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sports while their children are supervised by Club Med counselors at a children's park nearby. More recently, Club Med has added cruise ships to its vacation possibilities to attract the more senior members who are no longer interested in water sports. As this example illustrates, service firms that capture customer data at the time of the initial purchase have the opportunity to establish a lifetime relationship, with the potential for creating new or modified services for future purchase.

#### *Micromarketing*

Today, we can see a truly focused service strategy that can target customers at the micro level. Bar coding and checkout scanner technology create a wealth of consumer buying information that can be used to target customers with precision. Analysis of this database allows marketers to pinpoint their advertising and product distribution. To increase sales, Borden Inc. has used such information to select stores in which to feature its premium pasta sauce. Kraft USA saw its sales of cream cheese increase after targeting its flavors to the tastes of a particular store's shoppers. American Express, by analyzing information about its customers and their changing spending patterns in meticulous detail, can even tell when they get married.

#### **Productivity Enhancement**

New developments in the collection and analysis of information have increased our ability to manage multisite service operations. Through use of bar code information, retail inventory can be managed on a daily basis to make better use of shelf space by matching displayed products with sales. Information collected on the performance of multisite units can be used to identify the most efficient producers, and productivity is enhanced system-wide when the sources of these successes are shared with other sites. The foundation for a learning organization is then established.

#### *Inventory Status*

Using a tablet computer, Frito-Lay sales representatives have eliminated paper forms. They download the data collected on their routes each day via the Internet to the Plano, Texas, headquarters, and the company then uses these data to keep track of inventory levels, pricing, product promotions, and stale or returned merchandise. These daily updates on sales, manufacturing, and distribution keep fresh products moving through the system, matching consumer demands. For a perishable product like potato chips, having the right product at the right place and in the proper amount is critical to Frito-Lay's success.

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**Data Envelopment Analysis**

*Data envelopment analysis* (DEA) is a linear programming technique developed by Abraham Charnes, William W. Cooper, and Edwardo Rhodes to evaluate nonprofit and public sector organizations. Subsequently, it has found applications in for-profit service organizations. DEA compares each service delivery unit with all other service units for a multisite organization, and it computes an efficiency rating that is based on the ratio of resource inputs to outputs. Multiple inputs (e.g., labor-hours, materials) and multiple outputs (e.g., sales, referrals) are possible and desirable in measuring a unit's efficiency. The linear programming model uses this information to determine the efficiency frontier on the basis of those units producing at 100 percent efficiency. Areas for improvement can be identified by comparing the operating practices of efficient units with those of less efficient units. Sharing management practices of efficient units with less efficient units provides an opportunity for the latter's improvement and enhancement of total system productivity. Repeated use of DEA can establish a climate of organizational learning that fuels a competitive strategy of cost leadership.

In one case, applying DEA to a 60-unit fast-food restaurant chain found 33 units to be efficient. Three outputs (i.e., food sales for breakfast, lunch, and dinner) and six inputs (i.e., supplies and materials, labor, age of store, advertising expenditures, urban versus rural location, and existence of a drive-in window) were used. It is interesting to note that the inputs included both discretionary and uncontrollable variables (e.g., the demographic variable of urban/rural locations, whether or not the unit had a drive-in window). The topic of data envelopment analysis is covered in more detail as a supplement to Chapter 7, Process Improvement.

**The Internet of Things (IoT)**

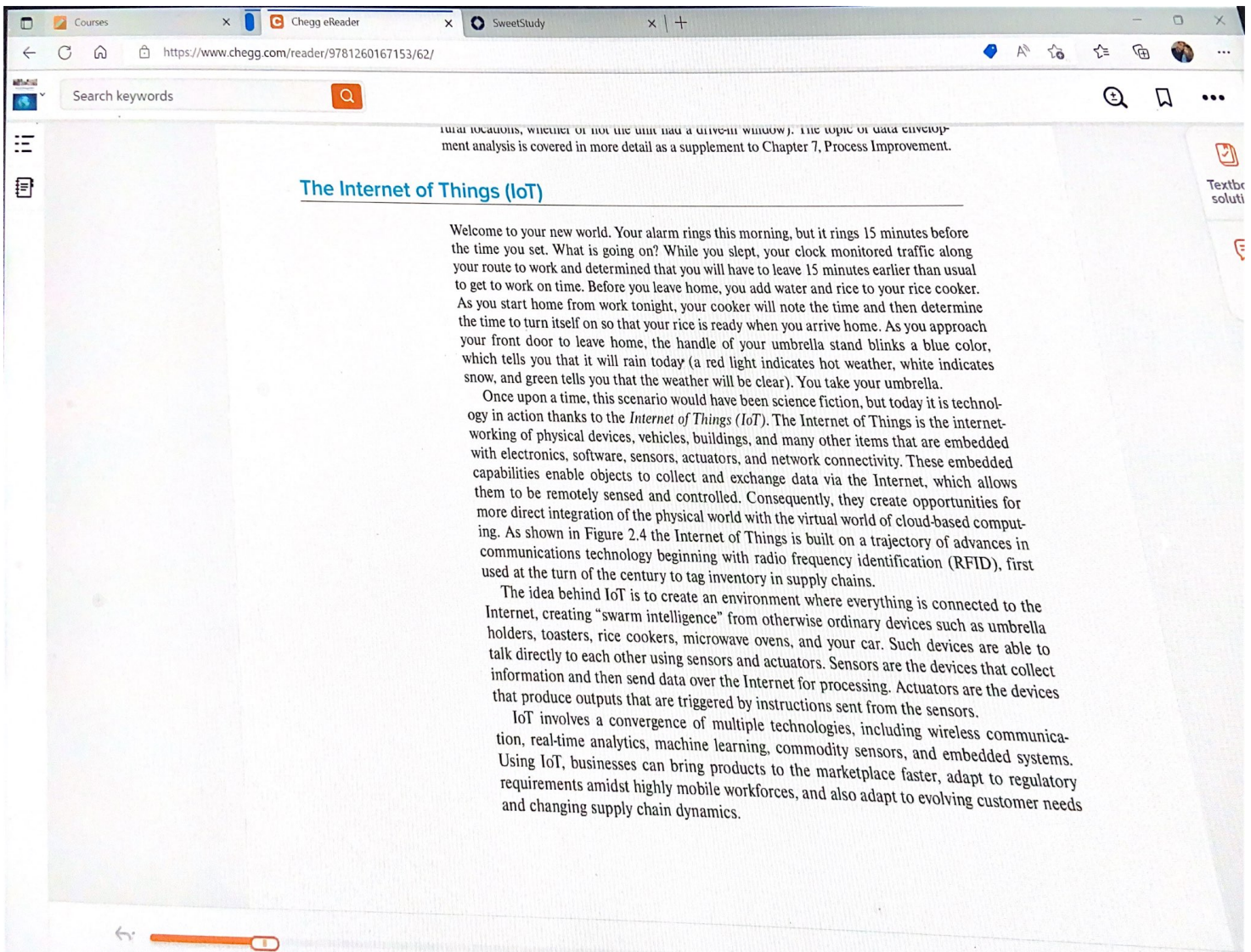
Welcome to your new world. Your alarm rings this morning, but it rings 15 minutes before the time you set. What is going on? While you slept, your clock monitored traffic along your route to work and determined that you will have to leave 15 minutes earlier than usual to get to work on time. Before you leave home, you add water and rice to your rice cooker. As you start home from work tonight, your cooker will note the time and then determine the time to turn itself on so that your rice is ready when you arrive home. As you approach your front door to leave home, the handle of your umbrella stand blinks a blue color, which tells you that it will rain today (a red light indicates hot weather, white indicates snow, and green tells you that the weather will be clear). You take your umbrella.

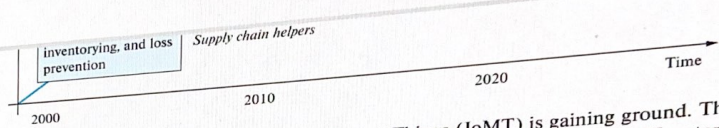
Once upon a time, this scenario would have been science fiction, but today it is technology in action thanks to the *Internet of Things (IoT)*. The Internet of Things is the networking of physical devices, vehicles, buildings, and many other items that are embedded with electronics, software, sensors, actuators, and network connectivity. These embedded

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In the field of health care, Internet of Medical Things (IoMT) is gaining ground. This capability involves medical devices and applications that connect to health care IT systems through online computer networks. Medical devices equipped with Wi-Fi allow machine-to-machine communication that is linked to cloud platforms such as Amazon Web Services, on which captured data can be stored and analyzed.<sup>12</sup>

Examples of IoMT include remote monitoring of patients with chronic conditions, tracking patient medication orders, and locating patients admitted to hospitals. Patients wear devices such as wrist bands that can send information to caregivers. Infusion pumps that connect to analytics dashboards and hospital beds that are rigged with sensors to measure patients' vital signs are other examples of IoMT technology. The practice of using IoMT devices to monitor patients in their homes remotely is also known as telemedicine. Use of telemedicine spares patients from traveling to a hospital or physician's office whenever they have a medical situation or a change in health condition.

Drawbacks of IoMT include overloading physicians with too much data and distracting them from treating patients. In addition, hospitals and insurance agencies must tweak their security policies continuously to keep up with technological advancements.

IoT involves privacy concerns because it opens your personal activities to public access through the Internet, which is a massive open-publishing platform. While technology, by itself, is simply an enabler, it can definitely be misused by third parties with ulterior motives. Massive storage capabilities, especially in the cloud, and the advent of strong data mining tools allow personal data to be searched and exposed for the entire world to see. Posting your party photographs on Facebook is one thing, but it is a completely different story for an unsolicited third party to dig into your intimate lifestyle and medical history.

Recent stories on computer hacking via the Internet and leaking of personal information by groups such as Wikileaks demonstrate that IoT remains a risky venture. Contractual obligation clauses are included in most business ventures on how much information can be shared with outside parties, even including the government and the police. Can giving up some control on the privacy of personal information be justified in the face of terrorist threats or the safety of the country? Legal, social, and ethical discussions on this subject are sure to continue.

Determining what level of Internet of Things is appropriate will be the subject of much debate in coming years. Just because technology exists to control your household devices

using the Internet from remote locations, do the benefits truly exceed the risks? Should the fear of misuse hinder the advancement of technology toward a better life? In today's technological world, practitioners of IoT might have an opportunity (and perhaps a responsibility?) to contribute to providing moral leadership in many of the upcoming social and ethical challenges that technology offers.

### Data Analytics in Services

Data analytics refers to the discovery, interpretation, and processing of meaningful patterns in data for improved decision making. This process involves simultaneous application of statistics, computer programming, and operations research to quantify an organization's performance. The broad subject of data analytics often is broken down into subordinate areas of descriptive analytics, diagnostic analytics, predictive analytics, and prescriptive analytics as shown in Figure 2.5. Businesses use analytics to describe, analyze, and predict business performance to gain actionable insights that can foster smarter decisions and better outcomes.

Data analytics and big data are associated terms. Big data are extremely large and complex data sets that can be computationally analyzed to reveal patterns and trends. It is important to differentiate ordinary *data* from useful *information* to obtain relevant *knowledge*. Author and analyst Nate Silver calls this extracting the *signal* from the *noise*. The traditional three-layer model of data-information-knowledge was extended to the current four-layer maturity model of data-information-knowledge-wisdom. We offer a five-layer model of data-information-knowledge-fact-evidence. This five-layer model screens ordinary *data* to obtain *information* that can be used to create new *knowledge*. Computational methods then are used to establish *facts* that can be proven quantitatively and offered as *evidence* for business purposes.

As shown in Table 2.4, use of analytics has become commonplace across industries. For a Hollywood example, recall the use of analytics to draft players for the Oakland A's in the book and movie *Moneyball*.

Analytics can be challenging because a business must keep up with the four components of big data—volume, variety, velocity, and variability. These components change fast and require special optimization techniques and computational capabilities to manage them.

In the customer service domain, the use of data analytics is far from optimal for several reasons, including lack of integration of different phases of customer service and

**FIGURE 2.5**  
Big Data

What types of questions can Big Data help answer?  
Gartner Analytic Ascendancy Model

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duplication of efforts. For example, good use of data analytics by a call center allows for personalization of the customer experience, which in turn can lead to improvements in customer satisfaction and cost efficiency. Analytics can be used to best advantage by including data collection that spans the entire customer journey, understanding customer needs better, using predictive analytics and machine-learning to anticipate important events, and using customer feedback to tune the analytics platform continuously.<sup>13</sup>

In a typical firm, some minimal level of data analysis is necessary for day-to-day activities—to keep the lights on. For example, in health care this analysis will include areas such as the human resource system, basic patient records, parts supply, and patient billing. The true benefits of higher-level analytics, however, are realized if a health care firm can leverage technology and quantitative analysis to achieve transformational changes by using capabilities such as an electronic health record (EHR) integrated system (e.g., EPIC software), telemedicine, mobile medical devices, surgical suite monitoring, and real-time medical alerts. The area of health analytics has the potential to reduce treatment costs, predict outbreaks of epidemics, avoid preventable diseases, and improve quality of life in general. The nature of such complexities makes big data and business analytics the next frontier for innovation, competition, and productivity.

### The Virtual Value Chain<sup>14</sup>

Today, businesses compete in two worlds: a physical world of people and things called a *marketplace* and a virtual world of information called a *marketspace*. For example, after Barnes and Noble opened a website it established a presence in the virtual marketspace created by the Internet, but it also continued its competitive position as the leading bookstore in the marketplace. The nature of the marketspace that requires customer information for order fulfillment also enables the service provider to collect useful information such as customer buying behavior and addresses. The marketspace information also can be used to improve the service delivery process and create customer value.

The process of creating value has long been described as stages linked together to form a *value chain*. The traditional physical value chain, as shown at the top of Figure 2.6, consists of a sequence of stages beginning with manufacturing and ending with sales to a customer. The *virtual value chain*, as shown at the bottom of Figure 2.6, traditionally has been treated as information supporting physical value-adding elements, but not as a source of value itself. For example, managers use information on inventory levels to monitor the process, but they rarely use information itself to create new value for the customer. This is no longer the case for breakthrough service companies. For example, FedEx now exploits its information database by allowing customers to track packages themselves using the company's website on the Internet. UPS and the USPS have followed suit. Now customers can locate a package in transit by entering the airbill number, and they can even identify

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To create value with information, managers must look to the marketpace. Although the value chain of the marketpace can mirror that of the marketplace, the value-adding process first must gather raw information that is processed and finally distributed. The value-adding steps are virtual in that they are performed through and with information. Creating value in any stage of a virtual value chain involves a sequence of five activities: gathering, organizing, selecting, synthesizing, and distributing information. The United Services Automobile Association (USAA), which provides financial services to military personnel and their families, has become a world-class competitor by exploiting the virtual value chain. USAA moved from the marketplace to marketpace in a four-stage evolution.

### First Stage (New Processes)

The first stage involves seeing the physical operations more effectively with information. USAA became a "paperless operation," as it moved from a manual paper-based filing system to one based on a central computerized database with access via desktop terminals.



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**Second Stage (New Knowledge)**

In the second stage, virtual alternatives substitute for physical activities. At USAA, information systems were installed to automate the core business of insurance sales and underwriting. In the process, USAA captured significant amounts of information about customers who are members of the association. Unlike a typical insurance company, USAA has no traveling sales force and all of its business is conducted by telephone, mail, or Internet. All member-contact employees are trained to evaluate members' needs and provide appropriate products and services. Consequently, USAA has been able to build a database on its members who are accustomed to doing business with relatively little human interaction.

**Third Stage (New Products)**

In this stage, member information is analyzed to discover new product needs and methods to deliver value. As the database accumulated, USAA prepared member risk profiles and customized policies. Analyzing the flow of information harvested along the virtual value chain, in particular the aging of its members, USAA instituted products targeted to members' evolving needs, such as property and casualty insurance, banking products and services, life and health insurance, mutual funds, and retirement communities. The "event-oriented service" anticipates individual member needs such as a teenage child requiring auto insurance. Today, members can manage their financial portfolios using the USAA website.

**Fourth Stage (New Relationships)**

In the final stage, opportunities for customer collaboration in the co-creation of value are explored. Retired and active duty members of USAA need financial planning. In response, USAA created web-based investment planning tools and frequent online interactive seminars dealing with current financial issues.

**Economics of Scalability**

*Scalability* is the ability of a firm to improve contribution margins (Revenue – Variable costs) as its sales volume increases. Infinite scalability can occur *only* when the variable cost of serving an additional customer is zero. There are three sources of scalability: (1) conduct only information or data-transfer services (e.g., online encyclopedia), (2) allow customers to serve themselves (e.g., online reservations), and (3) let customers serve other customers (e.g., online auctions).

As shown in Table 2.5, the features of a service determine the extent of scalability that is possible. Note that Kbb represents Kelly Blue Book, a source for new and used

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USAA website.

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As shown in Table 2.5, the features of a service determine the extent of scalability that is possible. Note that Kbb represents Kelly Blue Book, a source for new and used car prices. InfoHub serves as a liaison between those who want “special-interest” travel and providers. BlueApron is a meal-service company that delivers to subscribers packets of meal-sized ingredients and recipes to transform those ingredients into a dinner. Amazon has taken retailing farther with its ability to facilitate business management in the cloud.

Scalability is not enough because, without differentiation, the service can lead to commoditization with only the price leader surviving. Differentiation can be accomplished by capitalizing on the “network effect.” When the value for any one customer increases with the growth in total number of customers such as in online auctions (e.g., eBay), a network effect is experienced. Also, cultivating a reputation for effective human intervention can lead to a strategic advantage. Because customers often need help, a staff of responsive, effective, and empathetic call-center agents can foster customer loyalty.

Internet-enabled service is, of course, self-service delivered at home. We might be surprised at just how satisfied customers are with Internet service. In Table 2.6, the Internet services (Internet Retail, Internet Travel, and Internet Investments) are in good company

**TABLE 2.6**  
Customer Satisfaction  
Scores

Source: American Customer  
Satisfaction Index, University of  
Michigan, Ann Arbor, Michigan,  
<http://www.theacsi.org>.

Rank	Service Industry	Customer Satisfaction Scale of 0–100
1	Limited service restaurant (Chick-fil-A)	86
	Supermarkets (Wegmans)	86
2	Full service restaurants (Cracker Barrel)	83
	Internet retail (Amazon.com)	83
3	Consumer shipping (FedEx)	82
	Department stores (Nordstrom)	82
4	Hotels (Hilton)	81
	Internet travel (Priceline)	81
	Specialty stores (Costco and L Brands)	81
5	Airlines (JetBlue)	80
	Internet investment services (Vanguard)	80

with other service firms because of their reputation for exceptional service. The firms selected for inclusion in Table 2.6 are the leaders in customer satisfaction in their respective industries. Self-service has become an established and appreciated delivery mode for digital services.

### Limits in the Use of Information

So far only the benefits of using information as a competitive strategy have been addressed. Some of these strategies, however, raise questions of fairness, invasion of privacy, and anticompetitiveness. Also, if these strategies were abused, the result could harm consumers.

#### Anticompetitive

To create entry barriers, the use of reservation systems and frequent user programs has been identified as potentially anticompetitive. For example, how should a frequent flyer's free-trip award be considered, particularly when the passenger has been traveling

on business at corporate expense? The IRS is considering taxing the free trip as income in kind, and corporations believe that the free tickets belong to the company. The long-run implication, however, is the removal of price competition in air travel.

**Fairness**  
Perhaps the easiest way to start a riot is asking airline passengers on a flight how much their tickets cost. Under yield management, ticket prices can change every hour; therefore, price is a moving target and the ticketing process a lottery. At the extreme, is yield management fair and equitable to the public, or has every service price always been negotiable? Are customers only now becoming aware of their buying power?

**Invasion of Privacy**  
The concept of micromarketing has the potential to create the most violent backlash from consumers because of the perceived invasion of privacy. When a record of your every purchase at the local supermarket is shared with eager manufacturers, very manipulative sales practices, such as targeting buyers of a competitor's soft drink with enticements to buy an alternative, could result. Lotus Development Corporation felt the sting of consumer displeasure after announcing the availability of its MarketPlace household database to anyone with a PC and modem. Lotus received more than 30,000 requests from irate persons wanting to be removed from this database. Lotus subsequently withdrew its offer of general availability, but continued to sell access to the database to large corporations. The company was acquired by IBM in 1995.

**Data Security**  
Allowing information to get into the hands of others for inappropriate use is a significant problem for government agencies such as the IRS; however, releasing personal medical records to insurance firms or potential employers without the consent of the patient is far more common—and damaging. Some businesses market lists of people who have filed worker compensation claims or medical malpractice suits, and such databases can be used to blackball prospective employees or patients.

**Reliability**  
Are the data accurate? Data kept on individuals can be corrupted and create havoc in people's lives. For example, a new law ameliorates such dilemmas by requiring credit-report agencies to allow individuals to review their credit records for accuracy.

[Using Information to Categorize Customers<sup>15</sup>](#)

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## Using Information to Categorize Customers<sup>15</sup>

Service firms have become sophisticated in the use of information to target those customers who are worth extra pampering because of heavy purchases while ignoring others who are only casual users. The following popular techniques are used to serve customers based on their profitability to the company:

- *Coding* grades customers based on how profitable their business is. Each account is given a code with instructions for service staff on how to handle each category.
- *Routing* is used by call centers to place customers in different queues based on a customer's code. Big spenders are whisked to high-level problem solvers. Others may never speak to a live person at all.
- *Targeting* allows choice customers to have fees waived and get other hidden discounts based on the value of their business. Less valuable customers may never even know the promotions exist.
- *Sharing* corporate data about your transaction history with other firms is a source of revenue. You can be slotted before you even walk in the door, because your buying potential has already been measured.



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## Stages in Service Firm Competitiveness<sup>16</sup>

If a service firm is to remain competitive, continuous improvement in productivity and quality must be part of its strategy and corporate culture. The framework shown in Table 2.7 was developed by Chase and Hayes to describe the role of operations in the strategic development of service firms. This framework also is useful as an illustration of the many sources of productivity and quality improvement (i.e., new technology is only one source). In addition, the framework provides a way to measure and evaluate a firm's progress in the development of its service delivery system. It organizes service firms into four different stages of development according to their competitiveness in service delivery, and for each stage, the management practices and attitudes of the firm are compared across key operational dimensions.

It should be noted that services need not start at stage 1, but during their life cycle, they could revert to stage 1 out of neglect. For example, one might argue that FedEx began service as a stage 3 competitor because of its innovative hub-and-spoke network concept, whereby all sorting is accomplished at the single Memphis hub (thus guaranteeing overnight delivery).

### Available for Service

Some service firms—and, often, government services in particular—fall into this category because they view operations as a necessary evil to be performed at minimum cost. There is little motivation to seek improvements in quality because the customers often have no alternatives. Workers require direct supervision because of their limited skills and the potential for poor performance that results from minimal investment in training. Investment in new technology is avoided until it is necessary for survival (e.g., consider the long-overdue adoption of Doppler radar by the Federal Aviation Administration for air traffic control). These firms are essentially noncompetitive, and they exist in this stage only until they are challenged by competition.

### Journeyman

After maintaining a sheltered existence in stage 1, a service firm may face competition and, thus, may be forced to reevaluate its delivery system. Operations managers then must adopt industry practices to maintain parity with new competitors and avoid a significant loss of market share. For example, if all successful fast-food restaurants have drive-thru windows, then a new entrant might be inclined to do the same. The contribution of operations in this situation becomes competitive-neutral, because all the firms in the industry have adopted similar practices and even look like each other.

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When firms do not compete on operations effectiveness, they often are creative in competing along other dimensions (e.g., breadth of product line, peripheral services, advertising). The workforce is disciplined to follow standard procedures and is not expected to take any initiative when unusual circumstances arise. These firms have not yet recognized the potential contribution of operations to a firm's competitiveness.

### **Distinctive Competence Achieved**

Firms in stage 3 are fortunate to have senior managers with a vision of what creates value for the customer and who understand the role that operations managers must play in delivering the service. For example, Jan Carlzon, former CEO of Scandinavian Airlines (SAS), realized that recapturing the business-traveler market, which had been lost to aggressive competition, required improving on-time departure performance. To achieve this goal, he had to provide a leadership role that fostered operations innovations, like not allowing late passengers to board an aircraft even if it had not yet departed the gate.

Operations managers are the typical advocates of continuous improvement (Six Sigma) in their firms and take the lead in instituting service guarantees, worker empowerment, and service-enhancing technologies. Workers in these organizations often are cross-trained and encouraged to take the initiative when necessary to achieve operational goals that are

World-class service firms such as Disney and Marriott define the quality standards by which others are judged.

New technology no longer is viewed only as a means to reduce costs; it is considered to be a competitive advantage that is not easily duplicated. For example, FedEx developed COSMOS (Customer Operations Service Master On-line System) to provide a system that tracks packages from pickup to delivery. Customers, using the Internet and the FedEx website, can receive information on the exact location of their packages. This system also can be used to tell a driver en route to make customer pickups.

Working at a world-class firm is considered to be something special, and employees are encouraged to identify with the firm and its mission. For example, a Disney trash collector is considered to be a "cast member" who helps visitors to enjoy the experience.

Sustaining superior performance throughout the delivery system is a major challenge. Duplicating the service at multiple sites, however, and in particular overseas, is the true test of a world-class competitor.

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## Summary

We first looked at the strategic service vision and answered a number of questions before implementing the service. Our discussion then turned to the economic nature of competition in the service sector. The fragmented nature of service industries populated with many small- to medium-sized firms suggests a rich environment for the budding entrepreneur.

The three generic competitive strategies of overall cost leadership, differentiation, and focus were used to outline examples of creative service strategies. Because of the transferability of concepts among service firms, strategies that are successful in one industry may find application in firms seeking a competitive advantage in another service industry.

Next, we looked at several dimensions of service competition and examined the concepts of service winners, qualifiers, and losers as competitive criteria.

The strategic role of information in service strategies is organized into four categories: creation of barriers to entry, revenue generation, database asset, and productivity enhancement. Information-based competitive strategies were illustrated for each category.