

# Information Systems in the 2010s

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References

## Learning Objectives

- 1 Understand the role of information technology (IT) in optimizing performance.
- 2 Explain why the business value of IT is determined by people, business processes, and organizational culture.
- 3 Describe the role of IT in business performance management and the performance measurement process.
- 4 Understand the strategic planning process, SWOT analysis, and competitive models.
- 5 Discuss how IT impacts your career and the positive outlook for IS management careers.

## Integrating IT



ACC



FIN



MKT



OM



HRM



IS

## Chapter 1 LINK LIBRARY

- How to generate a Microsoft Tag** [microsoft.com/tag/](http://microsoft.com/tag/)
- How to create a custom 2D tag** [mediadl.microsoft.com/mediadl/www/t/tag/CreatingCustomTags.wmv](http://mediadl.microsoft.com/mediadl/www/t/tag/CreatingCustomTags.wmv)
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- United Kingdom National Offender Management Information System project (NOMIS)** [nao.org.uk/whats\\_new/0708-1/0809292.aspx](http://nao.org.uk/whats_new/0708-1/0809292.aspx)

## QUICK LOOK at Chapter 1, Information Systems in the 2010s

*This section introduces you to the business issues, challenges, and IT solutions in Chapter 1. Topics and issues mentioned in the Quick Look are explained in the chapter.*

A strategically important technology trend in businesses worldwide is the growth of **interactivity applications**. Interactivity applications connect, communicate, collaborate, and do commerce on-demand, in real-time, and at a distance. The capability to “reach and respond” on-demand became technically possible thanks to the integration of broadband telecommunications, the Internet, digital communications, high-performance mobile devices, and the digitization of all media content. Integration of information technology (IT) forms the *critical infrastructure*, and that infrastructure enables the next wave of IT developments and breakthroughs.

Why does IT matter to managers? New IT capabilities (e.g., e-commerce and social networks) strongly influence competitive strategies and the efficiency of operations. Imagine the disadvantage to a traditional international retailer, like U.S.-based Walmart (*walmart.com*) or France’s Galeries Lafayette (*galerieslafayette.com*), that did not sell via an e-commerce Web site. What would be the impact on a news service such as Reuters that did not add multimedia or on a network such as CNN that did not offer RSS feeds and podcasts in its media mix?

No doubt, failing to invest in IT could drive companies out of business.

New IT developments are important to all business disciplines because they trigger changes in marketing, operations, e-commerce, logistics, human resources, finance, accounting, and relationships with customers and business partners. Nothing about business or **corporate strategy** is untouched by IT. Corporate strategy is the collection of activities and actions a company chooses to invest in and perform, and those it chooses not to invest in or perform.

In Chapter 1, we provide a look at some of the latest IT developments and how companies might deploy them to improve performance. You learn about business-critical information system (IS) applications and IT solutions, most of which integrate wireless networks and social technologies, like Facebook and Twitter. We explain how IT innovations are shaking up or disrupting the ways companies do business, the jobs of managers and workers, the design of business processes, and the structure of markets. IT has evolved from narrowly focused data processing and routine reports in the mid-1970s to a function that supports business processes, manages relationships with customers and suppliers, and creates limitless possibilities in the 2010s—when out of touch means out of business.

By mid-2010, over 500 million mobile subscribers worldwide routinely accessed online content on their mobile browsers. Many users take the Internet into their own hands, accessing it only on an iPhone, Palm Pre, or BlackBerry. Consider the business opportunities that this situation creates—being able to interact with tech-savvy gadget-people not just at any time and place, but at the *optimal* time and place. The optimal time and place, from a marketing viewpoint, is when the customer is most likely to respond to an offer or want to engage in the interaction. Two-dimensional (2D) tag technology provides this capability. **2D tags** make it possible to interact with individuals via the devices closest to them and when they'd be most interested or responsive.

## Understanding 2D Tags and Technology

**Barcodes** that you commonly find on products are a 1-dimensional (1D) series of black-and-white stripes. Product and price data are stored in stripes that are readable by specialized scanners. New 2D tags consist of boxes or dots that form a matrix-like pattern, as shown in Figure 1.1. Each small box or dot contains information, which might be a Web site address. When a camera snaps a 2D tag, the app may load a Web site, instruction, or interactive experience, depending on what's encoded in the tag.



**Figure 1.1** Comparison of 1D barcode and 2D tag. (Wendell Franks/iStockphoto), (Martin McCarthy/iStockphoto)

Benefits of tags are that they have greater capacity than striped barcodes, can be designed to be visually interesting, and can be read by digital cameras on smartphones. In order to be able to read tags, a software app must be downloaded to a smartphone, which turns the camera into a scanner. The camera needs to meet the code's minimum image resolution for reliable performance, which is not much of a problem because tags are designed to be snapped (scanned) by limited-performance cameras. It's relatively simple for users to find and install the software for the iPhone and BlackBerry from app (application) stores.

## Introduction of 2D Tags

In the early 2000s, 2D tags became popular in Japan, mostly due to mobile companies that wanted to take advantage of Internet browsing on smartphones. The 2D technology

spread throughout Japan, Europe, and the United States. Companies were using tags to push content to mobile devices for advertising, mobile commerce, customer service, and other revenue-generating purposes.

Microsoft introduced its own 2D tag format in January 2009, simply named Tag. Microsoft Tag uses color to increase the density of information that can be stored. Being able to use color enables designers to create artistic tags—several of which were on exhibit at the Metropolitan Museum of Art (MoMA). Visit [moma.org/interactives/exhibitions/2008/elasticmind/#/154/](http://moma.org/interactives/exhibitions/2008/elasticmind/#/154/) to view them.

## Types of 2D Codes

Several types of 2D codes and readers exist. In Europe and America, the most common barcode types are QR (quick response) Code and Data Matrix. Google's mobile Android operating system (OS) supports QR Codes by including the ZXing scanner on some models. Nokia's Symbian OS also has a barcode scanner that reads QR codes. See Fig. 1.2. iPhones can decode QR, Data Matrix, and Aztec Codes formats. The Microsoft Tag Reader is compatible with numerous mobile platforms, including Apple iPhone; BlackBerry 81xx, 83xx, and Bold; J2ME-based handsets; Symbian S60 3rd Edition; and Windows Mobile 5 and 6.



**Figure 1.2** QR tag, code, or 2D barcode, used in tracking applications and for mobile phone users or mobile tagging. (Max Delson Martins Santos/iStockphoto)

## Assessing the Business Value of Interactivity

For managers, the critical issue with any new IT is to identify and take advantage of its potential business value. To understand 2D tags' potential business value, consider the following list of interactivities that can occur by snapping a tag:

- Open a microsite on the mobile browser
- Push (deliver) text or a message, such as an ad or address, to the handheld device
- Start streaming a video or audio file
- Download an image, document, or other type file
- Initiate an e-mail, instant message, phone call, fax, or other communication

Marketers are devising ways to add interactivity to their products and offline media, such as print materials. Companies can reach prospective and current customers by making their print ads immediately actionable and entertaining. Other benefits of interactivity include being able to track actions that customers take. Using tracking data, analysts can evaluate what works best to learn how to improve their marketing strategies. Given the huge expense of advertising campaigns, knowing what works can increase sales revenues and decrease waste. Here are four examples showing the value-added possibilities of tag-triggered interactivity:

- British retailer Marks and Spencer put Data Matrix 2D codes on their own brand of freshly squeezed juice, which lead to their “Food to Go” mobile Web site. The tag is printed directly onto the packaging and, when snapped, loads a mobile site with information about the product and a voucher for money off the next juice purchase.
- In Singapore, starting in June 2009, Coca-Cola launched an ad campaign offering free downloadable content to consumers who snapped the tags on its cans. Tag technology is able to identify repeat scans and push fresh content towards the consumer. Linking physical objects to digital content is known as a **hardlink**.

- Continental Airlines added QR codes to its mobile boarding pass services at London’s Heathrow Airport. It was the first airline to offer the convenience of paperless boarding passes on nonstop international flights from the United Kingdom to the United States.
- Nike ran an ad campaign built around tags on posters at traveling extreme-sports competitions. At every stop of the extreme-sports tour, fans could snap codes on posters publicly displayed and strategically placed. Snapping the codes would get Nike-sponsored athletes’ videos, photos, and fan data.

### **Business Lessons Learned**

The introduction of 2D tags and readers that run on smartphones reinforces an important business principle: *What companies can do depends on what their information systems can do.* And what ISs can do depends increasingly on mobile devices (*mobiles*, for short), wireless networks, and social media. One obvious change is in e-commerce, which is being done substantially more on mobiles. As ITs mature and become more widespread, they add to the global IT infrastructure that support next-generation (next-gen) IT-based strategies.

### **For Class Discussion and Debate**

**1. Scenario for Brainstorming and Discussion:** Smartphones have innovative user interfaces and applications as well as significant processing power and storage capacity. And most owners would not ever be without their mobiles. Given those factors, consider a company that you buy products or services from that could benefit by using 2D tags. Benefits could be increased sales or improved customer loyalty.

- a. Explain how the company could benefit from the “power and presence” of smartphones and 2D tag interactivity.
- b. Describe where the 2D tags should be positioned or located to achieve the benefit.
- c. Compare and assess your answers with others in your class.

**2. Debate:** The paradox is that IT advances open up many new opportunities and threaten the status quo. Assume that

you work for a bank, credit union, or other financial institution whose problem is attracting new customers. Specifically, the company wants to attract recent college graduates and those in MBA programs. Your company wants to add 2D tags to postcards that are being mailed to targeted prospects (prospective customers) as part of a new marketing campaign. When tags on the postcards are snapped, the 2D tags would link to a compelling offer for customers who opened an account.

**To Do: There are two possible outcomes:** Either this proposed action will solve the problem or it won’t. The latter outcome would waste most of the advertising budget. Your position, therefore, is that you’re in favor of this IT solution or you’re against it. Select one of these two positions and defend it. You need to make logical assumptions to support your position.

## **1.1 Positioning IT to Optimize Performance**

Boom economic conditions typically provide companies with plenty of opportunities to improve performance. But during downturns and global financial crises, opportunities are harder to find and the risk of failure rises. As markets recover from a worldwide recession during the 2010s, managers are exploring new strategies to improve business performance, or profitability. One approach is to develop the *agility* needed to identify and capture opportunities more quickly than rivals.

## AGILITY + MOBILITY

The importance of being an **agile enterprise**, which is one that has the ability to adapt rapidly, has never been greater because of struggling economic recoveries and advances in mobile technology. Within this economic and technological context, we discuss how organizations can benefit from opportunities made possible by high-performance mobile devices and high-speed mobile telecommunication networks. Examples are the 3G (third-generation) and 4G (fourth-generation) networks of cellular service providers.

Mass migration of users from PCs to mobile devices has expanded the scope of ISs beyond traditional organizational boundaries—making *location* irrelevant for the most part. Perhaps equally significant, mobile technology has torn down the walls between our business, professional, and personal lives. We will examine the impacts of the commingling of business and personal lives in later chapters. For now, the focus is on the opportunities created by agility and mobility.

**IT in the Hands of Customers.** Organizations depend on IT to be able to adapt to market conditions and gain a competitive edge. That competitive advantage is short-lived if competitors quickly duplicate it. No advantage is very long-lasting. Therefore, companies need to upgrade, develop, and/or deploy new ISs to remain in the competitive game, as you will read throughout this book.

A profitable role for IT is developing ways to connect with and push content to social networks and mobile devices. During the last decade, companies were adapting to social networking. Facebook, LinkedIn, YouTube, Twitter, and blogs became extensions of businesses to reach customers, prospects, and business partners. By the start of our current decade, companies were adapting to the growing importance of being able to grab the attention of potential and current customers on their mobiles and also on customers' terms, as you will see in *IT at Work 1.1*. Making various elements of IT all work together is a huge concern because of its potentially large strategic payoff.

In the next section, we review this IT strategic challenge. You need to understand why, for example, an e-commerce Web site designed for a large laptop screen, which is found via a search engine and transferred over fiber-optic cables, may be dangerously inadequate in the age of 3G/4G/Wi-Fi smartphones and other mobile devices.

**Mobile Market Opportunities.** The iPad and Que—like the iPhone, BlackBerry, Pre, Nexus One, and other smart mobile devices—quickly become gadgets that owners depend on. Mobiles are replacing computers as the primary way to connect with public and private networks, to access digital content from anywhere at any time, and

## IT at Work 1.1

### Diffusion of Mobile Devices Creates Opportunities

Apple sold a record-setting 8.7 million iPhones in the fourth quarter of 2009 (4Q2009), in part because of a sales boost from the introduction of the iPhone in China. That was up 17.60 percent from the 7.4 million Apple had sold in the previous quarter (3Q2009) and double what it had sold during the same quarter in 2008 (4Q2008). A 100 percent year-over-year rise in iPhone sales is a signal of change and an opportunity not to be ignored.

In April 2010, Apple introduced the iPad ([apple.com/ipad/](http://apple.com/ipad/)), a 3G/Wi-Fi multitouch device that featured 12 brand-new apps and could run most of the 140,000 apps in the Apple store. That same month, Plastic Logic introduced Que ([quereader.com](http://quereader.com)), the world's first proReader, which is an e-reader for the work and lifestyles of business professionals. Que is an 8.5 × 11 inch

superthin 3G/Wi-Fi device designed for reading the document formats that business users need, such as PDF, Microsoft Excel, PowerPoint, and Word documents.

Research firms Yankee Group and In-Stat estimated nearly 1 million e-readers had shipped in 2008; sales are forecasted to jump to 28 million in 2013. In terms of sales revenues, e-reader sales will explode from \$400 million in 2009 to \$2.5 billion in 2013.

Sources: Compiled from [apple.com](http://apple.com) (2010), [quereader.com](http://quereader.com) (2010), Yankee Group (2009).

**Discussion Questions:** What changes do these sales of iPhones and e-readers signal? What opportunities do they present?

## IT at Work 1.2

### Facebook Changes from Social Network to Online Hub

In March 2010, Facebook pulled in more traffic in North America than Google. According to Experian Hitwise (*hitwise.com*), a global online competitive intelligence service firm, Facebook had 7.07 percent of all U.S. Internet activity for the week ending March 13, 2010. By comparison, Google had 7.03 percent of the market. Compared to 2009, Facebook's market share increased 185% within the year.

No longer is Facebook simply a social network. It has positioned itself as a major online hub, posing a competitive challenge to Google. Facebook has made great strides in real-time search, which Google had dominated for many years. What Facebook has achieved is best understood and analyzed by comparison to Google. Google is a giant, \$130 billion public company with an

immensely profitable business model, capturing \$23 billion in annual sales. Facebook is huge, but it is still a start-up company lacking a sustainable business model that can justify its current valuation, which is estimated to be between \$8 billion and \$15 billion. Facebook's ranking as number one is an interesting business case showing the power of IT to disrupt the status quo and transform industries.

Sources: Compiled from Eaton (2010) and *Weblogs.hitwise.com* (2010).

**Discussion Questions:** Visit *Facebook.com* and review the features that appeal to various age groups. Why does Facebook pull in such a huge amount of traffic? Explain how Facebook might be disrupting the status quo and transforming industries.

to get work done. Gadgets of all kinds are starting to look and feel like proper hand-held computers, able to run all sorts of software. Desktop and laptop computers are taking on more and more nontraditional duties, like streaming media to TV sets, stereos, and other household appliances. Business professionals use their mobile devices to fulfill business needs that keep their companies running at optimal levels of productivity, performance, and profitability.

This massive adoption of smart devices has created a huge base of multitasking users and a market for companies to tap and target. Touch-navigate devices running on 3G and 4G networks, combined with innovative technologies like 2D tags (as you read in the opening case), create business opportunities and threats. That is, they create opportunities for competitive advantage while destroying older ones. For example, according to Pew Research, newspapers saw ad revenue fall 26% during the 2009 and 43% over the period 2007–2010 (Pew Research, 2010).

Consumers expect to be continually informed—about work, news, bank balances, credit card charges, traffic, weather—regardless of where they are. Supervisors, subordinates, friends, and family send updates through SMS (texting), tweets (microtexts), and other mobile approaches. Part of Facebook's meteoric growth has to be attributed to mobility, as 65 million members access it from mobile devices. *IT at Work 1.2* describes this rapid growth. This growth is also true for Twitter, as 80% of all Twitter interactions take place over mobile devices.

#### BUSINESS INNOVATION AND DISRUPTION OF THE STATUS QUO

Widespread adoption of new technology is going to disrupt the usual way business is done. Facebook outranked Google, as you read in *IT at Work 1.2*. Apple created an entirely new market and changed the game for industries that were not its usual competitors—namely, music, media, and consumer electronics companies. With the iPod, iTunes, iPhone, and Web apps, Apple has moved the dynamics of several industries from being technology-led to being led by customer experience. Apple then leveraged the successful *personal mobile music* business model, adapted it, and applied it in other industries (media and consumer electronics).

Here are three examples in the commercial and nonprofit sectors of innovative disruptions triggered by IT.

1. The Vancouver winter Olympics in 2010 became the first *social media Olympics*. Twitter and Facebook were platforms used by marketers, athletes, and sports fans to share news, to get game updates, and to send and receive marketing promotions.

**TABLE 1.1** Assessing the Value of Innovation

Innovation leads to profitable growth if it:

- Generates new profit pools
- Increases demand for products and services
- Attracts new customers
- Opens new markets
- Sustains the business for years to come

**2.** Facebook, Skype, and blogs formed critical ISs in Haiti and Chile after catastrophic earthquakes. After the January and February 2010 earthquakes hit Haiti and Chile, Facebook, Skype, and blogs were used to communicate, find missing people, and spread requests for donations to the Haitian relief.

**3.** Whole Foods Market attracts customers and reinforces relationships via its free iPhone app. Whole Foods' app attracts customers by providing holiday-specific and healthy recipes whose ingredients link to a Whole Foods store locator with directions on how to get there. Instead of pursuing customers with traditional advertising only, Whole Foods is attracting new and current customers via its lower-cost and more targeted iPhone app. In the fiercely competitive food market industry, Whole Foods is using the *attraction advantage* to connect with and draw customers to its stores and to beat out competitors.

Not all innovations add value. In order to improve performance, innovation needs to achieve one or more goals. Table 1.1 lists characteristics for assessing the expected value of an innovation.

Mobile marketing efforts can be invasive. As you will read in greater detail in Part III of this book, use of mobile media requires understanding best and worst practices. For example, mobile marketing strategies need to include proper tracking of customer responses to ensure that customers are drawn in, rather than turned off, by mobile messages.

It is important to recognize that some types of IT are **commodities** that do not provide a special advantage. Commodities are basic things that companies need to function, like electricity and buildings. Computers, databases, and network services are examples of commodities. In contrast, how a business applies IT to support business processes transforms those IT commodities into competitive assets. Critical business processes are those that improve employee performance and profit margins. How a company generates revenue from its assets is referred to as its business model.

## BUSINESS MODELS

A **business model** is a method of doing business by which a company can generate sales revenue and profit to sustain itself. The model spells out how the company creates or adds value in terms of the goods or services the company produces. Some models are very simple. For example, Nokia makes and sells cell phones and generates profit from these sales. On the other hand, a TV station provides free broadcasting. Its survival depends on a complex model involving factors such as advertisers and content providers. Google and Yahoo also use a similarly complex business model.

According to McKay and Marshall (2004), a comprehensive business model is composed of these six elements:

- 1.** A description of all *products* and *services* the business will offer
- 2.** A description of the *business process* required to make and deliver the products and services
- 3.** A description of the *customers* to be served and the company's relationships with these customers, including what constitutes value from customers' perspective (*customers' value proposition*)

4. A list of the *resources* required and the identification of which ones are available, which will be developed in-house, and which will need to be acquired
5. A description of the organization's *supply chain*, including *suppliers* and other *business partners*
6. A description of the revenues expected (*revenue model*), anticipated costs, sources of financing, and estimated profitability (*financial viability*)

Models also include a **value proposition**, which is an analysis of the benefits of using the specific model (tangible and intangible), including the customers' value proposition. We examine value propositions in detail in the later section that covers business performance management.

The next section focuses on technology issues and provides an overview of core IS and IT concepts.

### Review Questions

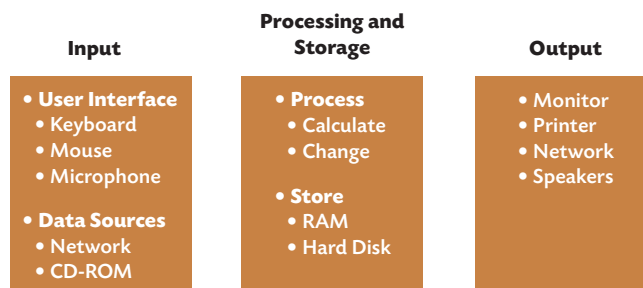
1. What are the characteristics of an agile organization?
2. What opportunities have been created by the mass migration of users from PCs to mobile devices?
3. Describe how to assess the value of an innovation.
4. What is a business model?

## 1.2 Information Systems and Information Technology: Core Concepts

An **information system (IS)** collects, processes, stores, analyzes, and distributes information for a specific purpose or objective. Basic functions of an IS are shown in Figure 1.3 and described below.

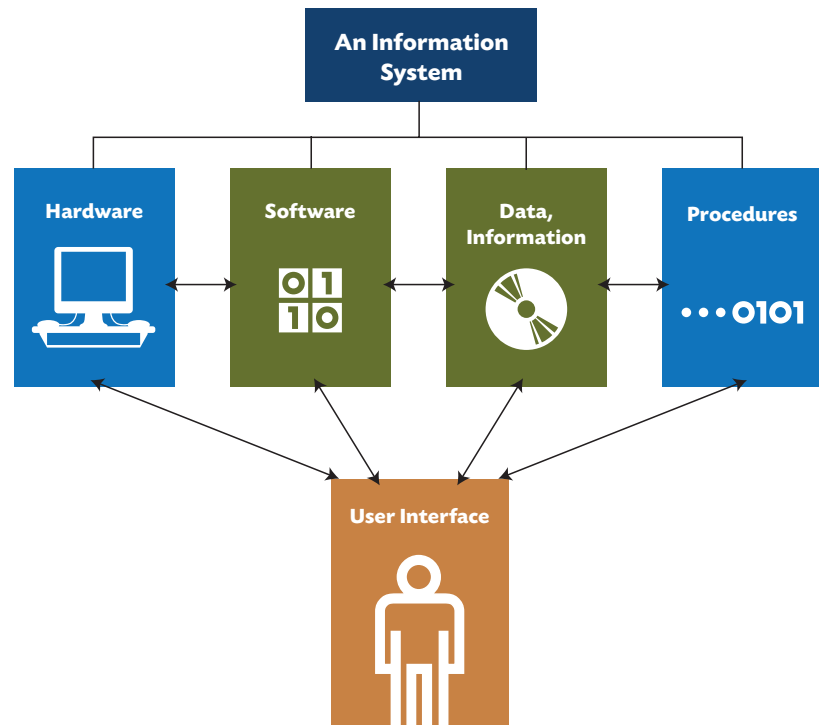
- **Input.** Data and information about business transactions are captured or collected by point-of-sale (POS) scanners and Web sites and received by other input devices.
- **Processing.** Data is transformed, converted, and analyzed for storage or transfer to an output device.
- **Output.** Data, information, reports, and so on are distributed to digital screens or hardcopy (paper), sent as audio, or transferred to other ISs via communication networks.
- **Feedback.** A feedback mechanism monitors and controls operations.

The collection of computing systems used by an organization is termed **information technology (IT)**. IT, in its narrow definition, refers to the technological side of an information system. Often the term *information technology* is used interchangeably with *information system*. In this book, we use the term *IT* in its broadest sense—to describe an organization's collection of information systems, their users, and the management that oversees them. For the most part, the terms *IT* and *IS* are considered to be the same thing.



**Figure 1.3** Four basic functions of an information system: Input, processing, storage, and output.





**Figure 1.4** Components of information systems.

### COMPONENTS OF AN INFORMATION SYSTEM



An IS uses computer technology and networks to perform some or all of its tasks. As you read in the opening section, IS can be as small as a smartphone with a software app that can snap tags to load a Web site. Or it may include several thousand computers of various types, scanners, printers, and other devices connected to databases via wired and wireless telecommunication networks. Basic components of ISs are listed next and shown in Figure 1.4. On the textbook's Web site, you find Technology Guides 1, 2, 3, 4, and 5 that contain detailed descriptions of hardware, software, data and databases, telecommunication networks, and systems analysis and design.

- *Hardware* is a set of devices such as processor, monitor, keyboard, and printer. Graphical user interfaces, which are called GUI, accept data and information that are then processed by central processing units (CPUs), stored in databases, and displayed on screens.
- *Software* is a set of applications (apps) or programs that instruct the hardware to process data or other inputs such as voice commands.
- *Data* is an essential part processed by the system and, if needed, stored in a database or other storage system.
- A *network* is a telecommunication system connecting hardware that is wired, wireless, or a combination.
- *Procedures* are the set of instructions about how to combine the above components in order to process information and generate the desired output.
- *People* are those individuals who work with the system, interface with it, or use its output.

Table 1.2 lists major capabilities of ISs and the business objectives that they support.

**ISs Exist within a Culture.** ISs do not exist in isolation. ISs have a purpose and a social (organizational) context. A common *purpose* is to provide a solution to a business problem. The *social context* of the system consists of the values and beliefs that determine what is admissible and possible within the culture of the organization and

**TABLE 1.2** Major Capabilities of ISs and Supported Business Objectives

- Perform high-speed, high-volume, numerical computations
- Provide fast, accurate communication and collaboration unrestricted by time and location
- Store huge amounts of information that is accessible via private networks and the Internet
- Automate semiautomatic business processes and manually done tasks.
- Enable automation of routine decision making and facilitate complex decision making

IS capabilities support these business objectives:

- Improve productivity (productivity is a measurement of the ratio of inputs to outputs)
- Reduce costs and waste
- Improve the ability to make informed decisions
- Facilitate collaboration
- Enhance customer relationships
- Develop new analytic capabilities
- Provide feedback on performance

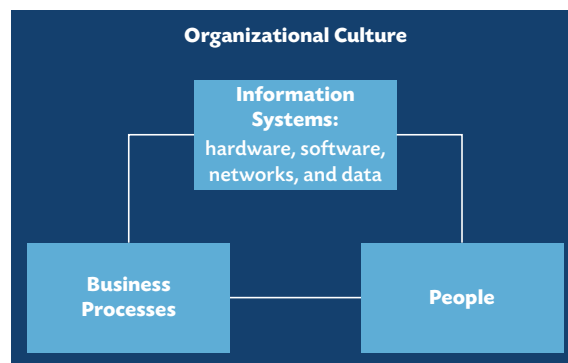
people involved. For example, a company may believe that superb customer service and on-time delivery are critical success factors. This belief system influences IT investments, among other things.

The business value of IT is determined by the people who use it, the business processes it supports, and the culture of the organization. That is, IS value is determined by the relationships among ISs, people, and business processes—all of which are influenced strongly by organizational culture, as shown in Figure 1.5.

The IS building blocks that support business performance are high-performance devices (hardware); their apps (software and processing); connectivity (networks) to data; shared content, contact lists, and so on (information); and users (people). Many of today's ISs run on wireless networks, social media, and high-performance devices, making it faster and easier to reach others and to get work done with minimal downtime and effort. In Chapters 2 through 16, you will read about enterprise-wide and business-critical IS applications and IT solutions, many of which integrate mobile and social technologies.

**ISs Extend Organizations and Disrupt Ways of Doing Business.** The mass migration of users from PCs to mobile devices has expanded ISs beyond the organization and made *location* practically irrelevant. Perhaps equally significant, mobile technology has torn down the walls between our business lives and our personal lives.

IT innovations are shaking up or disrupting the ways companies do business, the jobs of managers and workers, the design of business processes, and the structure of markets. *IT at Work 1.3* describes how a new IS that provided feedback to operators



**Figure 1.5** Information systems function within a culture.

## IT at Work 1.3

## Feedback and Incentives Improve Performance at 1-800-CONTACTS

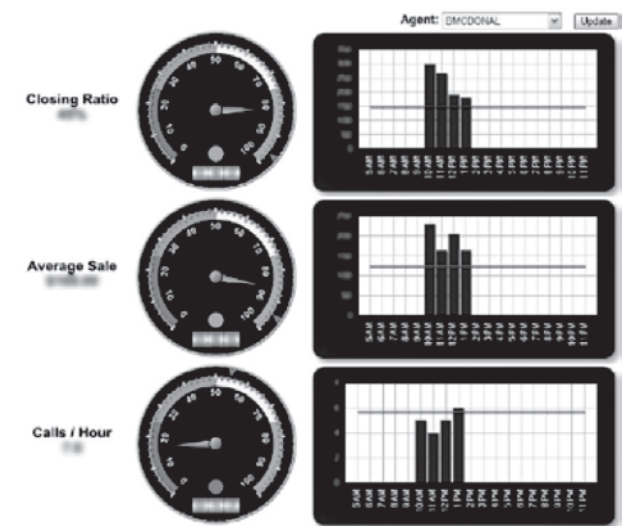


1-800-CONTACTS is a leading worldwide contact lens provider selling to consumers through its Web site and toll-free call center. The company maintains an inventory of 20 million contact lenses and sells an average of 150,000 replacement contact lenses per day. Maintaining a large inventory is critical to the company's business strategy, which is to provide customers with a greater selection of contact lenses at better prices than retail optical outlets.

In the past, the company's information and reporting systems could not provide the call center managers and business analysts with quick and easy access to real-time (up-to-date) sales data. For example, when business analysts wanted to review the average number of contact lens boxes shipped per order, they had to get the data from the IT department. Response time was several days. Managers faced an information bottleneck that created *blindspots* (a blindspot means not knowing what's going on as it's going on) about sales and inventory levels until IT provided the reports. To eliminate the problems, the company invested in data warehouse technology. (Data warehousing is discussed in detail in Chapter 10. For now, we are examining the impact of having access to accurate data.) Dashboard reporting tools were implemented in the call centers. (See the example of dashboard displays in Figure 1.6.) Call center operators could monitor their performance by looking at the dashboards on their computer screens.

Operators' dashboards are updated every 15 minutes. At a glance, they know how they are doing on key metrics (measurements) and how their performance compares to that of other operators. Color-coded round gauges on the left display the operator's closing ratio, average sale, and calls per hour for the day. Operators were also measured in terms of customer satisfaction, which was considered to be critical to customer loyalty and ultimately sales growth and profitability. At month's end, operators are ranked based on a mix of metrics that contributed to profit—the *bottom line*. Operators in the top 80 percent receive bonuses based on their scores and the size of the bonus pool, which is tied to overall business success. A top-ranked agent can earn a monthly bonus of \$1,000.

By linking operators' pay to the metrics displayed on their dashboards and their performance relative to other operators, 1-800 CONTACTS improved sales by \$50,000 per month and call



**Figure 1.6** Examples of dashboards that report information in familiar graphical displays to keep operators informed of their sales performance.

quality remained high. Once operators could see that their performance tied into their bonus, their overall quality improved. As a result, every metric of strategic importance to the company also improved.

Sources: Compiled from *Microsoft SQL Server Case Study* (Hill, 2005), and Watson and Hill (2009). The Watson and Hill case study is available on the Teradata University Network (TUN). Visit [academicprograms.teradata.com/](http://academicprograms.teradata.com/). Registration (free) is required for access to TUN.

**Discussion Questions:** Who is managing the performance of the operators? How did feedback at the operators' level lead to improved performance at the organizational level? Why have the dashboards created a beneficial competitive environment for the operators? Why do you think the metrics are updated every 15 minutes instead of only at the end of the operator's workday or shift? Do you think it is possible to monitor too many metrics? Why or why not?

at 1-800-CONTACTS disrupted the status quo with a feedback system, thus motivating performance improvements and ultimately increasing sales revenues.

IT has evolved from narrowly focused data processing and routine reports in the mid-1970s to a function that increasingly supports business processes, manages relationships with customers and suppliers, and creates limitless possibilities in the 2010s, when out of touch means out of business.

## Review Questions

1. Define an information system.
2. Describe the building blocks of an information system.
3. What business objectives are supported by ISs?

## 1.3 Business Performance Management and Measurement

Organizations and managers set goals and objectives; for example, to increase the number of new accounts by 4.0% within the next quarter or to decrease labor costs by 7.0% within six months. Performance is measured by how well those goals and objectives are met. Despite how simple this sounds, measuring business (or organizational) performance is extremely challenging. In this section, you will learn why performance measurement is so challenging in practice, how performance can be measured, and how ISs can help or hinder performance measurement.

### WHAT IS PERFORMANCE MANAGEMENT? WHY IS IT A CHALLENGE?

What does *performance management* mean? How do you manage performance? Assume that a company's goals are increased sales and improved customer loyalty. Sales revenue is a rather easy-to-calculate quantitative metric. In contrast, customer loyalty is a qualitative metric and probably has a longer time dimension. You can immediately know how much customers have purchased on a particular day, but not how many customers you've lost that day.

In order to manage performance, two fundamental requirements are:

- **Being able to measure.** You cannot manage what you cannot measure. Stated in reverse, if you cannot measure a process, you cannot manage or control it. To be reliable, "measuring" needs to be fact-based and/or data-driven. Otherwise, managers are making decisions based on conditions of uncertainty. The more accurate and timely the data, the better the ability to measure.
- **Knowing that your indicator is measuring the right thing.** Not all performance metrics are clearly linked to the desired outcome. Consider the differences in measuring sales revenues (a quantitative metric) and customer loyalty (a qualitative metric). You often need to find surrogate quantitative measures for qualitative metrics that can reliably measure what you want measured. Even for quantitative metrics, measuring is challenging. If the goal is sales growth, then measuring sales revenues makes sense. But if the goal is to increase total profit (total profit = total sales revenues – total expenses), then multiple metrics are needed.

Measuring performance requires:

- Identifying the most meaningful measures of performance
- Being able to measure them correctly
- Selecting the set of measures that provides a holistic indicator of total business performance
- Identifying who should receive the reports and in what timeframe

Adding to the challenge is that rarely do managers agree on the answers about which sets of metrics are the right ones to track. As you can see, measuring performance requires a lot of managers' time and effort—and serves as a clear example of the critical role of people in IS success. We examine performance measurement processes next.

**Performance Measurement Process.** Measuring performance is a multistep cyclical process. The major steps in business performance management are:

**Step 1. Decide on desired performance levels.** Namely: *What does the company want to achieve?* Such targets are decided upon and expressed as goals and objectives, based on the organization's mission. Also, specific metrics should be set for desirable and measurable performance topics so that the company can evaluate its success.

**Step 2. Determine how to attain the performance levels.** The issue is: *How to get there?* This is determined by the corporate strategies and specific short-, medium-, and long-term plans.

**Step 3. Periodically assess where the organization stands with respect to its goals, objectives, and measures.** The issue here is to find: *How are we doing?* This is accomplished by monitoring performance and comparing it to the values set in Step 1.

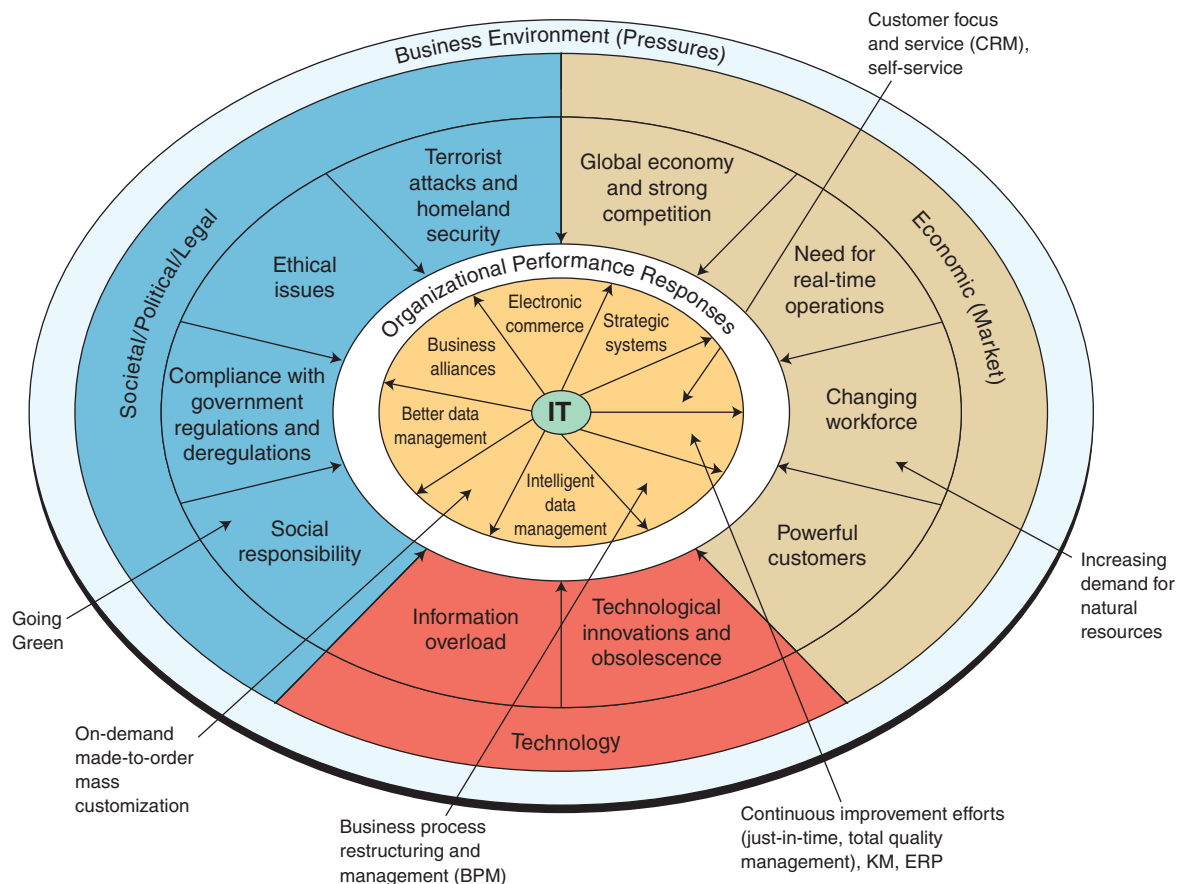
**Step 4. Adjust performance and/or goals.** If performance is too low—that is, there is a negative gap between where we want to be and where we are—corrective actions need to be taken: *How do we close the gap?*

As with many topics introduced in this chapter, business performance management is discussed in later chapters.

In the remainder of this section, we examine in more detail two components—business environmental pressures and organizational responses.

**Business Environmental Pressures.** The business environment consists of a variety of factors—societal, legal, political, technological, and economic. Figure 1.7 shows major pressures and how that might affect each other. Also see Table 1.3.

**Impact of Business Environment Factors.** The business environment factors shown in Figure 1.7 can impact the performance of individuals, departments, and entire organizations. Some factors create constraints, while others cost a great deal of money or divert efforts away from the business. New laws and regulations almost always involve the implementation of new ISs for compliance, especially during the first years after they go into effect. Examples of such laws and regulations are the Sarbanes-Oxley Act (SOX), Foreign Corrupt Practices Act (FCPA), Basel II, Gramm-Leach-Bliley (GLB) Act, Environmental Protection Agency (EPA) requirements, and Health Information Portability and Accountability Act (HIPAA).



**Figure 1.7** Business pressures, organizational performance and responses, and IT support.

Note that pressures may come from business partners. For example, Walmart mandated that its top suppliers adopt the RFID (radio frequency identification) technology. Similar requirements are imposed by other large buyers, including federal and state governments.

**Green IT to Reduce Carbon and Energy Footprints.** Concern about environmental damage and reducing a company's carbon and energy footprints on the planet has triggered efforts for **green IT**. Those footprints are a measure of the impact a business' activities have on the environment—in particular, climate change. It relates to the amount of greenhouse gases produced through burning fossil fuels for electricity and power production. For example, energy use in data centers (a data center is a facility used to house computer hardware and telecommunication systems) is a major concern to managers. IT purchase decisions regarding data center power, cooling, and space consumption affect a company's green status, as discussed in *IT at Work 1.4*.

Data center servers are known to be both power-hungry and heat-generating. PC monitors consume about 80 to 100 billion kilowatt-hours of electricity every year in the United States. Both Intel and AMD are producing new chips that reduce energy usage. Discarded PCs and other computer equipment are waste disposal problems. Green software refers to software products that help companies save energy or comply with EPA requirements.

Agencies worldwide are striving to reduce carbon footprints, including the following:

- Department for Environment, Food and Rural Affairs (DEFRA)—United Kingdom
- World Resource Institute (WRI) Greenhouse Gas (GHG) Protocol
- Vehicle Certification Agency (VCA)—United Kingdom
- Environmental Protection Agency (EPA)—United States

## IT at Work 1.4

### Greening Data Centers at Wells Fargo and Monsanto



Wells Fargo is a large financial institution that wanted to minimize its energy consumption and the carbon footprints of its data centers and IT infrastructures. When energy costs spiked in 2007, the company decided to go “green” in its two new data centers. Data centers must ensure security and availability of their services. When built from the ground up, they can be significantly more energy-efficient due to low power consumption. The two new facilities have 8,000 servers that consume considerable power and generate heat that must be cooled.

Several energy-saving features were introduced, including water-based economizers that regulate energy usage and cool the physical environment, a computer-controlled central fan system for cooling the floors, direct air to cool specific hot spaces, and semiconductor chips that automatically shut off power until needed. With increasing volumes of data, Wells Fargo constantly expands and renovates its data centers, taking environmental concerns into consideration.

Monsanto Inc., a large global provider of agricultural products, built an energy-efficient data center to support analysis of

its worldwide operations. Like many companies that step back and take a hard look at their IT future, Monsanto felt the best way to move forward was to stop wasting capital to maintain its outdated data center. Two factors driving investment in the new center were the 50% annual growth in data usage and high cooling costs for the old data center. The new energy-efficient center houses 900 servers and has an exterior glass shield that deflects 90% of the sun's heat.

Both companies' data centers are certified by the Leadership in Energy and Environmental Design (LEED) of the U.S. Green Building Council.

Sources: Compiled from Duvall (2007a) and Watson (2007).

**Discussion Questions:** Why are companies willing to invest in the building of new data centers? What are the incentives to be ecofriendly? How can energy-efficient data centers be justified? What are organizations such as LEED doing (visit [usgbc.org/leed](http://usgbc.org/leed))?

**TABLE 1.3** Organizational Responses to Pressures and Opportunities

Response/Action	Description
Develop strategic systems	Implement systems that provide strategic advantage; e.g., new features, low prices, super service, superb quality.
Introduce customer-focused systems, and customer loyalty programs	Meet customers' needs or priorities.
Improve decision making and forecasting	Use analytical methods to optimize operations, reduce cost, expedite decision making, support collaboration, automate routine decisions.
Restructure business processes and organization structure	Restructure business processes to make them more efficient or effective. Eliminate waste.
Use self-service approach	Have your customers, employees, or business partners use self-service whenever possible; e.g., track status, change an address, or manage your inventory.
Employ on-demand manufacturing/service and superb supply chain management	Meet the demands of your customers for standard or customized products/services efficiently and effectively.
Promote business alliances and partner relationship management	Create business alliances, even with your competitors, to reduce risks and costs. Collaborate effectively; provide benefits to your partners.
Use e-commerce	Automate business processes, procedures, and routine operations. Use new business models and electronic markets.
Share information and manage knowledge	Encourage information and knowledge creation, storage, and reuse.
Use enterprise and integrated systems	Integrate systems of internal information applications with partners' systems in order to facilitate collaboration, reduce costs and errors, and provide competitive advantage.
Go green	Save energy and the environment.
Reduce cycle time	Increase speed via automation, collaboration, and innovation.

- Department of Energy (DOE)—United States
- Green House Office—Australia
- Standards Association (CSA) GHG Registries—Canada

Political and economic activities add to environmental complexity and chaos.



**ETHICS**

**Ethical Issues.** IT creates challenging ethical issues ranging from monitoring employee e-mail to invading the privacy of customers whose data are stored in private and public databases. Ethical issues create pressures or constraints on business operations. **Ethics** relates to standards of right and wrong, and *information ethics* relates to standards of right and wrong in information management practices. Ethical issues are challenging, in part, because what is considered ethical by one person may seem unethical to another. Likewise, what is considered ethical in one country may be considered unethical in others.

### Review Questions

1. Define business performance management and show its cycle.
2. Describe the impact of the business environment and list some of its components.
3. What is green IT and why has it become important?
4. List some environmental issues of data centers.
5. Describe organizational responses.
6. Define *ethics*.

## 1.4 Strategic Planning and Competitive Models

Strategic planning is critical for all organizations, including government healthcare, education, military, and other nonprofit and for-profit agencies. We start by discussing strategic analysis and then explain the activities or component parts of strategic planning.

### WHAT IS STRATEGIC (SWOT) ANALYSIS?

There are many views on strategic analysis. In general, strategic analysis is the scanning and review of the political, social, economic, and technical environment of the organization. For example, any company looking to expand its business operations into a developing country has to investigate that country's political and economic stability and critical infrastructure. That strategic analysis would include reviewing the U.S. Central Intelligence Agency's (CIA) World Factbook ([cia.gov/library/publications/the-world-factbook/](http://cia.gov/library/publications/the-world-factbook/)). The World Factbook provides information on the history, people, government, economy, geography, communications, transportation, military, and transnational issues for 266 world entities. Then the company would need to investigate competitors and their potential reactions to a new entrant into their market. Equally important, the company would need to assess its ability to compete profitably in the market and impacts of the expansion on other parts of the company. For example, having excess production capacity would require less capital than building a new factory.

The purpose of this analysis of the environment, competition, and capacity is to learn about the strengths, weaknesses, opportunities, and threats (SWOT) of the expansion plan being considered. **SWOT analysis**, as it is called, involves the evaluation of strengths and weaknesses, which are internal factors, and opportunities and threats, which are external factors. Examples are:

- Strengths: reliable processes; agility; motivated workforce
- Weaknesses: lack of expertise; competitors with better IT infrastructure
- Opportunities: a developing market; ability to create a new market or product
- Threats: price wars or other fierce reaction by competitors; obsolescence

SWOT is only a guide and should be used together with other tools such as Porter's five-forces analysis model. Porter's models are described in an upcoming section. The value of SWOT analysis depends on how the analysis is performed. Here are several rules to follow:

- Be realistic about the strengths and weaknesses of your organization.
- Be realistic about the size of the opportunities and threats.
- Be specific and keep the analysis simple, or as simple as possible.
- Evaluate your company's strengths and weaknesses in relation to those of competitors (better than or worse than competitors).
- Expect conflicting views because SWOT is subjective, forward-looking, and based on assumptions.

SWOT analysis is often done at the outset of the strategic planning process. Now you can proceed to answer the question, "What is strategic planning?"

### WHAT IS STRATEGIC PLANNING?

**Strategic planning** is a series of processes in which an organization selects and arranges its businesses or services to keep the organization viable (healthy or functional) even when unexpected events disrupt one or more of its businesses, markets, products, or services. Strategic planning involves environmental scanning and prediction, or SWOT analysis, for each business relative to competitors in that business's market or product line. The next step in the strategic planning process is strategy.



## WHAT IS STRATEGY?

**Strategy** defines the plan for how a business will achieve its mission, goals, and objectives. It specifies the necessary financial requirements, budgets, and resources. Strategy addresses fundamental issues such as the company's position in its industry, its available resources and options, and future directions. A strategy addresses questions such as:

- What is the long-term direction of our business?
- What is the overall plan for deploying our resources?
- What trade-offs are necessary? What resources will it need to share?
- What is our position vis-à-vis competitors?
- How do we achieve competitive advantage over rivals in order to achieve or maximize profitability?

Two of the most well-known methodologies were developed by Porter. Their essentials are presented next.

## PORTER'S COMPETITIVE FORCES MODEL AND STRATEGIES

Michael Porter's **competitive forces model**, also called the **five-forces model**, has been used to develop strategies for companies to identify their competitive edge. The model also demonstrates how IT can enhance competitiveness. Professor Porter discusses this model in detail in a 13-minute YouTube video from the Harvard Business School, which you can view at [youtube.com/watch?v=mYF2\\_FBCvXw](https://www.youtube.com/watch?v=mYF2_FBCvXw) or by searching YouTube for the video.

The model recognizes five major forces (think of them as *pressures* or *drivers*) that could influence a company's position *within a given industry* and the strategy that management chooses to pursue. Other forces, such as those cited in this chapter, including new regulations, affect all companies in the industry and therefore may have a rather uniform impact on each company in an industry. Although the details of the model differ from one industry to another, its general structure is universal.

**Basis of the Competitive Forces Model.** Before examining the model, it's helpful to understand that it is based on the fundamental concept of profitability and profit margin.

- **PROFIT** = TOTAL REVENUES minus TOTAL COSTS. Profit is increased by increasing total revenues and/or decreasing total costs. Profit is decreased when total revenues decrease and/or total costs increase.
- **PROFIT MARGIN** = SELLING PRICE minus COST OF THE ITEM. Profit margin measures the amount of *profit per unit of sales* and does not take into account all costs of doing business.

**Five Industry Forces.** According to Porter's competitive forces model, there are five major forces in an industry that affect the degree of competition and thus impact profit margins and ultimately profitability. These forces interact, so although you will read about them individually, it is their interaction that determines the industry's profit potential. For example, while profit margins for pizzerias may be small, the ease of entering that industry draws new entrants into it. Conversely, profit margins for delivery services may be large, but the cost of the IT to support the service is a huge barrier to entry into the market.

Here is an explanation of the five industry (market) forces.

**1. Threat of entry of new competitors.** Industries with large profit margins attract more competitors (called *entrants*) into the market than do industries with small profit margins. It's the same principle that applies to jobs—people are attracted to higher-paying jobs, provided that they can meet or acquire the criteria for that job. In order to gain market share, entrants typically sell at lower prices or offer some incentive. Those companies already in the industry may be forced to defend their

market share by lowering prices, which reduces their profit margin. Thus, this threat puts downward pressure on profit margins by driving prices down.

This force also refers to the strength of the **barriers to entry** into an industry, which is how easy it is to enter an industry. The threat of entry is lower (less powerful) when existing companies have ISs that are difficult to duplicate or very expensive. Those ISs create barriers to entry that reduce the threat of entry.

**2. Bargaining power of suppliers.** Bargaining power is high where the supplier or brand is powerful; for example, Apple, Microsoft, and auto manufacturers. Power is determined by how much a company purchases from a supplier. The more powerful company has the leverage to demand better prices or terms, which increase its profit margin. Conversely, suppliers with very little bargaining power tend to have small profit margins.

**3. Bargaining power of customers or buyers.** This force is the reverse of the bargaining power of suppliers. Examples are Dell Computers, Walmart, and governments. This force is high where there are a few large customers or buyers in a market.

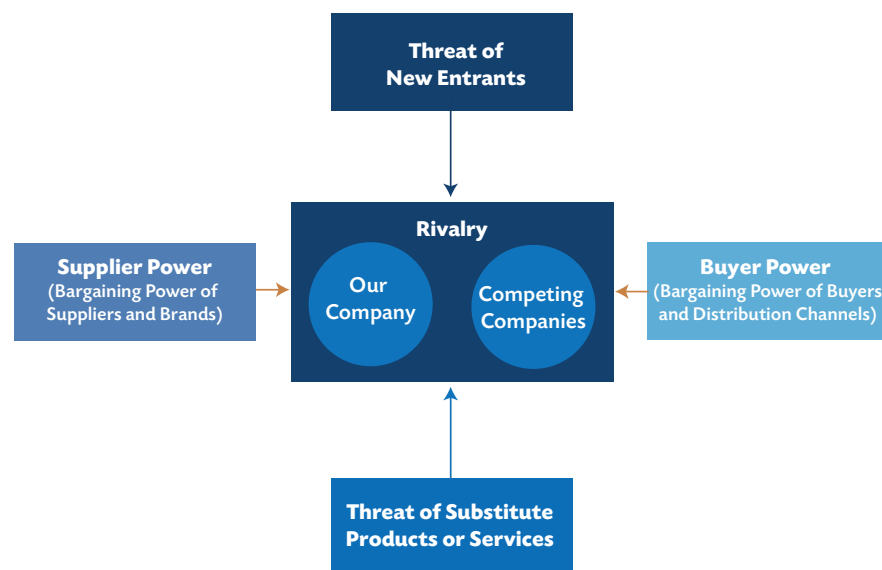
**4. Threat of substitute products or services.** Where there is product-for-product substitution, such as Kindle for Nook or e-mail for fax, there is downward pressure on prices. As the threat of substitutes increases, profit margin decreases because sellers need to keep prices competitively low.

**5. Competitive rivalry among existing firms in the industry.** Fierce competition involves expensive advertising and promotions, intense investments in research and development (R&D), or other efforts that cut into profit margins. This force is most likely to be high when entry barriers are low, threat of substitute products is high, and suppliers and buyers in the market attempt to control. That's why this force is placed in the center of the model.

The strength of each force is determined by the industry's structure. Existing companies in an industry need to protect themselves against the forces. Alternatively, they can take advantage of the forces to improve their position or to challenge industry leaders. The relationships are shown in Figure 1.8.

Companies can identify the forces that influence competitive advantage in their marketplace and then develop a strategy. Porter proposed three types of strategies—cost leadership, differentiation, and niche strategies.

In Table 1.4, Porter's three classical strategies are listed first, followed by a list of nine other general strategies for dealing with competitive advantage. Each of these



**Figure 1.8** Porter's competitive forces model.

**TABLE 1.4** Strategies for Competitive Advantage

Strategy	Description
Cost leadership	Produce product/service at the lowest cost in the industry.
Differentiation	Offer different products, services, or product features.
Niche	Select a narrow-scope segment ( <i>market niche</i> ) and be the best in quality, speed, or cost in that segment.
Growth	Increase market share, acquire more customers, or sell more types of products.
Alliance	Work with business partners in partnerships, alliances, joint ventures, or virtual companies.
Innovation	Introduce new products/services; put new features in existing products/services; develop new ways to produce products/services.
Operational effectiveness	Improve the manner in which internal business processes are executed so that the firm performs similar activities better than rivals.
Customer orientation	Concentrate on customer satisfaction.
Time	Treat time as a resource, then manage it and use it to the firm's advantage.
Entry barriers	Create barriers to entry. By introducing innovative products or using IT to provide exceptional service, companies can create entry barriers to discourage new entrants.
Customer or supplier lock-in	Encourage customers or suppliers to stay with you rather than going to competitors. Reduce customers' bargaining power by locking them in.
Increase switching costs	Discourage customers or suppliers from going to competitors for economic reasons.

strategies can be enhanced by IT, as will be shown throughout the book. Other chapters will show (1) how different ITs impact the five forces and (2) how IT facilitates the twelve strategies.

### PORTER'S VALUE CHAIN MODEL

According to Porter's **value chain model**, the activities conducted in any manufacturing organization can be divided into two parts: *primary activities* and *support activities*.

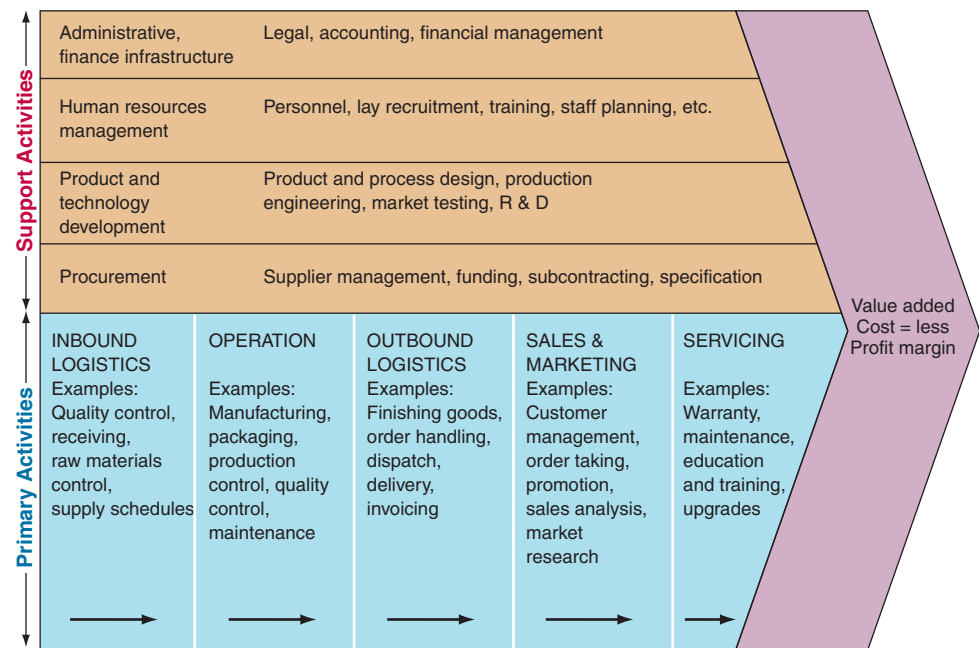
**Primary activities** are those business activities through which a company produces goods, thus creating value for which customers are willing to pay. Primary activities involve the purchase of materials, the processing of materials into products, and delivery of products to customers. Typically, there are five primary activities:

1. Inbound logistics (incoming raw materials and other inputs)
2. Operations (manufacturing and testing)
3. Outbound logistics (packaging, storage, and distribution)
4. Marketing and sales (to buyers)
5. Services

The primary activities usually take place in a sequence from 1 to 5. As work progresses, value is added to the product in each activity. To be more specific, the incoming materials (1) are processed (in receiving, storage, etc.) in activities called **inbound logistics**. Next, the materials are used in *operations* (2), where significant value is added by the process of turning raw materials into products. Products need to be prepared for delivery (packaging, storing, and shipping) in the **outbound logistics** activities (3). Then *marketing and sales* (4) attempt to sell the products to customers, increasing product value by creating demand for the company's products. The value of a sold item is much larger than that of an unsold one. Finally, *after-sales service* (5), such as warranty service or upgrade notification, is performed for the customer, further adding value. The goal of these value-adding activities is to make a profit for the company.

Primary activities are supported by the following support activities:

1. The firm's infrastructure (accounting, finance, management)
2. Human resources management



**Figure 1.9** The firm's value chain. The arrows illustrate the flow of goods and services.

3. Technology development (R&D)
4. Procurement (purchasing)

Each support activity can be applied to any or all of the primary activities. Support activities may also support each other, as shown in Figure 1.9.

Innovation and adaptability are **critical success factors**, or CSFs, related to Porter's models. CSFs are those things that must go right for a company to achieve its mission. CSFs must be quantitative or measurable, such as the increase in the number of customers within a time period. An example of innovative strategy is provided in *IT at Work 1.5*.

**Adaptive and Innovative Organizations.** Charles Darwin, the renowned scientist, said, "It's not the strongest of species that survives, nor the most intelligent; but the one most responsive to change." What is true in nature is true today for organizations that operate in a rapidly changing environment, as you have read earlier. The digital revolution and rapid environmental changes bring opportunities and risks. Bill Gates is aware of this. Microsoft is continually developing new Internet and IT products and services to defend itself against Google. Google is defending itself against Facebook.

Competition exists not only among products or services but also among business models, customer service operations, and supply chains. The concept of value chain has been supplemented by the concepts of *value system* and *value network*.

A firm's value chain is part of a larger stream of activities, which Porter calls a value system. A **value system** includes the suppliers that provide the inputs necessary to the firm and their value chains. Once the firm creates products, they pass through the value chain of distributors, all the way to the buyers (customers). All parts of these chains are included in the value system. Gaining and sustaining a competitive advantage, and supporting that advantage by means of IT, this requires an understanding of the entire value system.

A *value network* is a complex set of social and technical resources. Value networks work together via relationships to create social goods (public goods) or economic value. This value takes the form of knowledge and other intangibles and/or financial value.

## IT at Work 1.5

### How IT Helped the Boston Red Sox Win the World Series



The Boston Red Sox won the World Series in 2004 and 2007. Contributing to their success is their sophisticated recruitment and layoff strategy, which is heavily supported by IT. Winning depends on identifying players with the right talents, knowing how long to keep each player, and developing the right strategy—all of which depend on information, analysis, and intelligence.

Extensive and detailed data is available on each player and game. Players' performance is measured down to every swing, step, or throw taken. Baselines are calculated on every facet of an athlete—height, weight, arm strength, hitting discipline, and mental errors. The Red Sox require players in their farm system to keep a log of their every at-bat.

Teams need to develop a winning strategy. Sports data needs to be analyzed to compare actual performance of each player against average number of wins. This determines whether or not to pay \$10 to \$20 million per year to a star pitcher or other player and when to retire a player. Some teams can afford to pay more for players and therefore acquire the best players.

**Business intelligence (BI)** can give every team an edge. BI is a broad category of applications, technologies, and processes for gathering, storing, accessing, and analyzing data to help

business users make better decisions. BI helps identify the winning characteristics of “human capital” before the competition finds them. BI does analysis with *sabermetrics*. *Sabermetrics* is the mathematical analysis of player batting and pitching performances. The term is derived from SABR (Society for American Baseball Research), a community of baseball enthusiasts, and differs from traditional player metrics, such as runs batted in and batting averages.

*Sabermetricians* use measures that accurately reflect a player's contribution toward achieving a win, such as “runs created.” This statistic counts the number of times a batter gets on base and factors in an added value for the power of a hit (single or home run). The purpose is to determine what the batter does at the plate to create an opportunity for his team to score a run. *Sabermetrics* can help teams more accurately find minor league prospects likely to succeed in the big leagues.

Sources: Compiled from Duvall (2004, 2007b).

**Discussion Questions:** Can management strategy be executed without IT? Why is it difficult for competitors to copy this strategy? Is this a sustainable strategic advantage?

**Real-Time, On-Demand IT Support.** Eliminating blindspots requires *real-time systems*. A **real-time system** is an IS that provides fast enough access to information or data that an appropriate decision can be made, usually before the data or situation changes (operational deadlines from event to system response). Fast enough may mean less than a second if you are buying a stock, or it may mean before a business opens in the morning if you are determining a price. It can be a day or two in other situations. When a patient is admitted to the hospital, the patient's medical records must be readily accessible. The longer the wait, the greater the risk to the patient. The real-time enterprise is a necessity since the basis of competition is often time or speed. Web-based systems (such as tracking stocks online) provide us with these capabilities. Some examples are the following:

- Salespeople can check to see whether a product is in inventory by looking directly into the inventory system.
- Suppliers can ensure adequate supplies by looking directly into the forecasting and inventory systems.
- An online order payment by credit card is checked for the balance, and the amount of the purchase is debited all in one second. This way authorization is given “fast enough” for both a seller and a buyer.

**Example of Real-Time IT Support.** HyperActive Technologies (*hyperactive technologies.com*) has developed a system by which cameras mounted on the roof of a fast-food restaurant track vehicles pulling into the parking lot or drive-through. Other cameras track the progress of customers moving through the ordering queue. Using *predictive analysis*, the system predicts what customers might order. In addition, a database includes historical car-ordering data, such as 20 percent of cars entering the lot will usually order at least one cheeseburger at lunchtime. Based on the camera's input and the database, the system predicts what customers will order 1.5 to 5 minutes before they actually order. Cooks are better informed, minimizing customers' waiting

time and the cost of overheated food without flavor. The real-time enterprise is also referred to as an on-demand enterprise. Such an enterprise must be able to fulfill orders as soon as they are needed.

**Innovation and Creativity.** Organizational responses usually occur in reaction to change in the business environment or to competitors' actions. Sometimes such response may be too late. Therefore, organizations can play a proactive role and make significant changes in their industry before anyone else. A first-mover strategy is risky but can be very rewarding if successful.

**Information Systems Failures.** So far, you have read several success stories. Unfortunately, IT projects are not always successful, and reasons for failure are often due to poor project management, which is a topic you will learn in Chapter 14. Some IT projects are doomed from the start because of inadequate budgeting or other resources.



We will show you some of these (marked with a “lessons from failures” icon) in this book or on our Web site. We can learn from failures as much as we can learn from successes.

Examples of three IT failures in different nations are the following:

- On February 24, 2008, about two-thirds of the world was unable to see YouTube for several hours. This happened when the Pakistan Telecommunication Authority decided to block offensive content in its own country. Its ISP, together with Hong Kong PCCW telecommunication, incorrectly programmed a block video on YouTube, causing the block to reach around the world instead (Claburn, 2008).
- The United Kingdom National Offender Management Information System project (NOMIS) failed due to mismanagement and vast budget overruns. The project to provide an IT system to support a new way of working with offenders was to be completed by January 2008. By July 2007, £155 million had been spent on the project, it was two years behind schedule, and estimated lifetime project costs had risen to £690 million. In January 2008, the NOMIS began work on a re-scoped program with an estimated lifetime cost of £513 million and a delivery date of March 2011 (Krigsman, 2009; NAO, 2009). The project offers an excellent case study relating failure directly to inadequate governance and oversight; it is discussed in the *public sector case* at the end of this chapter.
- The U.S. Census Bureau faced a loss of up to \$2 billion on an IT project to replace paper-based data collection methods with handheld devices for the 2010 census. The Census Bureau had not implemented longstanding Government Accountability Office (GAO) recommendations, however, and had to scrap the program.

#### Review Questions

1. Describe strategic planning.
2. Describe SWOT analysis.
3. Explain Porter's five-forces model and give an example of each force.
4. Describe adaptive organization.
5. Describe real-time business and information systems.

## 1.5 Why IT Is Important to Your Career, and IT Careers

In this part of the chapter, we describe the importance of IT to your performance and its value to your organization.

In this chapter, you read that business is IT-dependent. For most organizations, if their computer network goes down, so does the business. Imagine not having Internet access for 24 hours—no texting, e-mail, Facebook, Twitter, data access, status reports, and so on. Looking at what you could still accomplish without IT gives a clear perspective of its importance and ubiquity.

## IT DEFINES AND CREATES BUSINESSES AND MARKETS

IT creates markets, businesses, products, and careers. As you will continue to read throughout this book, exciting IT developments are changing how organizations and individuals do things. New technologies, such as 4G networks, 2D tags, mobile scanners, and e-readers point to groundbreaking changes. CNN.com, one of the most respected news media, has created a new market whose impacts are yet to be realized. Visit iReport at [ireport.com/](http://ireport.com/), where a pop-up reads “iReport is the way people like you report the news. The stories in this section are not edited, fact-checked or screened before they post.” CNN.com invites everyone to become a reporter and to “take part in the news with CNN. Your voice, together with other iReporters, can help shape what CNN covers and how. At CNN we believe that looking at the news from different angles gives us a deeper understanding of what’s going on. We also know that the world is an amazing place filled with interesting people doing fascinating things that don’t always make the news” ([ireport.com/about.jspa](http://ireport.com/about.jspa), 2010).

## OCCUPATIONAL OUTLOOK FOR IS MANAGERS

According to the 2010–11 edition of the *Occupational Outlook Handbook*, published by the U.S. Bureau of Labor Statistics, the outlook for computer and information systems managers is as follows:

- Employment is expected to grow faster than the average for all occupations.
- A bachelor’s degree in a computer-related field usually is required for management positions, although employers often prefer a graduate degree, especially an MBA with technology as a core component.
- Many managers possess advanced technical knowledge gained from working in a computer occupation.
- Job prospects should be excellent ([bls.gov/oco/ocos258.htm](http://bls.gov/oco/ocos258.htm)).

**IT as a Career: The Nature of IS and IT Work.** In today’s workplace, it is imperative that ISs work effectively and reliably. IS managers play a vital role in the implementation and administration of technology in their organizations. They plan, coordinate, and direct research on the computer-related activities of firms. In consultation with other managers, they help determine the goals of an organization and then implement technology to meet those goals. They oversee all technical aspects of an organization, such as software development, network security, and Internet operations.

IS managers can have additional duties, depending on their role in an organization. The **chief technology officers (CTO)** evaluates the newest and most innovative technologies and determines how they can be applied for competitive advantage. CTOs develop technical standards, deploy technology, and supervise workers who deal with the daily IT issues of the firm. When innovative and useful new ITs are launched, the CTO determines implementation strategies, performs cost-benefit or SWOT analysis, and reports those strategies to top management, including the chief information officer (CIO).

IT project managers develop requirements, budgets, and schedules for their firm’s information technology projects. They coordinate such projects from development through implementation, working with their organization’s IT workers, as well as clients, vendors, and consultants. These managers are increasingly involved in projects that upgrade the information security of an organization.

**Earnings in the IT Field.** According to the 2010–2011 analysis of the Bureau of Labor Statistics, wages of computer and information systems managers vary by specialty and level of responsibility. The median annual wage of these managers in May 2008 was \$112,210. The middle 50 percent earned between \$88,240 and \$141,890. Median annual wages in the industries employing the largest numbers of computer and information systems managers in May 2008 were as follows:

- Software publishers, \$126,840
- Computer systems design and related services, \$118,120

- Management of companies and enterprises, \$115,150
- Depository credit intermediation, \$113,380
- Insurance carriers, \$109,810

In addition to salaries, computer and information systems managers, especially those at higher levels, often receive employment-related benefits, such as expense accounts, stock option plans, and bonuses.

**IT Job Prospects.** As of 2010–2011, prospects for qualified IS managers should be excellent. Workers with specialized technical knowledge and strong communications and business skills, as well as those with an MBA with a concentration in ISs, will have the best prospects. Job openings will be the result of employment growth and the need to replace workers who transfer to other occupations or leave the labor force (Bureau of Labor Statistics, 2010–2011).

### Management Issues

**1. Recognizing opportunities for using IT and Web-based systems for strategic advantage and threats associated with not using them.** These opportunities and threats are highlighted and discussed throughout the book.

**2. Who will build, operate, and maintain the information systems?** This is a critical issue because management wants to minimize the cost of IT while maximizing its benefits. Some alternatives are to use cloud computing, to use software-as-a-service (SaaS) models, to outsource IT activities, and to divide the remaining work between the IS department and the end users.

**3. How much IT?** This is a critical issue related to IT planning. IT does not come free, but *not* having it may be much costlier.

**4. What social networking activities should be pursued?** This is an explosive topic and covered extensively in Chapter 8.

**5. How important is IT?** In some cases, IT is the only approach that can help organizations. As time passes, the *comparative advantage* of IT increases.

**6. Globalization** Global competition impacts most companies. At the same time, globalization creates opportunities, ranging from selling and buying products and services online in foreign markets to conducting joint ventures or investing in them. IT supports communications, collaboration, and discovery of information regarding all of the above.

**7. Ethics and social issues** The implementation of IT involves ethical and social issues that are constantly changing due to new developments in technologies and environments. These topics should be examined any time an IT project is undertaken.



GLOBAL



ETHICS

### Review Questions

1. Why is IT a major enabler of business performance and success?
2. Why is it beneficial to study IT today?
3. Why are IT job prospects so strong?

## Key Terms

2D tag 3	corporate strategy 2	primary activities 19
agile enterprise 5	ethics 15	real-time system 21
barriers to entry 18	green IT 14	strategic planning 16
business intelligence (BI) 21	inbound logistics 19	strategy 17
business model 7	information system (IS) 8	SWOT analysis 16
chief technology officer (CTO) 23	information technology (IT) 8	value chain model 19
commodity 7	interactivity application 2	value proposition 8
competitive forces model 17	outbound logistics 19	



## Chapter Highlights and Insights

(Numbers refer to Learning Objectives)

- 1 The importance of being an agile enterprise, which is one that has the ability to adapt rapidly, has never been greater because of struggling economic recoveries and advances in mobile technology.
- 1 IT adds to profitability by enabling ways to connect with and push content to social networks and mobile devices.
- 2 An information system collects, processes, stores, and disseminates information for a specific purpose.
- 2 The business value of IT is determined by the people who use it, the business processes it supports, and the culture of the organization. That is, IS value is determined by the relationships among ISs, people, business processes, and organizational culture.
- 3 Business performance management (BPM) is a cyclical process that begins with mission statement, goals, and targets, and then the strategy and plans of how to attain the targets. After measuring actual performance, one needs to compare it to the target. Finally, if a negative gap exists, corrective actions should be taken.
- 3 Many market, technology, and societal pressures surround the modern organization, which is responding with critical response activities supported by information technology.
- 3 Concern about environmental damage and reducing a company's carbon and energy footprints on the planet has triggered efforts for green IT.
- 4 Strategic analysis is the scanning and review of the political, social, economic, and technical environment of the organization.
- 4 IT is a major enabler of strategic systems. It can support organizational strategy or act as a direct strategic weapon.
- 5 Learning about IT is essential because the role of IT is rapidly increasing in the support of organizations. We are getting more dependent on IT as time passes. Also, more IT-related jobs with high salaries are available.

## Questions for Discussion

1. What is the business value of on-demand or interactivity applications?
2. Why do IT developments matter to managers?
3. How might mobile technologies disrupt the usual way business is done?
4. How has mobile technology influenced opportunities for entrepreneurs?
5. Explain how innovation can lead to profitable growth for businesses.
6. Explain the importance of culture and people in IS success.
7. How does green IT impact the bottom line?
8. Discuss why information systems might fail.
9. Explain why *measuring business performance in order to be able to manage it* is so challenging.

## Exercises and Projects

1. Review three examples of IT applications in Chapter 1, and identify the business pressures in each example.
2. The market for optical copiers is shrinking rapidly. It is expected that by 2012 as much as 90 percent of all duplicated documents will be done on computer printers.
  - a. How can a company such as Xerox Corporation survive? Visit Xerox's Web site for information to answer this question.
  - b. Identify business pressures on Xerox.
  - c. Find some of Xerox's response strategies (see *xerox.com*, *yahoo.com*, and *google.com*).
  - d. What emerging risks might Xerox face due to changes in IT?
3. Identify a personal or professional use for a 2D tag. Then create or generate that 2D Tag at Microsoft's Web site, *microsoft.com/tag/*. Check the Chapter 1 Link List for additional helpful Web sites.

## Group Assignments and Projects

1. Visit Teradata University Network (TUN) at *academicprograms.teradata.com/tun/* (ask your instructor for the password). Find and watch the *Partners 2009—Enterprise Rent-A-Car* video. You might also visit The Data Warehousing Institute at *tdwi.org* and find the case called "Enterprise Rent-A-Car's Data Warehouse Goes the Extra Mile with Decision-Making Horsepower." Link is: [http://tdwi.org/articles/1999/05/01/enterprise-rentacars-data-warehouse-goes-the-extra-mile-with-decisionmaking-horsepower.aspx?sc\\_lang=en](http://tdwi.org/articles/1999/05/01/enterprise-rentacars-data-warehouse-goes-the-extra-mile-with-decisionmaking-horsepower.aspx?sc_lang=en). Prepare a report identifying how IT improved business performance at Enterprise Rent-A-Car.
2. Visit Teradata University Network (TUN) at *academicprograms.teradata.com/tun/* (ask your instructor for the password). Find the Webinar "Turning Active Enterprise Intelligence into Competitive Advantage," by Imhoff, Hawkings, and Lee (2006). Identify the business environment pressures and real-time responses. Prepare a report.

3. Identify new business models related to or triggered by the power and performance capabilities of mobile devices. Identify older business models that are deteriorating because of these new models. Prepare a report.
4. Visit Facebook. Find five different types of organizations that are using Facebook. Identify two performance activities conducted by each organization (e.g., advertise, sell, recruit, collaborate).

## Internet Exercises

1. Visit the Web site of UPS (*ups.com*), Federal Express (*fedex.com*), or a comparable logistics and delivery company. Select your country.
  - a. Find out what information is available to customers before they send a package.
  - b. Find out about the “package tracking” system; be specific.
  - c. Compute the cost of delivering a 10" × 20" × 15" box, weighing 20 pounds, from your location to another location. Compare the fastest delivery against the least cost.
  - d. Prepare a spreadsheet for two different types of calculations available on the site. Enter data and solve for two different calculators. Use Excel.
4. Visit *YouTube.com* and search for two videos on Porter’s strategic models. Report what you learned from each of these videos.
5. Visit *Dell.com* and *Apple.com* to simulate buying a laptop computer. Compare and contrast the selection process, degree of customization, and other buying features. What are the barriers to entry into this market, based on what you learned from this exercise?

## BUSINESS CASE

### CIO of BP Global Helps Transform the Energy Giant



BP Global (British Petroleum, *bp.com*) is one of the world’s largest energy companies. It provides customers with fuel for transportation, energy for heat and light, retail services, and petrochemical products for everyday items. BP Global grew from a local oil company into a global energy group employing over 80,000 people and operating in over 100 countries worldwide.

#### Poor Performance Warnings

At a March 2008 meeting, CEO (chief executive officer) Tony Hayward warned 500 top BP managers that: “Despite having annual revenue of about \$300 billion, BP had become a *serial underperformer*.” A Morgan Stanley oil and gas analyst further warned that while the rest of the energy industry was undertaking rapid change, “BP will not exist in four to five years’ time in its current form.” The company had become bloated, passive, unfocused, and unconcerned with performance. Either the energy giant transformed itself or it would be wiped out by competitors.

The strategic goals were to restore revenue growth across the company, refocus the behavior of the company around high performance and accountability, and reduce the complexity in the organization that was driving up costs.

#### Role of the CIO and IT in the Transformation

The CIO (chief information officer) Dana Deasy and the IT teams helped in the transformation. Deasy understood that he had to make drastic changes in personnel, processes, and objectives across the entire IT organization in order to support the transformation across all of BP.

Deasy’s objectives were to cut \$800 million in expenses from BP’s overall IT budget of \$3 billion, reduce its 2,000 IT vendors by 50 percent, reduce the 8,500 applications in use

at BP worldwide, and turn IT from a tactical services unit to a business-driven strategic weapon.

CIO Deasy sought to simplify the global supply chain and reduce IT spending by \$20 million. He did so by reducing their 540 hardware and software suppliers in Europe and the United States to just two resellers, Computacenter and CompuCom. This consolidation not only significantly reduced costs but also eliminated most of the complexity from operations. Specifically, BP signed a five-year \$150 million contract with Computacenter and CompuCom, engaging them as global reseller partners to procure software licenses, servers, and PC commodities as well as provide maintenance across Europe and the United States. The five-year deal began on 1 February, 2010.

Sources: Compiled from *BP.com*, Evans (2010), and *MicroScope.co.uk* (2010).

#### Questions

1. Why do you think giant organizations like BP Global, with enormous revenues, become “serial underperformers”?
2. How does complexity in business processes, such as procurement (purchasing), cause an increase in costs?
3. Explain how the change from dealing with 540 vendors to partnering with 2 resellers would reduce costs significantly.
4. How has the CIO turned the IT department from a tactical services unit to a business-driven strategic weapon?
5. Visit *BP.com*. Read the BP strategy update and watch the strategy Webcast. What were the key issues discussed in the strategy update?
6. How has BP’s management explained the causes of the explosion that in turn caused the massive Gulf of Mexico oil spill in 2010? What response to the oil spill did BP post on its Web site or social media? In your opinion, did these responses help restore its reputation?

## PUBLIC SECTOR CASE

### UK National Offender Management Information System (NOMIS) Project



In the United Kingdom, the National Offender Management Service (NOMS; *noms.justice.gov.uk*) is the system that commissions and provides quality correctional services and interventions in order to protect the public and reduce re-offending.

In June 2004, the NOMIS project was set up to create a single, integrated database for all offender information. By integrating the ISs across 140 prisons and 42 administrative areas of the National Probation Service, NOMS hoped to redefine how information about offenders is managed. The goal was to improve the continuity, consistency, and effectiveness of offender case management.

The key strategic priority of NOMS was to reduce the rate of re-offending in the United Kingdom through the implementation of end-to-end offender case management. This would entail matching a single case manager for every offender and making offender information available to the appropriate individuals in both the prison and probation services.

#### NOMIS Viewed as an IT Project and Not an Organizational Project

As such, NOMIS was aligned to the strategic objectives of the organization. But the lack of any project-program plan and the failure to define the link between the project and the program led to NOMIS being regarded as an independent IT project rather than as a part of an IT-enabled business change program. The project failed.

The poorly defined link between the NOMIS project and the key strategic priorities of the NOMS was one partial cause of the project's failure. Other reasons for the project's failure were rather common. Three common reasons why projects fail so badly are:

1. **Poor-quality data.** The data used to assess the project is inadequate or just plain wrong. A project team may pick up an idea and run with it before critically evaluating the desired outcomes and alternatives.
2. **Optimism bias.** People are too optimistic about what can be achieved with the resources and deadlines available. The focus is on the benefits the project will achieve rather than what it will take to deliver the project.

3. **Strategic misrepresentation (deception).** There may be incentives to make the project look good on paper in order to get the project approved or to win the contract. So people may deliberately provide unrealistic cost estimates and delivery timetables.

#### Summary

NOMIS failed due to mismanagement and vast budget overruns. The project was to be introduced by January 2008 and had an approved lifetime cost of £234 million to 2020. By July 2007, £155 million had been spent on the project, it was two years behind schedule, and estimated lifetime project costs had risen to £690 million. In January 2008, NOMIS began work on a re-scoped program with an estimated lifetime cost of £513 million and a delivery date of March 2011.

Sources: Compiled from NAO (2009), Ministry of Justice (*noms.justice.gov.uk*), Krigsman (2009), Buering (2010), and World Finance (2009).

#### Questions

1. Why did the NOMIS project fail?
2. Given what you have read, when was the project doomed to fail?
3. Who was responsible for the governance (project management and oversight)? Who should have been responsible?
4. Dr. Cliff Mitchell, senior fellow and deputy director of the BP Managing Projects Programme at the Manchester Business School at the University of Manchester, stated: "We naturally believe we can achieve more, in less time, than historical data demonstrate. There is also a Western bias towards unrealistic macho management: we can get it done—we just need to drive harder." To what extent, if any, did the human dynamics mentioned by Dr. Mitchell play a role in the NOMIS project failure? Explain your answer.
5. Of the three reasons why projects go so wrong, which reason do you think is the most difficult to prevent? Explain your answer.

## ANALYSIS USING SPREADSHEETS

### Estimating Expected Improvement in Customer Retention



**Notes:** For this analysis, go to the Student Web Site to download the file. An image of that file, shown in Figure 1.10, is used to explain the scenario and required analysis.

**Customer attrition rate** is the rate at which a company loses customers. **Customer retention rate** is the opposite. It's the percent of customers that stay with the company. Mathematically, customer attrition rate = 100 percent – customer retention rate.

#### Scenario

InterMobile-2020 Company has asked you to prepare a spreadsheet that analyzes an expected improvement in customer retention. The company is considering implementing four new IT-based marketing campaigns to reduce customer attrition.

InterMobile-2020 estimates that they could control 6 percent of customer attrition with the right marketing strategies.

InterMobile-2020 Company					
Number of customers, January 2011	1,500,000				
Controllable Customer attrition rate (average rate per quarter) [CCAR]	6%				
<b>IT-based Strategies to reduce the Controllable Customer Attrition Rate (CCAR)</b>	<b>Percent reduction in CCAR</b>				
#1 - Launch campaign using 2D tags	1.25%				
#2 - Create campaign on Facebook	0.60%				
#3 - Launch viral marketing campaign	0.75%				
#4 - Develop an iPhone app	1.50%				
<b>Total reduction in CCAR</b>	<b>4.00%</b>				
	2012				Total loss of customers
	Q1	Q2	Q3	Q4	
Expected loss of customers, no strategy (6% CCAR)	90,000	84,600	79,524	74,753	328,877
Number of customers remaining at end of Quarter	1,410,000	1,325,400	1,245,876	1,171,123	
Expected loss of customers, using all 4 marketing campaigns					
Number of customers remaining at end of Quarter					
Improvement (number of customers retained) due to IT-based campaigns					

**Figure 1.10** Chapter 1 spreadsheet for analysis.

That is, with effective marketing campaigns they could prevent the entire 6 percent loss. They also have uncontrollable customer attrition, but that is irrelevant to this analysis.

As shown in the spreadsheet, the company estimates that the new four campaigns would reduce their quarterly controllable customer attrition rate (CCAR) by 4 percent. As of January 1, 2011, the company has 1.5 million customers. By the end of the fourth quarter (Q4) of 2011, the company will have lost an estimated 328,877 customers if no action is taken.

### Analysis

See the example spreadsheet. Download or develop this spreadsheet to calculate the performance improvement that InterMobile-2020 can expect. You need to perform the calculations for the green-highlighted cells. Some of the analysis has already been completed. The results of this analysis will be combined with the costs of the campaigns (when those costs become known) to determine the value of these IT strategies. Keep a copy of your analysis for use in following chapters.

## Resources on the Book's Web Site



More resources and study tools are located on the Student Web Site and on WileyPLUS. You'll find additional chapter materials and useful Web links. In addition, self-quizzes that provide individualized feedback are available for each chapter.

### Cases for Chapter 1 are available at [wiley.com/college/turban](http://wiley.com/college/turban)

1.1 Diamonds Forever

1.2 A Digital Hospital Increases Performance and Saves Lives

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