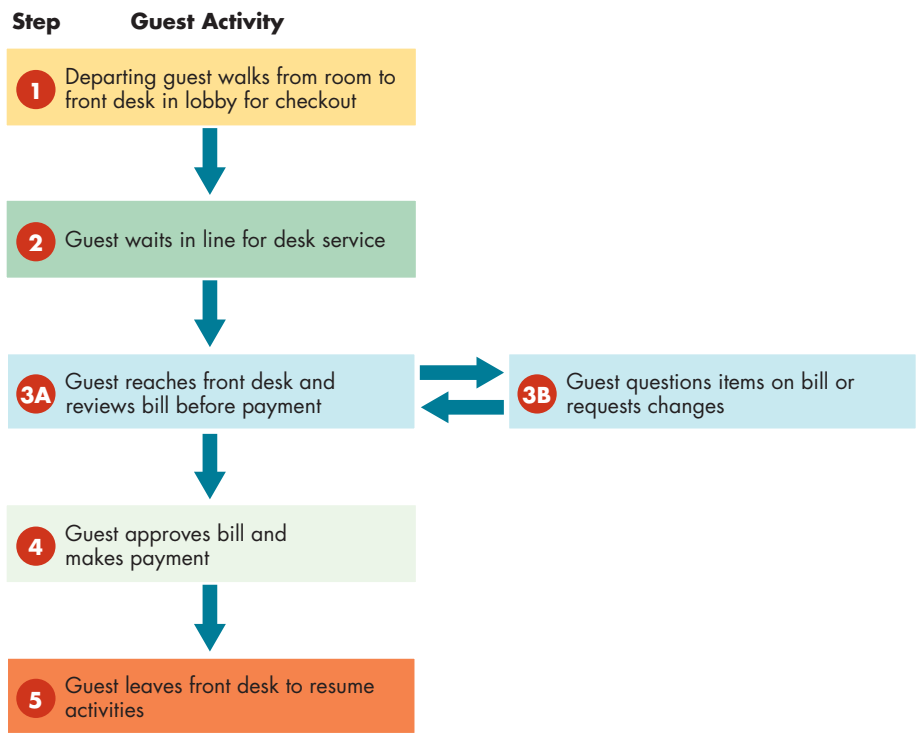


Figure 7.3 Flowchart of Traditional Guest Checkout

Operations Scheduling

5 Discuss the information contained in four kinds of operations schedules—the master production schedule, detailed schedule, staff schedule, and project schedule.

Continuing with the flow of activities in Figure 7.2, once operations plans have been determined, managers then develop timetables for implementing them. This aspect of operations, called *operations scheduling*, identifies times when specific production activities will occur.

In this section we consider four general kinds of schedules. (1) The *master schedule* is "the game plan" for upcoming production. (2) *Detailed schedules* show day-to-day activities that will occur in production. (3) *Staff schedules* identify who and how many employees will be working, and when. (4) Finally, *project schedules* provide coordination for completing large-scale projects.

The Master Production Schedule

Scheduling of production occurs at different levels. First, a top-level **master production schedule** shows which products will be produced, and when, in upcoming time periods. Logan Aluminum, for example, makes coils of aluminum that it supplies to customer companies that use it to make beverage cans. Logan's master schedule, with a format like the partial schedule shown in Figure 7.4, covers production for 60 weeks in which more than 300,000 tons will be produced. For various types of coils (products), it specifies how many tons will be produced each week, helping managers determine the kinds of materials, equipment, and other resources that will be needed for each week's production.

Detailed Schedules

While the master production schedule is the backbone for overall scheduling, additional information comes from **detailed schedules**—schedules showing daily work assignments with start and stop times for assigned jobs at each work station. Logan's production personnel need to know the locations of all coils in the plant and their various stages of completion. Start and stop times must be assigned, and employees need scheduled work assignments daily, not just weekly. Detailed short-term schedules allow managers to use customer orders and information about equipment status to update sizes and the variety of coils to be made each day.

Staff Schedules and Computer-Based Scheduling

Scheduling is useful for employee staffing in service companies, too, including restaurants, hotels, transportation, and landscaping. **Staff schedules**, in general, specify assigned working times in upcoming days—perhaps for as many as 30 days or more—for each employee on each work shift. They consider employees' needs and the company's efficiency and costs, including the ebbs and flows of demand for production.

Coil # (Product)	8/6/07	8/13/07	8/20/07	...	11/5/07	11/12/07
TC016	1,500	2,500			2,100	600
TC032	900		2,700		3,000	
TR020	300		2,600			1,600

Figure 7.4 Example of Partial Master Production Schedule

Master Production Schedule schedule showing which products will be produced, and when, in upcoming time periods

Detailed Schedule schedule showing daily work assignments with start and stop times for assigned jobs

Staff Schedule assigned working times in upcoming days for each employee on each work shift

Computer-based scheduling, using tools such as the *ABS Visual Staff Scheduler® PRO* (VSS Pro) software, can easily handle multi-shift activities for many employees—both part-time and full-time. It accommodates vacation times, holiday adjustments, and daily adjustments in staffing for unplanned absences and changes in production schedules.

Project Scheduling

Special projects, such as new business construction or redesigning a product, require close coordination and precise timing among many activities. In these cases, project management is facilitated by project scheduling tools, including Gantt charts and PERT.

The Gantt Graphical Method Named after its developer, Henry Gantt, a **Gantt chart** breaks down large projects into steps to be performed and specifies the time required to perform each one. The project manager lists all activities needed to complete the work, estimates the time required for each step, records the progress on the chart, and checks the progress against the time scale on the chart to keep the project moving on schedule. If work is ahead of schedule, some employees may be shifted to another project. If it's behind schedule, workers may be added or completion delayed.

Figure 7.5 shows a Gantt chart for the renovation of a college classroom. It shows progress to date and schedules for remaining work. It also shows that some steps can be performed at the same time (e.g., step D can be performed during the same time as steps C and E), but others cannot (e.g., step A must be completed before any of the others can begin). Step E is behind schedule; it should have been completed before the current date.

Project Scheduling with PERT Charts The *Program Evaluation and Review Technique* (*PERT*) provides even more information for controlling the progress of large projects. Along with times required to perform the activities, the layout of the **PERT chart** uses arrows to show the necessary *sequence* among activities, from start to finish, for completing the project. It also identifies the *critical path*—the most time-consuming set of activities—for completing the project.

Figure 7.6 shows a PERT chart for renovating the college classroom. The project's nine activities and the times required to complete them are identified. Each activity

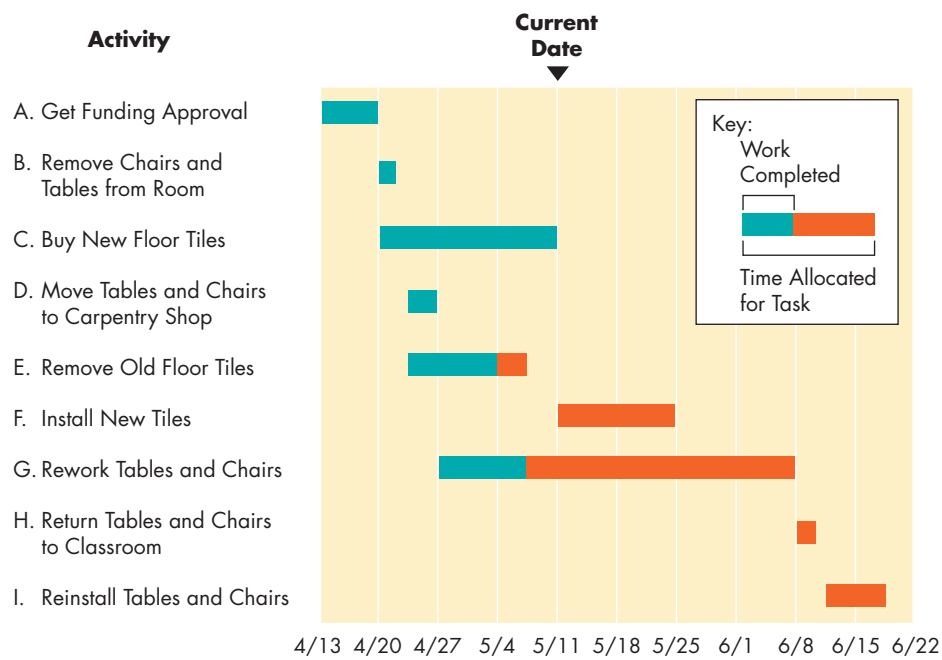


Figure 7.5 Gantt Chart

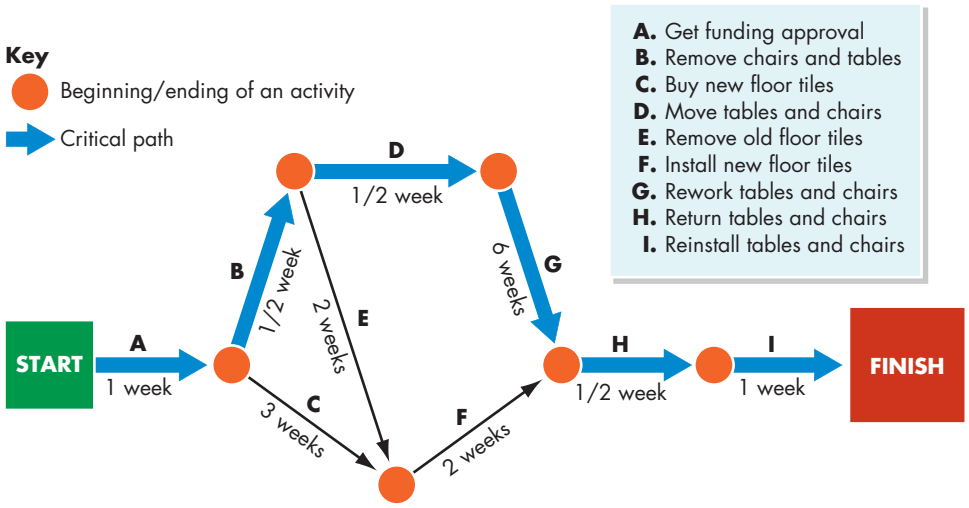


Figure 7.6 PERT Chart

is represented by an arrow. The arrows are positioned to show the required sequence for performing the activities. For example, chairs and tables can't be returned to the classroom (H) until after they've been reworked (G) and after new floor tiles are installed (F). Accordingly, the diagram shows arrows for G and F coming before activity H. Similarly, funding approval (A) has to occur before anything else can get started.

The critical path is informative because it reveals the most time-consuming path for project completion, and for most projects speed of completion is vital. The critical path for classroom renovation consists of activities A, B, D, G, H, and I, requiring 9.5 weeks. It's critical because a delay in completing any of those activities will cause corresponding lateness beyond the planned completion time (9.5 weeks after startup). Project managers will watch those activities and, if potential delays arise, take special action—by reassigning workers and equipment—to speed up late activities and stay on schedule.

Operations Control

6 Discuss the two key activities required for operations control.

Once long-range plans have been put into action and schedules have been drawn up, **operations control** requires managers to monitor performance by comparing results with detailed plans and schedules. If schedules or quality standards aren't met, managers can take corrective action. **Follow-up**—checking to ensure that production decisions are being implemented—is a key and ongoing facet of operations.

Operations control includes *materials management* and *quality control*. Both activities ensure that schedules are met and products delivered, both in quantity and in quality.

Gantt Chart production schedule that breaks down large projects into steps to be performed and specifies the time required to perform each step

Pert Chart production schedule specifying the sequence of activities, time requirements, and critical path for performing the steps in a project

Operations Control process of monitoring production performance by comparing results with plans and taking corrective action when needed

Follow-Up operations control activity for ensuring that production decisions are being implemented

Materials Management

Most of us have difficulty keeping track of personal items now and then—clothes, books, cell phones, and so on. Imagine keeping track of thousands or even millions of things at any one time. That's the challenge in **materials management**—the process by which managers plan, organize, and control the flow of materials from sources of supply through distribution of finished goods. For manufacturing firms, typical materials costs make up 50 to 75 percent of total product costs. For service firms, too, the materials stakes are high. UPS delivers 16 million packages every day and promises that all of them will arrive on schedule. It keeps this promise by tracking the locations, schedules, and on-time performance of 600 aircraft and 100,000 vehicles as they carry packages through the delivery system.

It's All in the Timing **Lean production systems**, pioneered by Toyota, are designed for smooth production flows that avoid inefficiencies, eliminate unnecessary inventories, and continuously improve production processes. **Just-in-time (JIT) production**, a type of lean system, brings together all needed materials at the precise moment they are required for each production stage, not before, thus creating fast and efficient responses to customer orders. All resources flow continuously—from arrival as raw materials to final assembly and shipment of finished products.

JIT production reduces to practically nothing the number of goods in process (goods not yet finished). It minimizes inventory costs, reduces storage space requirements for inventories, and saves money by replacing stop-and-go production with smooth movement. Once smooth flow is the norm, disruptions are more visible and are resolved more quickly. Finding and eliminating disruptions by the continuous improvement of production is a major objective of JIT production.

Materials Management Activities

Once a product has been designed, successful materials flows depend on five activities. From selecting suppliers on through the distribution of finished goods, materials managers engage in the following areas that compose materials management:

- **Supplier selection** means finding and choosing suppliers of services and materials to buy from. It includes evaluating potential suppliers, negotiating terms of service, and maintaining positive buyer–seller relationships.
- **Purchasing** is the acquisition of all the raw materials and services that a company needs to produce its products. Most large firms have purchasing departments to buy proper services and materials in the amounts needed.
- **Transportation** includes the means of transporting resources to the producer and finished goods to customers.
- **Warehousing** is the storage of both incoming materials for production and finished goods for distribution to customers.
- **Inventory control** includes the receiving, storing, handling, and counting of all raw materials, partly finished goods, and finished goods. It ensures that enough materials inventories are available to meet production schedules, while at the same time avoiding expensive excess inventories.

Quality Control

Quality control means taking action to ensure that operations produce goods or services that meet specific quality standards. Consider, for example, service operations where customer satisfaction depends largely on the employees who provide the service. By monitoring services, mistakes can be detected and corrections made. First, however, managers or other personnel must establish specific standards and

measurements. At a bank, for example, quality control for teller services might require supervisors to observe employees periodically and evaluate their work according to a checklist. The results would then be reviewed with employees and would either confirm proper performance or indicate changes for bringing performance up to standards.

The quality of customer-employee interactions is no accident in firms that monitor customer encounters and provide training for employee skills development. Many managers realize that without employees trained in customer-relationship skills, quality suffers, and businesses, such as airlines—as we saw in our opening story—and hotels, can lose customers to better-prepared competitors.

MARKA/Alamy

Quality control means taking action to ensure that operations produce products that meet specific quality standards.

Quality Improvement and Total Quality Management

7 Identify the activities and underlying objectives involved in total quality management.

It is not enough to *control* quality by inspecting products and monitoring service operations as they occur, as when a supervisor listens in on a catalog sales service representative's customer calls. Businesses must also consider *building* quality into goods and services. In order to compete on a global scale, U.S. companies continue to emphasize a quality orientation. All employees, not just managers, participate in quality efforts, and firms have embraced new methods to measure progress and to identify areas for improvement. In many organizations, quality improvement has become a way of life.

Managing for Quality

Total quality management (TQM) includes all the activities necessary for getting high-quality goods and services into the marketplace. TQM begins with leadership and a desire for continuously improving both processes and products. It must consider all aspects of a business, including customers, suppliers, and employees. To marshal the interests of all these stakeholders, TQM first evaluates the costs of poor quality. It then involves assigning and accepting responsibility for quality improvement.

Materials Management process of planning, organizing, and controlling the flow of materials from sources of supply through distribution of finished goods

Lean Production System production system designed for smooth production flows that avoid inefficiencies, eliminate unnecessary inventories, and continuously improve production processes

Just-in-Time (Jit) Production type of lean production system that brings together all materials at the precise time they are required at each production stage

Supplier Selection process of finding and choosing suppliers from whom to buy

Purchasing acquisition of the materials and services that a firm needs to produce its products

Transportation activities in transporting resources to the producer and finished goods to customers

Warehousing storage of incoming materials for production and finished goods for distribution to customers

Inventory Control process of receiving, storing, handling, and counting of all raw materials, partly finished goods, and finished goods

Quality Control action of ensuring that operations produce products that meet specific quality standards

Total Quality Management (TQM) all activities involved in getting high-quality goods and services into the marketplace

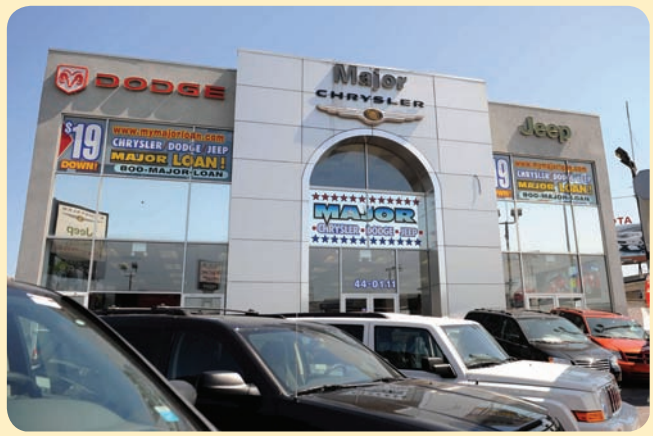
MANAGING IN TURBULENT TIMES

Leaner Operations Are Restoring the U.S. Auto Industry

Recent signs of recovery for the U.S. auto industry stem from more than financial bailouts. General Motors and Chrysler, suffering grave financial losses in 2008, needed to demonstrate that they can survive and repay the bridge loans received from the U.S. Department of the Treasury. Under the guise of restructuring or reorganization, the steps automakers have taken can be summarized in just two words: *leaner operations*. GM, Chrysler, and Ford are adopting business strategies that Japanese producers have been using (and have mastered) for three decades to simplify production and capture a greater market share.

A reduction in product offerings is the foundation for leaner operations: A smaller number of makes, models, and options such as colors, engine sizes, trims, etc. simplifies product design, production, and distribution. It leads to lower costs, higher quality, and better customer service. Because it's easier to design a few rather than many different products, design and engineering requirements are vastly lowered. Designers strive for commonality of component parts so that all models use the same parts [e.g., all use the same door handles] rather than having separate designs for each model. Parts reductions simplify the supply chain, too: Fewer suppliers are needed, communications are easier and faster, and closer relationships with suppliers provide faster supplier responses on short notice.

Design simplification is a blessing for assembly operations, too, because fewer production steps are required, and when quality problems arise, they are easier to find and are quickly corrected. Because fewer components require less inventory space and equipment, smaller factories—which are less costly and easier to maintain—become possible. Production scheduling is simpler, as are materials movements during production, so there is less work stoppage and fewer mistakes, product quality improves, and on-time deliveries to customers increase.



x10/ZUMA Press/Newscom

The company's distribution network is simplified, too, when some of its auto brands are eliminated. GM has downsized to just four core brands—Buick, Cadillac, Chevrolet, and GMC—after ending the Oldsmobile, Pontiac, Saturn, Hummer, and Saab brands under the GM label. Chrysler's roster includes just three major brands: Chrysler, Jeep, and Dodge. Ford has discontinued its Mercury brand. Fewer brands means some auto dealerships are no longer needed, thus lowering distribution costs. With speedier product designs and production operations, newer products get into the marketplace more quickly than those of competitors, and customer service improves. When the benefits of lower costs, higher quality, and lower prices are added together, it becomes apparent that lean production systems offer significant competitive advantages. Causing it to happen, and quickly, at GM, Chrysler, and Ford continues to be a massive challenge for survival in turbulent times.

MyBizLab

The Cost of Poor Quality As seen prominently in the popular press, Toyota recalled more than 10 million cars in 2009–2010, costing the world's then-number-one automaker billions of dollars and a severe blemish to its high-quality image. Problems ranging from sticking gas pedals and stalling engines, to malfunctioning fuel pumps were dangerous and costly not only to Toyota, but to many consumers, too.

As with goods producers, service providers and customers, too, suffer financial distress from poor-quality service products. The banking industry is a current example. As a backbone of the U.S. financial system, banks and their customers are still suffering because of bad financial products, most notably home mortgage loans. Lenders during "good times" began relaxing (or even ignoring altogether) traditional lending standards for determining whether borrowers are creditworthy (are they qualified to borrow and likely to repay mortgage loans?). Lenders in some cases intentionally overstated property values so customers could borrow more money than the property justified. Borrowers were sometimes encouraged to overstate (falsify) their incomes and were not required to present evidence of income or even employment. Some

borrowers, unaware of the terms of their loan agreements, were surprised after an initial time lapse when a much higher interest rate (and monthly payment) suddenly kicked in. Unable to meet their payments, borrowers had to abandon their homes. Meanwhile, banks were left holding foreclosed properties, unpaid (defaulted) loans, and no cash. With shortages of bank funds threatening to shut down the entire financial system, the entire nation felt the widespread costs of poor quality.

Quality Ownership: Taking Responsibility for Quality To ensure high-quality goods and services, many firms assign responsibility for some aspects of TQM to specific departments or positions. These specialists and experts may be called in to assist with quality-related problems in any department, and they keep everyone informed about the latest developments in quality-related equipment and methods. They also monitor quality-control activities to identify areas for improvement.

The backbone of TQM, however, and its biggest challenge, is motivating all employees throughout the company and its suppliers to achieve quality goals. Leaders of the quality movement use various methods and resources to foster a quality focus—training, verbal encouragement, teamwork, and tying compensation to work quality. When those efforts succeed, employees and suppliers will ultimately accept **quality ownership**— the idea that quality belongs to each person who creates it while performing a job.

With TQM, everyone—purchasers, engineers, janitors, marketers, machinists, suppliers, and others—must focus on quality. At Saint Luke's Hospital of Kansas City, for example, every employee receives the hospital's "balanced scorecard" showing whether the hospital is meeting its goals: fast patient recovery for specific illnesses, 94 percent or better patient-satisfaction rating, every room cleaned when a patient is gone to X-ray, and the hospital's return on investment being good enough to get a good bond rating in the financial markets. Quarterly scores show the achievement level reached for each goal. Every employee can recite where the hospital is excelling and where it needs improvement. In recognition of its employees' dedication to quality performance, Saint Luke's received the Malcolm Baldrige National Quality Award—the prestigious U.S. award for excellence in quality—and is a three-time winner of the Missouri Quality Award.[11]

Tools for Total Quality Management

Hundreds of tools have proven useful for quality improvement, ranging from statistical analysis of product data, to satisfaction surveys of customers, to **competitive product analysis**—a process by which a company analyzes a competitor's products to identify desirable improvements. Using competitive analysis, for example, Toshiba might take apart a Xerox copier and test each component. The results would help managers decide which Toshiba product features are satisfactory, which features should be upgraded, and which operations processes need improvement.

In this section, we survey five of the most commonly used tools for TQM: *value-added analysis*, *quality improvement teams*, *getting closer to the customer*, *the ISO series*, and *business process reengineering*.

Value-Added Analysis **Value-added analysis** refers to the evaluation of all work activities, materials flows, and paperwork to determine the value that they add for customers. It often reveals wasteful or unnecessary activities that can be eliminated without jeopardizing customer service. The basic tenet is so important that Tootsie Roll Industries, the venerable candy company, employs it as a corporate principle: "We run a trim operation and continually strive to eliminate waste, minimize cost, and implement performance improvements." [12]

Quality Ownership principle of total quality management that holds that quality belongs to each person who creates it while performing a job

Competitive Product Analysis process by which a company analyzes a competitor's products to identify desirable improvements

Value-Added Analysis process of evaluating all work activities, materials flows, and paperwork to determine the value that they add for customers

Quality Improvement Teams Companies throughout the world have adopted **quality improvement teams** patterned after the successful Japanese concept of *quality circles*: collaborative groups of employees from various work areas who meet regularly to define, analyze, and solve common production problems. Their goal is to improve both their own work methods and the products they make. Quality improvement teams organize their own work, select leaders, and address problems in the workplace. For years, Motorola has sponsored companywide team competitions to emphasize the value of the team approach, to recognize outstanding team performance, and to reaffirm the team's role in the company's continuous-improvement culture.

Getting Closer to the Customer Successful businesses take steps to know what their customers want in the products they consume. On the other hand, struggling companies have often lost sight of customers as the driving force behind all business activity. Such companies waste resources by designing products that customers do not want. Sometimes, they ignore customer reactions to existing products or fail to keep up with changing tastes.

Successful firms take steps to know what their customers want in the products they consume. Caterpillar financial services, for example, received the Malcolm Baldrige National Quality Award for high ratings by its customers (that is, dealers and buyers of caterpillar equipment). Buying and financing equipment from Cat Financial became easier as Cat moved its services increasingly online. Customers now have 24/7 access to information on how much they owe on equipment costing anywhere from $30,000 to $2 million, and they can make payments around the clock, too. In the past, the 60,000 customers had to phone a Cat representative, who was often unavailable, resulting in delays and wasted time. The improved online system is testimony to Cat Financial's dedication in knowing what customers want, and then providing it.[13]

Identifying Customers—Internal and External Improvement projects are undertaken for both external and internal customers. Internal suppliers and internal customers exist wherever one employee or activity relies on others. For example, marketing managers rely on internal accounting information—costs for materials, supplies, and wages—to plan marketing activities for coming months. The marketing manager is a customer of the firm's accountants—the information user relies on the information supplier. Accountants in a TQM environment recognize this supplier–customer connection and take steps to improve information for marketing.

The ISO Series Perhaps you've driven past companies proudly displaying large banners announcing, "This Facility Is ISO Certified." The ISO (pronounced ICE-oh) label is a mark of quality achievement that is respected throughout the world and, in some countries, it's a requirement for doing business.

ISO 9000 **ISO 9000** is a certification program attesting that a factory, a laboratory, or an office has met the rigorous quality management requirements set by the International Organization for Standardization. Today, more than 160 countries have adopted ISO 9000 as a national standard. Nearly 1 million certificates have been issued to organizations worldwide meeting the ISO standards.

The standards of *ISO 9000* allow firms to show that they follow documented procedures for testing products, training workers, keeping records, and fixing defects. It allows international companies to determine (or be assured of) quality of product (or the business) when shipping for/from/to suppliers across borders. To become certified, companies must document the procedures followed by workers during every stage of production. The purpose is to ensure that a company's processes can create products exactly the same today as it did yesterday and as it will tomorrow.

ISO 14000 The **ISO 14000** program certifies improvements in environmental performance by requiring a firm to develop an *environmental management system*: a plan documenting how the company has acted to improve its performance in using resources (such as raw materials) and in managing pollution. A company must not only identify hazardous wastes that it expects to create, but it must also stipulate plans for treatment and disposal.

Business Process Reengineering Every business consists of processes—activities that it performs regularly and routinely in conducting business, such as receiving and storing materials from suppliers, billing patients for medical treatment, filing insurance claims for auto accidents, and filling customer orders from Internet sales. Any business process can increase customer satisfaction by performing it well. By the same token, any business process can disappoint customers when it's poorly managed.

Business process reengineering focuses on improving a business process—rethinking each of its steps by starting from scratch. *Reengineering* is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements as measured by cost, quality, service, and speed. The discussion of Caterpillar's changeover to an online system for customers is an example. Cat reengineered the whole payments and financing process by improving equipment, retraining employees, and connecting customers to Cat's databases. As the example illustrates, redesign is guided by a desire to improve operations and thereby provide higher-value services for customers.

Adding Value Through Supply Chains

8 **Explain how a supply chain strategy differs from traditional strategies for coordinating operations among firms.**

The term *supply chain* refers to the group of companies and stream of activities that work together to create a product. A **supply chain** (or **value chain**) for any product is the flow of information, materials, and services that starts with raw-materials suppliers and continues adding value through other stages in the network of firms until the product reaches the end customer.

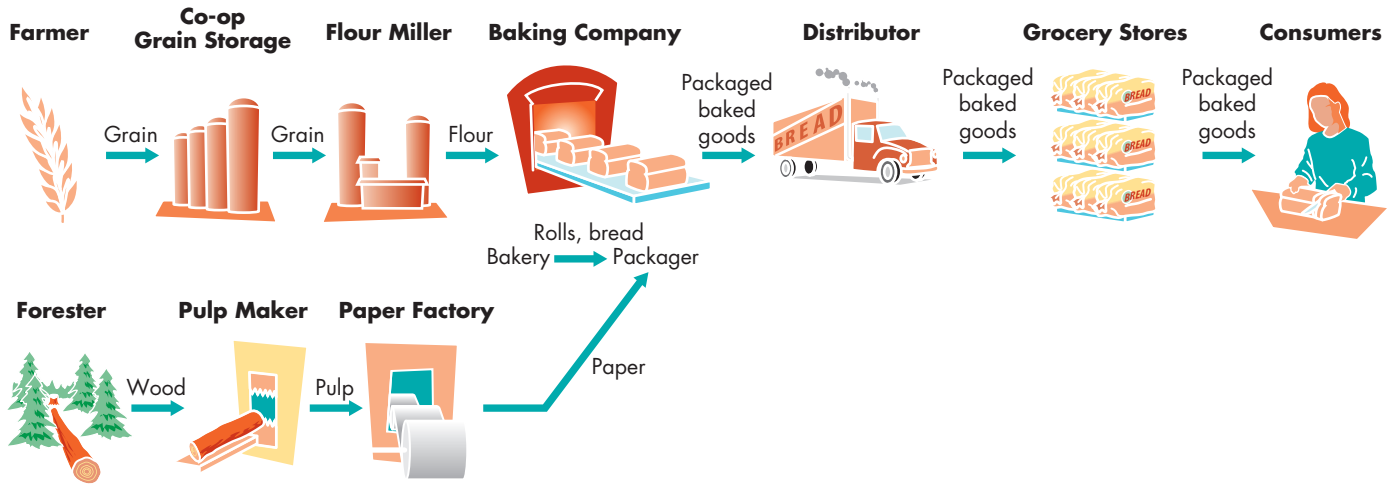


Figure 7.7 Supply Chain for Baked Goods

Quality Improvement Team TQM tool in which collaborative groups of employees from various work areas work together to improve quality by solving common shared production problems

ISO 9000 program certifying that a factory, laboratory, or office has met the quality management standards set by the International Organization for Standardization

ISO 14000 certification program attesting to the fact that a factory, laboratory, or office has improved its environmental performance

Business Process Reengineering rethinking and radical redesign of business processes to improve performance, quality, and productivity

Supply Chain (Value Chain) flow of information, materials, and services that starts with raw-materials suppliers and continues adding value through other stages in the network of firms until the product reaches the end customer

Figure 7.7 shows the chain of activities for supplying baked goods to consumers. Each stage adds value for the final customer. This bakery example begins with raw materials (grain harvested from the farm). It also includes storage and transportation activities, factory operations for baking and wrapping, and distribution to retailers. Each stage depends on the others for success in getting freshly baked goods to consumers. However, a failure by any link can spell disaster for the entire chain.

The Supply Chain Strategy

Traditional strategies assume that companies are managed as individual firms rather than as members of a coordinated supply system. Supply chain strategy is based on the idea that members of the chain will gain competitive advantage by working as a coordinated unit. Although each company looks out for its own interests, it works closely with suppliers and customers throughout the chain. Everyone focuses on the entire chain of relationships rather than on just the next stage in the chain.

A traditionally managed bakery, for example, would focus simply on getting production inputs from flour millers and paper suppliers, and then on supplying baked goods to distributors. Unfortunately, this approach limits the chain's performance and doesn't allow for possible improvements when activities are more carefully coordinated. Proper management and better coordination among supply chain activities can provide fresher baked goods at lower prices.

Supply Chain Management

Supply chain management (SCM) looks at the chain as a whole to improve the overall flow through a system composed of companies working together. Because customers ultimately get better value, supply chain management gains competitive advantage for each of the chain's members.

An innovative supply chain strategy was the heart of Michael Dell's vision when he established Dell Inc. Dell's concept improves performance by sharing information among chain members. Dell's long-term production plans and up-to-the-minute sales data are available to suppliers via the Internet. The process starts when customer orders are automatically translated into updated production schedules in the factory. These schedules are used not only by operations managers at Dell but also by such parts suppliers as Sony, which adjust their own production and shipping activities to better meet Dell's production needs. In turn, parts suppliers' updated schedules are transmitted to their materials suppliers, and so on up the chain. As Dell's requirements change, suppliers up and down the chain synchronize their schedules to produce only the right materials and parts. As a result, Dell's prices are low and turnaround time for shipping PCs to customers is reduced to a matter of hours instead of days.

Reengineering Supply Chains for Better Results

Process improvements and reengineering often are applied in supply chains to lower costs, speed up service, and coordinate flows of information and material. Because the smoother flow of accurate information along the chain reduces unwanted inventories and transportation, avoids delays, and cuts supply times, materials move faster to business customers and individual consumers. SCM offers faster deliveries and lower costs than customers could get if each member acted only according to its own operations requirements.

Outsourcing and Global Supply Chains

Outsourcing is the strategy of paying suppliers and distributors to perform certain business processes or to provide needed materials or services. The decision to outsource expands supply chains. The movement of manufacturing and service operations from the United States to countries such as China, Mexico, and India has reduced U.S. employment in traditional jobs. It has also created new operations jobs for supply chain management. Maytag, for example, had to develop its own internal global operations expertise before it could decide to open a new refrigerator factory in Mexico, import refrigerators from South Korea's Daewoo, and get laundry appliances from South Korea's Samsung Electronics. In departing from a long-standing

practice of domestic production, Maytag adopted new supply chain skills for evaluating prospective outsourcing partners.

Skills for coordinating Maytag's domestic activities with those of its cross-border partners didn't end with the initial decision to get appliances from Mexico and Korea. Maytag personnel in their Newton, Iowa, headquarters have near-constant interaction with their partners on a host of continuing new operations issues. Product redesigns are transferred from the United States and used at remote manufacturing sites. Arrangements for cross-border materials flows require compliance with each country's commerce regulations. Production and global transportation scheduling are coordinated with U.S. market demand so that outsourced products arrive in the right amounts and on time without tarnishing Maytag's reputation for high quality. Although manufacturing operations are located remotely, they are closely integrated with the firm's home-base activities. That tightness of integration demands on-site operations expertise on both sides of the outsourcing equation. Global communication technologies are essential. The result for outsourcers is a greater need of operations skills for integration among dispersed facilities.

Supply Chain Management (SCM) principle of looking at the supply chain as a whole to improve the overall flow through the system

Ben Stansall/AFP/Getty Images/Newscom

Continued from page 166

Some Airlines Are "Getting It Right"

Unlike many carriers, better-performing airlines are proving that good service quality need not be sacrificed to remain profitable. JetBlue Airways, for example, continues to be profitable while also receiving fewer complaints than most other U.S. airlines. Among larger carriers, Southwest Airlines has demonstrated consistently that the two—high-quality service and profitability—go hand-in-hand. Southwest's service quality has attracted a loyal customer following. Passenger testimonials cite Southwest's refusal to charge extra for baggage, for booking flights on the phone, or for changing flights. They receive exceptionally high ratings for baggage handling (fewer lost bags), orderly boarding practices, and consistent on-time performance.[14] Southwest had the fewest number of consumer complaints for the most recent three consecutive years in the U.S. Department of Transportation's (DOT) official reports.[15] Along with quality, profitability continues to grow, while other airlines are operating at a loss: "Yearend results for 2009 marked Southwest's 37th consecutive year of profitability."[16]

Airline quality ratings are well-documented, using measurements from airport operations records and from customer complaints on numerous service activities. At the DOT, for example, the Aviation Consumer Protection Division gathers data on flight delays, mishandled baggage, oversales (number of confirmed passengers denied boarding), and customer complaints (on cancellations, misconnections, delays, baggage, fares, ticketing mistakes, and rude or unhelpful employees). Airlines are ranked each month, from top (fewest complaints) to bottom on each service activity, and Southwest Airlines is at or near the top consistently.[17] Several other well-known brands, near the bottom, seem to have little interest in improving. Many passengers are left wondering, "Why don't more airlines adopt the Southwest model?"

QUESTIONS FOR DISCUSSION

1. How would you define *quality* and how is quality measured in this industry? Are some measurements more useful than others? Explain.
2. Some *service activities*, such as delayed departures, are not under total control by airlines, but are also affected by outside factors. Among all service activities that affect quality for customers, identify three or more that are totally controlled by airlines, and three or more that airlines cannot totally control. Should both sets of activities be included in the airlines' quality ratings? Explain.
3. Describe how *process flowcharts* may be helpful for methods improvement in airline service operations. What kinds of information would you hope to gain from the flowcharts?
4. Identify a major U.S. airline that has received *poor quality ratings*. Who are its customers, and what are the basic causes that led to declining quality?
5. U.S. airplane passengers must choose between two controversial security-screening procedures: full-body image detection or probing pat-downs. How might these procedures affect customers' *perceptions of airlines' services*? What actions would you recommend be considered by airlines to overcome negative perceptions?

SUMMARY OF LEARNING OBJECTIVES MyBizLab

1. Explain the meaning of the term *production* or *operations*. (p. 166)

Operations (or *production*) refers to all the activities involved in making products—goods and services—for customers. Through their operations processes—using knowledge, physical materials, information, equipment, the customer, and human skills—firms provide benefits for themselves and for their customers. Production provides businesses with economic results: profits, wages, and goods purchased from other companies. At the same time, it adds value and benefits for customers by providing products that satisfy a want or need.

2. Describe the three kinds of utility that operations processes provide for adding customer value. (pp. 166–170)

Production or operations adds customer value by providing *utility*—the ability of a product to satisfy a want or need—in terms of form, time, and place: (1) *Form utility*: By turning raw materials and human skills into finished goods and services, production adds customer value by making products available. (2) *Time utility*: Production provides customer value by making products available when customers want them. (3) *Place utility*: Production adds customer value by making products available where they are convenient for customers.

3. Explain how companies with different business strategies are best served by having different operations capabilities. (pp. 170–172)

Production is a flexible activity that can be molded into many shapes to give different operations capabilities (production capabilities) for different purposes. Its design is best driven from above by the firm's larger business strategy. When firms adopt different strategies for winning customers in specific target markets, they should also adjust their *operations capabilities*—what production must do especially well—to match the chosen strategy. The operations capability that is appropriate for a low-cost strategy, for example, is different than the kind of competence that is best for a dependability strategy. Accordingly, the operations characteristics—such as number and size of production facilities, employee skills, kinds of equipment—and its operations activities will be different, resulting in different operations capabilities to better support their different purposes.

4. Identify the major factors that are considered in operations planning. (pp. 172–176)

Operations planning includes five major considerations: (1) *Capacity planning* considers current and future capacity requirements for meeting anticipated customer demand. The amount of a product that a company can produce under normal conditions is its *capacity*, and it depends on how many people it employs and the number and size of its facilities. (2) *Location planning* is crucial because a firm's location affects costs of production, ease of transporting, access to skilled workers, and convenient accessibility for customers. (3) *Layout planning* determines the physical location of machinery, equipment, and facilities and affects how efficiently a company can respond to customer demand. A *custom-products layout* is effective for make-to-order production specializing in custom jobs. A *same-steps layout*, such as assembly lines, is often used for large-volume, make-to-stock production. (4) *Quality planning* begins when products are being designed and extends into production operations for ensuring that the desired performance and consistency are built into products. (5) *Methods planning* considers each production step and the specific methods for performing it. The purpose is to reduce waste and inefficiency by methods improvement procedures.

5. Discuss the information contained in four kinds of operations schedules—the master production schedule, detailed schedule, staff schedule, and project schedule. (pp. 177–179)

Operations scheduling identifies times when specific production activities will occur. The *master production schedule*, the top-level schedule for upcoming production, shows how many of which products will be produced in each time period, in weeks or months ahead, to meet upcoming customer demand. *Detailed schedules* take a shorter-range perspective by specifying daily work assignments with start and stop times for assigned jobs at each workstation. *Staff schedules* identify who and how many employees will be working, and their assigned working times on each work shift for up to 30 days ahead. Finally, *project schedules* provide information for completing large-scale projects. Project scheduling tools such as *PERT* break down special large projects into the sequence of steps to be performed and when to perform them. PERT shows the necessary sequence among activities, and identifies the critical path—the most time-consuming set of activities for completing the project.

6. Discuss the two key activities required for operations control. (pp. 179–181)

Once plans and schedules have been drawn up, *operations control* requires managers to monitor performance by comparing results against those plans and schedules. If schedules or quality standards are not met, managers take corrective action. *Follow-up*—checking to ensure that decisions are being implemented—is an essential facet of operations control. *Materials management*—including supplier selection, purchasing, transportation, warehousing, and inventory control—facilitates the flow of materials. It may use lean production systems, such as *just-in-time operations*, for smooth production flows that avoid inefficiencies, comply with schedules, eliminate unnecessary inventories, and continuously improve production

processes. *Quality control* means taking action to ensure that operations produce goods or services that meet specific quality standards.

7. Identify the activities and underlying objectives involved in total quality management. (pp. 181–185)

Total quality management (*TQM*) is a customer-driven culture for offering products with characteristics that customers want. It includes all the activities necessary for getting customer-satisfying goods and services into the marketplace and, internally, getting every job to give better service to internal customers. TQM begins with leadership and a desire for continuously improving both processes and products. It considers all aspects of a business, including customers, suppliers, and employees. The TQM culture fosters an attitude of quality ownership among employees and suppliers—the idea that quality belongs to each person who creates it while performing a job—so that quality improvement becomes a continuous way of life. It identifies the costs of poor quality, and applies the process improvement tools of TQM to reduce those costs.

8. Explain how a supply chain strategy differs from traditional strategies for coordinating operations among firms. (pp. 185–187)

The supply chain strategy is based on the idea that members of the *supply chain*—the stream of all activities and companies that add value in creating a product—will gain competitive advantage by working together as a coordinated unit. In contrast, traditional strategies assume that companies are managed as individual firms, each acting in its own interest. By managing the chain as a whole—using *supply chain management*—companies can more closely coordinate activities throughout the chain. By sharing information, overall costs and inventories can be reduced, quality can be improved, overall flow through the system improves, thus providing customers higher value from faster deliveries and lower costs.

KEY TERMS MyBizLab

assembly line (p. 175)
business process reengineering (p. 185)
capacity (p. 173)
competitive product analysis (p. 183)
consistency (p. 175)
custom-products layout (p. 174)
detailed schedule (p. 177)
follow-up (p. 179)
Gantt chart (p. 178)
goods operations (goods production) (p. 166)
high-contact system (p. 170)
inventory control (p. 180)
ISO 9000 (p. 184)
ISO 14000 (p. 184)
just-in-time (JIT) production (p. 180)
lean production system (p. 180)
low-contact system (p. 170)
make-to-order operations (p. 169)
make-to-stock operations (p. 169)
master production schedule (p. 177)
materials management (p. 180)
operations capability (production capability) (p. 170)
operations control (p. 179)
operations process (p. 169)
operations (production) (p. 166)
operations (production) management (p. 167)
operations (production) managers (p. 167)
performance (p. 175)
PERT chart (p. 178)
purchasing (p. 180)
quality (p. 175)
quality control (p. 180)
quality improvement team (p. 184)
quality ownership (p. 183)
same-steps layout (p. 175)
service operations (service production) (p. 166)
staff schedule (p. 177)
supplier selection (p. 180)
supply chain management (SCM) (p. 186)
supply chain (value chain) (p. 185)
total quality management (TQM) (p. 181)
transportation (p. 180)
utility (p. 166)
value-added analysis (p. 183)
warehousing (p. 180)

QUESTIONS AND EXERCISES

QUESTIONS FOR REVIEW

1. What are the major differences between goods-production operations and service operations?
2. What are the major differences between high-contact and low-contact service systems?
3. What are the five major categories of operations planning?
4. What are the major activities in materials management?
5. What activities are involved in total quality management?

QUESTIONS FOR ANALYSIS

6. What are the input resources and finished products in the following services: a real estate firm, a child care facility, a bank, and a hotel?
7. Choose a consumer item, such as an iPod, packaged food, or another everyday product, and trace its supply chain. Identify at least four upstream stages in the chain. Based on your familiarity with the product and the supply chain stages you identified, what recommendations would you make to improve the supply chain?
8. Develop a list of internal customers and internal suppliers for some business that you use frequently (or where you work), such as a cafeteria, a dormitory or hotel, or a movie theater. Identify areas for potential quality improvement in these internal customer–supplier activity relationships.
9. Find good examples of a make-to-order production process and a make-to-stock process in both goods operations and in service operations. Explain your choices.

APPLICATION EXERCISES

10. Think of an everyday activity, either personal or professional, that you would like to streamline for faster performance or more convenience. It could be something like gassing up your car, going to work or school, enrolling in classes at school, or any other activity that involves several stages with which you are familiar. Describe how you would use methods planning as described in the chapter to improve the activity. Draw a process flowchart that shows the stages in the activity you chose, then tell how you would use it.

11. Interview the manager of a local service business, or speak to a food service, bookstore, or other manager at your school. Identify the major decisions involved in planning that business's service operations.

BUILDING YOUR BUSINESS SKILLS

The One-On-One Entrepreneur

Goal

To encourage you to apply the concept of customization to an entrepreneurial idea.

Background Information

You are an entrepreneur who wants to start your own service business. You are intrigued with the idea of creating some kind of customized one-on-one service that would appeal to baby boomers, who often like to be pampered, and working women, who have little time to get things done.

Method

Step 1

Get together with three or four other students to brainstorm ideas for services that would appeal to harried working people. Here are just a few:

- A concierge service in office buildings that would handle such personal and business services as arranging children's birthday parties and booking guest speakers for business luncheons.
- A personal-image consultation service aimed at helping clients improve appearance, etiquette, and presentation style.
- A mobile pet-care network through which vets and groomers make house calls.

Step 2

Choose one of these ideas or one that your team thinks of. Then write a memo explaining why you think your idea will succeed. Research may be necessary as you target any of the following:

- A specific demographic group or groups (Who are your customers, and why would they buy your service?)
- Features that make your service attractive to this group
- The social factors in your local community that would contribute to success

FOLLOW-UP QUESTIONS

1 Why is the customization of and easy access to personal services so desirable?

2 As services are personalized, do you think quality will become more or less important? Why?

3 Why does the trend toward personalized, one-on-one service present unique opportunities for entrepreneurs?

4 In a personal one-on-one business, how important are the human relations skills of those delivering the service? Can you make an argument that they are more important than the service itself?

EXERCISING YOUR ETHICS: INDIVIDUAL EXERCISE

Promises, Promises

The Situation

Unfortunately, false promises are not uncommon when managers feel pressure to pump up profits. Many operations managers no doubt recall times when excited marketing managers asked for unrealistic commitments from production to get a new customer contract. This exercise will introduce you to some ethical considerations pertaining to such promises and commitments.

The Dilemma

You are an operations manager for a factory that makes replacement car mufflers and tailpipes. Your products are distributed throughout the country to muffler-repair shops that install them on used vehicles. After several years of modest but steady growth, your company recently suffered a downturn and shut down 5 percent of the factory's production capacity. Two supervisors and 70 production workers were laid off.

After returning from lunch, you get a phone call from the general manager of King Kong Mufflers, one of the nation's top three muffler-repair chains, who says the following:

I suppose you know that we're about to sign a contract for your firm to supply us with replacement parts in large volumes, beginning two months from now. Your sales manager assures me that you can reliably meet my needs, and I just want to confirm that promise with you before I sign the contract.

This is the first you've heard about this contract. While your potential customer is talking, you realize that meeting his needs will require a 20-percent increase in your current production capacity. Two months, however, isn't enough time to add more equipment, acquire tools, hire and train workers, and contract for supplies. An increase this large might even require a bigger building (which would take considerably more than two months to arrange). On the other hand, you also know how much your firm needs the business. Your thoughts are interrupted when the caller says, "So what's your production situation insofar as meeting our needs?" The caller waits in silence while you gather your thoughts.

QUESTIONS TO ADDRESS

1 What are the underlying ethical issues in this situation?

2 From an ethical standpoint, what is an appropriate response to the customer's question? What steps should you take in responding to it? Explain.

3 What would you say on the phone at this time to this customer?

EXERCISING YOUR ETHICS: TEAM EXERCISE

Calculating the Cost of Conscience

The Situation

Product quality and cost affect every firm's reputation and profitability, as well as the satisfaction of customers. This exercise will expose you to some ethical considerations that pertain to certain cost and service decisions that must be made by operations managers.

The Dilemma

As director of quality for a major appliance manufacturer, Ruth was reporting to the executive committee on the results of a program for correcting problems with a newly redesigned compressor (the motor that cools the refrigerator) that the company had recently begun using in its refrigerators. Following several customer complaints, the quality lab had determined that some of the new compressor units ran more loudly than expected. One corrective option was simply waiting until customers complained and responding to each complaint if and when it occurred. Ruth, however, decided that this approach was inconsistent with the company's policy of being the high-quality leader in the industry. Insisting on a proactive, "pro-quality" approach, Ruth initiated a program for contacting all customers who had purchased refrigerators containing the new compressor.

Unfortunately, her "quality-and-customers-first" policy was expensive. Service representatives nationwide had to phone every customer, make appointments for home visits, and replace original compressors with a newer model. Because replacement time was only 30 minutes, customers were hardly inconvenienced, and food stayed refrigerated without interruption. Customer response to the replacement program was overwhelmingly favorable.

Near the end of Ruth's report, an executive vice president was overheard to comment, "Ruth's program has cost this company $400 million in service expenses." Two weeks later, Ruth was fired.

Team Activity

Assemble a group of four students and assign each group member to one of the following roles:

- Ruth
- Ruth's boss
- customer
- company investor

ACTION STEPS

1. Before hearing any of your group's comments on this situation, and from the perspective of your assigned role, do you think that Ruth's firing is consistent with the company's desire for industry leadership in quality? Write down the reasons for your position.
2. Before hearing any of your group's comments on this situation, and from the perspective of your assigned role, what are the underlying ethical issues, if any, in this situation? Write down the issues.
3. Gather your group together and reveal, in turn, each member's comments on Ruth's firing. Next, reveal the ethical issues listed by each member.
4. Appoint someone to record main points of agreement and disagreement within the group. How do you explain the results? What accounts for any disagreement?
5. From an ethical standpoint, what does your group conclude is the most appropriate action that should have been taken by the company in this situation?
6. Develop a group response to the following question: What are the respective roles of profits, obligations to customers, and employee considerations for the firm in this situation?

VIDEO EXERCISE MyBizLab

Method

Learning Objectives

The purpose of this video is to help you:

1. Explain how utility is created through the production process.
2. Describe the advantages and disadvantages of outsourcing for an organization.
3. Identify the activities and underlying objectives involved in total quality management.

Synopsis

While soap has been around for centuries, Method has taken a new approach to the production of this essential product. Method, founded by Adam Lowry and Eric Ryan, seeks to make fundamental change through the design, production, and distribution of their home cleaning and laundry products. A core value of the company is adherence to the Cradle to Cradle philosophy, which seeks to produce products that are infinitely renewable and recyclable. Cradle to Cradle certification is administered through MBDC (McDonough Braungart Design Chemistry), a global sustainability consulting and product certification firm. While being committed to environmental goals, Method must also produce their products in a cost efficient manner to keep prices close to their competition. One option for Method would be to design and build their own manufacturing facility. This would create assurance that they could address environmental concerns, but it would increase costs. To maintain their competitive position, Method has chosen to contract with outside manufacturers to produce Method products according to their exacting standards.

DISCUSSION QUESTIONS

1. Utility is the ability of a product to satisfy a want or need. What types of utility does Method create through their product line?
2. How are Method's products different from those of their competition?
3. Why did Method choose to outsource production of their products? What are the advantages and disadvantages of outsourcing?
4. How is Method's packaging different?
5. Method seeks to meet ISO 14000 standards, including ISO 14001 which seeks improved environmental performance. How do they achieve this goal?

Online Exploration

By visiting Method's website www.methodhome.com, you will gain insight into the company's mission, values, and products. Method works to reduce its impact on the environment in every decision that it makes, from the ingredients in their products to the manufacturing process to packaging decisions. Method carefully weighed the alternatives in packaging from post-consumer PET to bio-plastics and ultimately decided that traditional plastics were better for the environment. Read more about this, clicking on "sustainable packaging" under the "inside the bottle" heading on the right side of the page. What factors led Method to decide to use a more traditional plastic, post-consumer PET, for their packaging? Do you agree with their decision?

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