Chapter 2

Organizational Strategy, Competitive Advantage, and Information Systems

[ LEARNING OBJECTIVES ]

1. Discuss ways in which information systems enable cross-functional business processes and business processes for a single functional area.
2. Become familiar with business process definition, measurement, and analysis.
3. Compare and contrast business process improvement, business process reengineering, and business process management to identify the advantages and disadvantages of each one.
4. Identify effective IT responses to different kinds of business pressures.
5. Describe the strategies that organizations typically adopt to counter Porter’s five competitive forces.
6. Describe the characteristics of effective business–information technology alignment.

[ CHAPTER OUTLINE ]

2.1 Business Processes
2.2 Business Process Reengineering, Business Process Improvement, and Business Process Management
2.3 Business Pressures, Organizational Responses, and Information Technology Support
2.4 Competitive Advantage and Strategic Information Systems
2.5 Business–Information Technology Alignment

[ WEB RESOURCES ]

• Student PowerPoints for note taking

WileyPLUS

• E-book
• Author video lecture for each chapter section
• Practice quizzes
• Flash Cards for vocabulary review
• Additional “IT’s About Business” cases
• Video interviews with managers
• Lab Manuals for Microsoft Office 2010 and 2013
The Problem

In the months leading up to the terrorist attacks of September 11, 2001, the U.S. government had all the necessary clues to stop the al Qaeda perpetrators. The attackers were from countries known to harbor terrorists, they entered the United States on temporary visas, they had trained to fly civilian airliners, and they purchased one-way airplane tickets on September 11.

Unfortunately for thousands of workers in the World Trade Center, those clues were located in different databases scattered across many government agencies. Organizations like the CIA and the FBI maintain thousands of databases, each with its own data: financial records, DNA samples, voice and other sound samples, video clips, maps, floor plans, human intelligence reports from all over the world, and many other types of data. Integrating all of those data into a coherent whole is potentially overwhelming. In 2001 there was no tool available that would have enabled government analysts to integrate all of these different types of data that were dispersed across so many locations.

A Potential IT Solution

Today, more than a decade after the terrorist attacks, the government has an important new tool at its disposal, known as Palantir. The origins of Palantir go back to PayPal. Because PayPal was so successful, it attracted criminals who used it to carry out money laundering and fraud. By 2000, PayPal was in financial trouble because the existing antifraud software tools could not keep up with the criminal activity. Each time PayPal analysts caught onto one ploy, the perpetrators simply changed tactics.

To deal with these issues, PayPal's analysts created software that could view each transaction as a part of a pattern, rather than as just a single database entry. This process enabled analysts to spot networks of suspicious accounts and to discover patterns that PayPal's computers had missed. PayPal utilized this software to freeze suspicious payments before they were processed. The software saved the company hundreds of millions of dollars.

Several PayPal engineers who had worked on the software and Stanford computer scientists formed a startup company to develop PayPal's fraud-detection tool into a data-analysis system that integrated pattern recognition, artificial intelligence software, and human cognitive...
skills. They named the tool Palantir (www.palantir.com) for the “Seeing Stones” in the Lord of the Rings.

In an early deployment of Palantir, the U.S. intelligence community used the software tool in the war on terrorism. Palantir technology essentially solves the types of intelligence problems that allowed September 11 to occur. That is, it helps law enforcement agencies spot patterns in the vast amounts of data they analyze every day. Palantir software combs through all of the available databases, identifies related pieces of information, and integrates everything into a unified picture.

The Results

Palantir’s customer list currently includes the U.S. Department of Defense, the CIA, the FBI, the Army, the Marines, the Air Force, the police departments of New York and Los Angeles, and an increasing number of financial institutions that have an interest in detecting bank fraud. Most of Palantir’s government work remains classified, but information on some cases has leaked out.

In April 2010, for example, security researchers in Canada used Palantir software to crack a spy operation called the Shadow Network that had, among other things, broken into the Indian Defense Ministry and infiltrated the Dalai Lama’s e-mail account. Palantir has also been used to unravel child abuse and abduction cases, to locate suspects in the murder of a U.S. Immigration and Customs Enforcement special agent, and to uncover bombing networks in Syria, Afghanistan, and Pakistan.

In Afghanistan, the U.S. Special Operations Forces use Palantir to plan assaults. They type a village’s name into the system, and it generates a map of the village that details the locations of all reported shooting skirmishes and improvised explosive device (IED) incidents. The soldiers then utilize the timeline function to discover where the most recent attacks occurred, and they plot their mission in the village accordingly.

Another scenario that illustrates Palantir’s usefulness involves the U.S. Marines. The Marines used to spend years gathering fingerprint and DNA evidence from IEDs and trying to match those data against a database of similar information collected from villagers. Usually, by the time they obtained any results, the bombers had disappeared. In contrast, field operatives can now upload fingerprint/DNA evidence from villagers into Palantir and instantly find matches from past attacks.

Wall Street banks are also utilizing Palantir to search their transaction databases for criminal fraud, trading insights, and even new ways to price mortgages. One of the world’s largest banks employs Palantir software to break up a popular scam called BustOut. In this scam, criminals steal or purchase access to thousands of people’s online identities and then break into their bank and credit card accounts. Rather than act immediately, however, they spend weeks biding their time until someone on their radar purchases a plane ticket or leaves on a holiday. They then siphon money out of the accounts as quickly as they can while the victim is in transit. The criminals hide their trails by anonymizing their computing activity and disabling alert systems in the bank and credit card accounts. When the bank identifies a small number of compromised accounts, it uses Palantir to discern the characteristics of those accounts. Palantir then helps the bank discover thousands of other accounts with those characteristics that have not yet been tapped.

Another organization, the FBI, utilizes Palantir technology to instantly compile thorough dossiers on U.S. citizens. For example, agents can integrate surveillance videos with credit card transactions, cell phone records, e-mails, air itineraries, and Web search information. Privacy advocates worry that Palantir will make the FBI and other government agencies even more intrusive consumers of personal data. One specific event that raised concerns among privacy advocates concerned a Palantir engineer who was placed on leave after being exposed by the hacker collective Anonymous for participating in a plot to break into the personal computers of WikiLeaks supporters, but later was quietly rehired.

Palantir responds to these concerns by asserting that it has developed very sophisticated privacy-protection technology. Its software creates audit trails that detail who is privy to certain pieces of information and what they have done with the information. Palantir also has a
permission system that ensures that agency workers using their software can access only the data allowed by their clearance level.

Palantir is also generating controversy within the U.S. Army. In late 2012, the Pentagon’s top weapons tester assigned a failing grade to the Army’s premier battlefield intelligence system, which troops in Afghanistan have criticized as being too slow and unreliable in analyzing data to locate enemy combatants. A memo from the testing agency called the updated version of the $2.5 billion Defense Common Ground System “not operationally effective, not operationally suitable, and not operationally survivable against cyber threats.” The negative report was a blow to the Army’s analysis system. Further, the system faces competition from Palantir.

At first, the Army resisted Palantir, but overseas troops were clamoring for access to the system. One U.S. congressman accused the Army of protecting its own system, to the detriment of U.S. troops. Finally, in early 2013 the Army announced that it will attempt to integrate Palantir into its existing intelligence system. The results remain to be seen.


What We Learned from This Case

The chapter-opening case illustrates the importance of the Palantir system in helping organizations respond to business pressures (in this instance, national security and bank fraud) and providing support for their strategy. In particular, the system helps organizations collate and analyze vast amounts of data stored in different places and different organizations. The case also highlights the incredible complexity of the modern high-tech world, and it shows how organizations are using Palantir to make sense of a rapidly changing environment. Finally, it demonstrates that any information system can be strategic, meaning that it can provide a competitive advantage if it is used properly.

Competitive advantage refers to any assets that provide an organization with an edge against its competitors in some measure such as cost, quality, or speed. A competitive advantage helps an organization to control a market and to accrue larger-than-average profits. Significantly, both strategy and competitive advantage take many forms.

Although there are many companies that use technology in more expensive ways, Alta Bicycle Share, which is discussed in IT’s About [Small] Business 2.1, demonstrates that an entrepreneurial spirit coupled with a solid understanding of what IT can do for you will provide competitive advantages to entrepreneurs just as it does for Wall Street CIOs. As you study this chapter, think of the small businesses in your area that are utilizing popular technologies in interesting and novel ways. Have any of them found an innovative use for Twitter? Facebook? Amazon? PayPal? If not, then can you think of any businesses that would benefit from employing these technologies?

This chapter is important for you for several reasons. First, the business pressures we address in the chapter will affect your organization. Just as important, however, they also will affect you. Therefore, you must understand how information systems can help you—and eventually your organization—respond to these pressures.

In addition, acquiring competitive advantage is essential for your organization’s survival. Many organizations achieve competitive advantage through the efforts of their employees. Therefore, becoming knowledgeable about strategy and how information systems affect strategy and competitive position will help you throughout your career.
CHAPTER 2 Organizational Strategy, Competitive Advantage, and Information Systems

This chapter encourages you to become familiar with your organization’s strategy, mission, and goals and to understand its business problems and how it makes (or loses) money. It will help you understand how information technology contributes to organizational strategy. Further, you likely will become a member of business/IT committees that decide (among many other things) how to use existing technologies more effectively and whether to adopt new ones. After studying this chapter, you will be able to make immediate contributions in these committees when you join your organizations.

Information systems can be just as strategic to a small- or medium-sized company as they are to a large firm. IT’s About [Small] Business 2.1 illustrates how information systems are strategically important to bicycle-sharing companies.

IT’s about [small] business

2.1 Sharing Bicycles

A bicycle-sharing system, as the name suggests, is a service that makes bicycles available for individuals to use on a very short-term basis. The overall goal of these systems is to provide free or affordable access to bicycles for short-distance trips in urban areas to reduce traffic congestion, noise, and air pollution.

Bike-sharing systems have progressed through three generations: the first generation, called white bikes (or free bikes); the second generation of coin-deposited systems; and the third generation, or information technology-based systems. An emerging fourth generation includes all of the components of third-generation systems, but with one major difference: Fourth-generation systems are linked with public transit. The goal is seamless integration of bike sharing with public transportation and other modes of transit, such as taxis and carpooling. Fourth-generation systems will locate bike-sharing stations and parking conveniently near transit stations. In addition, they will coordinate transportation schedules, such as bus and train arrivals and departures. Finally, they will provide customers with a single payment smartcard that allows access to all of the available transportation options. Let’s take a closer look at one fourth-generation system, Alta Bicycle Share.

On a Washington, DC, morning, Alison Cohen rides her bicycle to work. She makes the 2 mile trip in 10 minutes—a trip that would otherwise entail a 20 minute subway ride, a 40 minute walk, or a $7 cab ride. Cohen is president of Alta Bicycle Share (www.altabicycleshare.com), the company behind Washington’s bicycle-sharing program. Formed in 2010, Alta combines three companies: (1) Alta Planning & Design, based in Portland, Oregon, which designs bike lanes and parks; (2) Montreal’s Public Bike System Company, which owns the credit card processing technology; and (3) Alta itself, which bids for government contracts and runs operations in cities across the United States, as well as in Melbourne, Australia. In mid-2013, Alta had bicycle-sharing services in Washington, DC, Chicago, Boston, and Chattanooga, Tennessee, with New York City, Portland, Oregon, and Columbus, Ohio, soon to be added.

How does this system operate? Basically, the participating cities buy the bikes and install docking stations where users can rent them with a credit card. Alta maintains the bikes and collects payment. In return, it receives either part of the revenue generated by the rentals or a flat annual management fee.

Significantly, Alta is reportedly turning a profit. However, the company faces competition from B-Cycle (www.bcycle.com), which operates 1,500 bicycles in 16 cities, including Chicago and Denver.

Interestingly, the rent-a-bike phenomenon is also being adopted by the Beijing municipal government. To ease the city’s notorious traffic jams, the Beijing China Municipal Commission of Development and Reform is setting up 500 rental kiosks around the city to offer residents the choice of more than 20,000 rental bikes.

Questions
1. Describe the problems involved with setting up a bicycle-sharing program in a new city.
2. Describe how information technology can help address these problems.

In many cases, organizations achieve competitive advantage by managing their business processes more profitably than their competitors do. Therefore, you begin this chapter with an introduction to business processes and business process management. You will then see how information systems enable organizations to respond to business pressures. Next, you will
learn how information systems help organizations gain competitive advantages in the marketplace. The chapter concludes by discussing business–IT alignment; in other words, how an organization’s IT function supports the organization’s strategy.

Business Processes

A business process is an ongoing collection of related activities that create a product or a service of value to the organization, its business partners, and/or its customers. A process is comprised of three fundamental elements:

- **Inputs**: Materials, services, and information that flow through and are transformed as a result of process activities
- **Resources**: People and equipment that perform process activities
- **Outputs**: The product or a service created by the process

If the process involves a customer, then that customer can be either internal or external to the organization. A manager who is the recipient of an internal reporting process is an example of an internal customer. In contrast, an individual or a business that purchases the organization’s products is the external customer of the fulfillment process.

Successful organizations measure their process activities to evaluate how well they are executing these processes. Two fundamental metrics that organizations employ in assessing their processes are efficiency and effectiveness.

**Efficiency** focuses on doing things well in the process; for example, progressing from one process activity to another without delay or without wasting money or resources. **Effectiveness** focuses on doing the things that matter; that is, creating outputs of value to the process customer—for example, high-quality products.

Many processes cross functional areas in an organization. For example, product development involves research, design, engineering, manufacturing, marketing, and distribution. Other processes involve only a single functional area. Table 2.1 identifies the fundamental business processes performed in an organization’s functional areas.

### Cross-Functional Processes

All of the business processes in Table 2.1 fall within a single functional area of the company. However, many other business processes, such as procurement and fulfillment, cut across multiple functional areas; that is, they are cross-functional business processes, meaning that no single functional area is responsible for their execution. Rather, multiple functional areas collaborate to perform the process. For a cross-functional process to be successfully completed, each functional area must execute its specific process steps in a coordinated, collaborative way. To clarify this point, let’s take a look at the procurement and fulfillment cross-functional processes. We discuss these processes in greater detail in Chapter 10.

The procurement process includes all of the tasks involved in acquiring needed materials externally from a vendor. Procurement comprises five steps that are completed in three different functional areas of the firm: warehouse, purchasing, and accounting.

The process begins when the warehouse recognizes the need to procure materials, perhaps due to low inventory levels. The warehouse documents this need with a purchase requisition, which it sends to the purchasing department (Step 1). In turn, the purchasing department identifies a suitable vendor, creates a purchase order based on the purchase requisition, and sends the order to the vendor (Step 2). When the vendor receives the purchase order, it ships the materials, which are received in the warehouse (Step 3). The vendor then sends an invoice, which is received by the accounting department (Step 4). Accounting sends payment to the vendor, thereby completing the procurement process (Step 5).

The fulfillment process is concerned with processing customer orders. Fulfillment is triggered by a customer purchase order that is received by the sales department. Sales then validates the purchase order and creates a sales order. The sales order communicates data related to the order to other functional areas within the organization, and it tracks the progress of the
order. The warehouse prepares and sends the shipment to the customer. Once accounting is notified of the shipment, it creates an invoice and sends it to the customer. The customer then makes a payment, which accounting records.

An organization’s business processes can create a competitive advantage if they enable the company to innovate or to execute more effectively and efficiently than its competitors. They can also be liabilities, however, if they make the company less responsive and productive. Consider the airline industry. It has become a competitive necessity for all of the airlines to offer electronic ticket purchases via their Web sites. To provide competitive advantage, however, these sites must be highly responsive and they must provide both current and accurate information on

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**Table 2.1 Examples of Business Processes**

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<td>• Generating Internet use policy</td>
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<td>• Managing service agreements and emergency services</td>
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<td>• Applying user workstation standards</td>
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flights and prices. An up-to-date, user-friendly site that provides fast answers to user queries will attract customers and increase revenues. In contrast, a site that provides outdated or inaccurate information, or has a slow response time, will hurt rather than improve business.

Clearly, good business processes are vital to organizational success. But, how can organizations determine if their business processes are well designed? The first step is to document the process by describing its steps, its inputs and outputs, and its resources. The organization can then analyze the process and, if necessary, modify it to improve its performance. We examine this procedure in Section 2.2.

To understand this point, let’s consider the e-ticketing process. E-ticketing consists of four main process activities: searching for flights, reserving a seat, processing payment, and issuing an e-ticket. These activities can be broken down into more detailed process steps. The result may look like the process map in Figure 2.1. Note that different symbols correspond to different types of process steps. For instance, rectangles (steps) are activities that are performed by process resources (reserve seats, issue e-ticket). Diamond-shaped boxes indicate decisions that need to be made (seats available?). Arrows are used as connectors between steps; they indicate the sequence of activities.

These symbols are important in the process flowchart (which is similar with a programming flowchart). Other symbols may be used to provide additional process details. For example, D-shaped boxes are used instead of rectangles when a waiting period is part of a process; ovals can show start and stop points; and process resources can be attached to activities with resource connector lines, or included as an annotation or property for each activity box.

The customers of the process are travelers planning a trip, and the process output is an e-ticket. Travelers provide inputs to the process: the desired travel parameters to begin the search, the frequent flyer miles number, and their credit card information. In addition, a computerized reservation system that stores information for many airlines also provides some of the process
inputs—such as the seat availability and prices. The resources used in the process are the airline Web site, the computerized reservation system, and, if the customer calls the airline call center at any time during the process, the call center system and the human travel agents. The process creates customer value by efficiently generating an output that meets the customer search criteria—dates and prices. The performance of the process depends on efficiency metrics such as the time required to purchase an e-ticket, from the moment the customer initiates the ticket search until he or she receives the e-ticket. Effectiveness metrics include customer satisfaction with the airline Web site. Finally, the performance of the process may be affected if the quality or the timeliness of the inputs is low—for example, if the customer enters the wrong dates—or if the process resources are not available—for example, if the Web site crashes before the purchase is finalized.

**Information Systems and Business Processes**

An information system (IS) is a critical enabler of an organization’s business processes. Information systems facilitate communication and coordination among different functional areas, and allow easy exchange of, and access to, data across processes. Specifically, ISs play a vital role in three areas:

- Executing the process
- Capturing and storing process data
- Monitoring process performance

In this section, you will learn about each of these roles. In some cases the role is fully automated—that is, it is performed entirely by the IS. In other cases, the IS must rely on the manager’s judgment, expertise, and intuition.

**Executing the Process.** An IS helps organizations execute processes efficiently and effectively. ISs are typically embedded into the processes, and they play a critical role in executing the processes. In other words, an IS and processes are usually intertwined. If the IS does not work, the process cannot be executed. IS help execute processes by informing people when it is time to complete a task, by providing the necessary data to complete the task, and, in some cases, by providing the means to complete the task.

In the procurement process, for example, the IS generates the purchase requisitions and then informs the purchasing department that action on these requisitions is needed. The accountant will be able to view all shipments received to match an invoice that has been received from a supplier and verify that the invoice is accurate. Without the IS, these steps, and therefore the process, cannot be completed. For example, if the IS is not available, how will the warehouse know which orders are ready to pack and ship?

In the fulfillment process, the IS will inform people in the warehouse that orders are ready for shipment. It also provides them with a listing of what materials must be included in the order and where to find those materials in the warehouse.

**Capturing and Storing Process Data.** Processes create data such as dates, times, product numbers, quantities, prices, and addresses, as well as who did what, when, and where. IS capture and store these data, commonly referred to as process data or transaction data. Some of these data are generated and automatically captured by the IS. These are data related to who completes an activity, when, and where. Other data are generated outside the IS and must be entered into it. This data entry can occur in various ways, ranging from manual entry to automated methods involving data in forms such as bar codes and RFID tags that can be read by machines.

In the fulfillment process, for example, when a customer order is received by mail or over the phone, the person taking the order must enter data such as the customer’s name, what the customer ordered, and how much he or she ordered. Significantly, when a customer order is received via the firm’s Web site, then all customer details are captured by the IS. Data such as the name of the person entering the data (who), at which location the person is completing the task (where), and the date and time (when) are automatically included by the IS when it creates the order. The data are updated as the process steps are executed. When the order is shipped, the warehouse will provide data about which products were shipped and in what quantities, and the IS will automatically include data related to who, when, and where.
An important advantage of using an IS compared to a manual system or multiple functional area information systems is that the data need to be entered into the system only once. Further, once they are entered, other people in the process can easily access them, and there is no need to reenter them in subsequent steps.

The data captured by the IS can provide immediate feedback. For example, the IS can use the data to create a receipt or to make recommendations for additional or alternate products.

**Monitoring Process Performance.** A third contribution of IS is to help monitor the state of the various business processes. That is, the IS indicates how well a process is executing. The IS performs this role by evaluating information about a process. This information can be created either at the instance level (i.e., a specific task or activity) or the process level (i.e., the process as a whole).

For example, a company might be interested in the status of a particular customer order. Where is the order within the fulfillment process? Was the complete order shipped? If so, when? If not, then when can we expect it to be shipped? Or, for the procurement process, when was the purchase order sent to the supplier? What will be the cost of acquiring the material? At the process level, the IS can evaluate how well the procurement process is being executed by calculating the lead time, or the time between sending the purchase order to a vendor and receiving the goods, for each order and each vendor over time.

Not only can the IS help monitor a process, it can also detect problems with the process. The IS performs this role by comparing the information with a standard—that is, what the company expects or desires—to determine if the process is performing within expectations. Management establishes standards based on organizational goals.

If the information provided by the IS indicates that the process is not meeting the standards, then the company assumes that some type of problem exists. Some problems can be routinely and automatically detected by the IS, whereas others require a person to review the information and make judgments. For example, the IS can calculate the expected date that a specific order will be shipped and determine whether this date will meet the established standard. Or, the IS can calculate the average time taken to fill all orders over the last month and compare this information to the standard to determine if the process is working as expected.

Monitoring business processes, then, helps detect problems with these processes. Very often these problems are really symptoms of a more fundamental problem. In such cases, the IS can help diagnose the cause of the symptoms by providing managers with additional, detailed information. For example, if the average time to process a customer order appears to have increased over the previous month, this problem could be a symptom of a more basic problem.

A manager can then drill down into the information to diagnose the underlying problem. To accomplish this task, the manager can request a breakdown of the information by type of product, customer, location, employees, day of the week, time of day, and so on. After reviewing this detailed information, the manager might determine that the warehouse has experienced an exceptionally high employee turnover rate over the last month and that the delays are occurring because new employees are not sufficiently familiar with the process. The manager might conclude that this problem will work itself out over time, in which case there is nothing more to be done. Alternatively, the manager could conclude that the new employees are not being adequately trained and supervised. In this case, the company must take actions to correct the problem. Section 2.2 discusses several methodologies that managers can use to take corrective action when process problems are identified.

**before you go on...**

1. What is a business process?
2. Describe several business processes carried out at your university.
3. Define a cross-functional business process, and provide several examples of such processes.
4. Pick one of the processes described in questions 2 or 3 given above, and identify its inputs, outputs, customer(s), and resources. How does the process create value for its customer(s)?
Excellence in executing business processes is widely recognized as the underlying basis for all significant measures of competitive performance in an organization. Consider these measures, for example:

- **Customer satisfaction**: The result of optimizing and aligning business processes to fulfill customers’ needs, wants, and desires.
- **Cost reduction**: The result of optimizing operations and supplier processes.
- **Cycle and fulfillment time reduction**: The result of optimizing the manufacturing and logistics processes.
- **Quality**: The result of optimizing the design, development, and production processes.
- **Differentiation**: The result of optimizing the marketing and innovation processes.
- **Productivity**: The result of optimizing each individual’s work processes.

The question is: How does an organization ensure business process excellence?

In their book *Reengineering the Corporation*, first published in 1993, Michael Hammer and James Champy argued that to become more competitive, American businesses needed to radically redesign their business processes to reduce costs and increase quality. The authors further asserted that information technology is the key enabler of such change. This radical redesign, called **business process reengineering (BPR)**, is a strategy for making an organization’s business processes more productive and profitable. The key to BPR is for enterprises to examine their business processes from a “clean sheet” perspective and then determine how they can best reconstruct those processes to improve their business functions. BPR’s popularity was propelled by the unique capabilities of information technology, such as automation and standardization of many process steps and error reduction due to improved communication among organizational information silos.

Although some enterprises have successfully implemented BPR, many organizations found this strategy too difficult, too radical, too lengthy, and too comprehensive. The impact on employees, on facilities, on existing investments in information systems, and even on organizational culture was overwhelming. Despite the many failures in BPR implementation, however, businesses increasingly began to organize work around business processes rather than individual tasks. The result was a less radical, less disruptive, and more incremental approach, called **business process improvement (BPI)**.

BPI focuses on reducing variation in the process outputs by searching for root causes of the variation in the process itself (such as a broken machine on an assembly line) or among the process inputs (such as a decline in the quality of raw materials purchased from a certain supplier). BPI is usually performed by teams of employees that include a process expert—usually the process owner (the individual manager who oversees the process)—as well as other individuals who are involved in the process. These individuals can be involved directly; for example, the workers who actually perform process steps. Alternative, these individuals can be involved indirectly; for example, customers who purchase the outputs from the process.

Six Sigma is a popular methodology for BPI initiatives. Its goal is to ensure that the process has no more than 3.4 defects per million outputs by using statistical methods to analyze the process. (A defect is defined as a faulty product or an unsatisfactory service.) Six Sigma was developed by Motorola in the 1980s, and it is now used by companies worldwide, thanks in part to promotional efforts by early adopters such as GE. Six Sigma is especially appropriate for manufacturing environments, where product defects can be easily defined and measured. Over the years, the methodology has been modified so that it focuses less on defects and more on customer value. As a result, it can now be applied to services as well as products. Today,
Six Sigma tools are widely used in financial services and healthcare institutions as components of process-improvement initiatives.

Regardless of the specific methodology you use, a successful BPI project generally follows five basic phases: define, measure, analyze, improve, and control, or DMAIC.

- **In the define phase**, the BPI team documents the existing “as is” process activities, process resources, and process inputs and outputs, usually as a graphical process map, or diagram. The team also documents the customer and the customer's requirements for the process output, together with a description of the problem that needs to be addressed.

- **In the measure phase**, the BPI team identifies relevant process metrics, such as time and cost to generate one output (product or service), and collects data to understand how the metrics evolve over time. Sometimes the data already exist, in which case they can be extracted from the IS that supports the process, as described in the previous section. Many times, however, the BPI team needs to combine operational process data already stored in the company’s IS systems with other data sources, such as customer and employee observations, interviews, and surveys.

- **In the analysis phase**, the BPI team examines the “as is” process map and the collected data to identify problems with the process (such as decreasing efficiency or effectiveness) and their root causes. If possible, the team should also benchmark the process; that is, compare its performance with that of similar processes in other companies, or other areas of the organization. The team can employ IT applications such as statistical analysis software or simulation packages in this phase.

  It is often valuable to use process simulation software during the analysis phase. Utilizing this software provides two benefits. First, it enables a process manager to quickly simulate a real situation (e.g., with a certain number of people undertaking activities) for a specific amount of time (e.g., a working day, a week, or a month). The manager can then estimate the process performance over time without having to observe the process in practice. Second, it allows the manager to create multiple scenarios; for instance, using a different number of resources in the process and/or using a different configuration for the process steps. In addition, process simulation software can provide a number of outputs regarding a process including the time used by all resources to execute specific activities, the overall cycle time of a process, the identification of resources that are infrequently used, and the bottlenecks in the process. Simulating a process is extremely valuable for process managers because it is a risk-free and inexpensive test of an improvement solution that does not need to be conducted with real resources.

- **In the improve phase**, the BPI team identifies possible solutions for addressing the root causes, maps the resulting “to be” process alternatives, and selects and implements the most appropriate solution. Common ways to improve processes are eliminating process activities that do not add value to the output and rearranging activities in a way that reduces delays or improves resource utilization. The organization must be careful, however, not to eliminate internal process controls—those activities that safeguard company resources, guarantee the accuracy of its financial reporting, and ensure adherence to rules and regulations.

- **In the control phase**, the team establishes process metrics and monitors the improved process after the solution has been implemented to ensure the process performance remains stable. An IS system can be very useful for this purpose.

Although BPI initiatives do not deliver the huge performance gains promised by BPR, many organizations prefer them because they are less risky and less costly. BPI focuses on delivering quantifiable results—and if a business case cannot be made, the project is not continued. All employees can be trained to apply BPI techniques in their own work to identify opportunities for improvement. Thus, BPI projects tend to be performed more from the bottom-up, in contrast to BPR projects, which involve top-down change mandates. BPI projects take less time overall, and even if they are unsuccessful, they consume fewer organizational resources than BPR projects. However, if incremental improvements through BPI are no longer possible, or if significant changes occur in the firm’s business environment, then the firm should consider
BPR projects. One final consideration is that over time, employees can become overstretched or lose interest if the company undertakes too many BPI projects and does not have an effective system to manage and focus the improvement efforts.

To sustain BPI efforts over time, organizations can adopt business process management (BPM), a management system that includes methods and tools to support the design, analysis, implementation, management, and continuous optimization of core business processes throughout the organization. BPM integrates disparate BPI initiatives to ensure consistent strategy execution.

Important components of BPM are process modeling, Web-enabled technologies, and business activity monitoring. BPM begins with process modeling, which is a graphical depiction of all of the steps in a process. Process modeling helps employees understand the interactions and dependencies among the people involved in the process, the information systems they rely on, and the information they require to optimally perform their tasks. Process modeling software can support this activity. IT’s About Business 2.2 shows how Chevron has employed BPR, BPI, and BPM.

Web-enabled technologies display and retrieve data via a Web browser. They enable an organization to integrate the necessary people and applications into each process, across functional areas and geographical locations.

Finally, business activity monitoring (BAM) is a real-time approach for measuring and managing business processes. Companies use BAM to monitor their business processes, identify failures or exceptions, and address these failures in real time. Further, because BAM tracks process operations and indicates whether they succeed or fail, it creates valuable records of process behaviors that organizations can use to improve their processes.

BPM activities are often supported by business process management suites (BPMS). A BPMS is an integrated set of applications that includes a repository of process information, such as process maps and business rules; tools for process modeling, simulation, execution, coordination across functions, and re-configuration in response to changing business needs; as well as process-monitoring capabilities.

BPM is growing in business value. In 2012, Capgemini (www.capgemini.com), an international consulting firm, surveyed more than 1,000 senior business executives. The majority of the respondents indicated that BPM would play a more prominent role in their organizations in 2013 and 2014.

Further, Gartner (www.gartner.com), a leading IT research and advisory firm, stated that companies need to focus on developing and mastering BPM skills throughout the organization. Gartner predicts that by 2016, high-performing companies will use BPM technologies such as real-time process monitoring, visualization, analytics, and intelligent automated decision making—all of them integrated in second-generation BPMS—to support intelligent business operations.

Another promising emerging trend is social BPM. This technology enables employees to collaborate, using social media tools on wired and mobile platforms, both internally across functions and externally with stakeholders (such as customers or experts), to exchange process knowledge and improve process execution.

BPM initially helps companies improve profitability by decreasing costs and increasing revenues. Over time, BPM can create a competitive advantage by improving organizational flexibility—making it easy to adapt to changing business conditions and to take advantage of new opportunities. For many companies, BPM can reduce costs, increase customer satisfaction, and ensure compliance with rules and regulations. In all cases, the company’s strategy should drive the BPM effort. The following example illustrates these benefits.

**Example**

**The State of Alaska Streamlines Its Processes**

The Alaska Department of Natural Resources (DNR) manages most state-owned land, water, and natural resources on behalf of Alaska residents. The group’s primary mission is to responsibly develop and use Alaska’s natural resources for the maximum benefit of the public.

One of the largest divisions of the DNR, the Division of Mining, Land, and Water (DMLW), is responsible for processing authorizations that allow individuals, corporations, or nonprofit organizations to use state resources. The authorization process begins when applicants submit a request. The DMLW then decides whether to allow the activity based on many criteria, such as how the
activity will affect the adjoining properties, the neighbors, or current or future land development. It is advantageous for the state to process as many of these permit authorizations as possible because allowing such activity can generate significant revenue and an increase in jobs for the state and its residents. In fact, the state derives approximately 90 percent of its state budget from oil and gas revenue. In addition, these operations can create job opportunities that benefit the state economy.

However, for 20 years the DMLW has experienced a backlog of permit authorizations, resulting in missed revenue and business opportunities. Facing a mandate from the state legislature to fix the problem within three years, the Division needed to identify a solution that would enable it to streamline its processes and to eliminate the backlog (and prevent it from recurring).

In the past, the Division had used Microsoft Visio diagrams to map processes, and, on paper applications, to manage the permit authorization process. These manual, paper-based methods contributed to the backlog. Today, the Division uses IBM Business Process Manager Advanced software to handle the authorization process. Now, authorization requests are scanned and entered into a content management system. The act of entering the request triggers a new business process, which enables staff members to begin processing the application. Employees use the software to complete the adjudication process consistently and appropriately.

In the past, Division managers found it nearly impossible to easily assess the backlog. Managers had no way to effectively track the status of work in progress or work completed, resulting in processing delays. With the IBM software, managers use dashboards (you will learn about dashboards in Chapter 12) to quickly determine how much work is outstanding, the status of all work in process, and the target due dates of work in the queue.

The IBM software also helps the Division establish greater process consistency. Under the old system, where three regional offices employed manual and generally undocumented processes, enforcing consistency was a sometimes overwhelming challenge. An application that was approved by one office, for example, might be denied by another. Today, the new system guides employees through the application processes, and it coaches them on the next steps to take. By mid-2013, the backlog was decreasing, and all stakeholders were benefiting from the Division’s improved authorization process management.


### IT's [about business]

#### 2.2 BPR, BPI, and BPM at Chevron

Chevron, one of the world’s largest oil and gas companies, and its subsidiaries are involved in exploration and production of oil and natural gas, as well as in manufacturing, transporting, and distributing petrochemical products, including gasoline and refined products. In 2013, Chevron employed more than 60,000 people worldwide, produced the equivalent of more than 2.6 million barrels of oil every day, and reported more than $230 billion in sales. Chevron has been involved in several process-reengineering and improvement efforts over the years, evolving from BPR to BPI and eventually to BPM, as described below.

In 1995, Chevron was less than half of its current size today, producing roughly 1 million barrels of oil per day across six plants. The company was divided into three major departments: Refining, Marketing, and Supply and Distribution (S&D). Management decided that they needed to improve their supply chain (see Chapter 11) to better integrate their multiple internal processes. A key figure in decision making concerning process management was Vice President Peter McCrea. McCrea was convinced that the best strategy to dramatically improve performance at Chevron was to reengineer its end-to-end core processes, from the acquisition of crude oil crude through distribution of final products to Chevron customers.

To accomplish this task, the Chevron team collaborated with a consultant company to create a model of the existing processes. The objective was to radically improve the existing processes to reflect Chevron’s business goals. In other words, Chevron’s strategy was not to analyze the existing processes to identify specific areas to improve. Rather, the project identified the desired outputs and then examined the supporting processes, utilizing BPR. As an added benefit, this holistic approach led the company to examine the interdependencies between processes executed in different business units. Adopting this holistic perspective ultimately improved the company’s overall performance. In a 1996 report, Chevron claimed that the BPR project saved the company $50 million.
This complex BPR effort was initially followed by several smaller, employee-driven BPI initiatives. For example, in 1998, six Chevron employees initiated a project to improve water treatment processes at a company plant in California. Their efforts generated a 30 percent reduction in operating costs. Their success inspired other employees to initiate BPI projects in Indonesia, Angola, and other locations around the globe by employing Six Sigma improvement techniques. Although some managers were able to demonstrate benefits of BPI at the local level, BPI did not achieve companywide recognition and corporate backing until 2006, when Lean Six Sigma, a methodology that combines statistical process analysis with techniques to eliminate waste and improve process flow, became the preferred improvement methodology at Chevron. Since then, hundreds of BPI projects have been executed worldwide, resulting in significant financial benefits. For example, from 2008 to 2010 Chevron reported more than $1 billion in BPI benefits. To support these internal improvement efforts, Chevron engaged its suppliers in BPI initiatives as well.

To coordinate these various BPI efforts, Chevron has adopted a unified BPM approach that involves standardizing processes across the entire company and consolidating process information within a central repository. Chevron estimates that only 20 percent of its processes can be fully automated—the rest involve a combination of manual and automated steps. Thus, process standardization involves not only supporting processes through integrated information systems, but also ensuring that relevant employees are familiar with the standards for manual activities. To facilitate this task, Chevron implemented Nimbus (nimbus.tibco.com), a BPMS that acts as an intelligent repository of standard, companywide business rules and procedures. In addition, Nimbus can provide employees with detailed work instructions.

Consider, for example, Chevron's shipping process, which experienced efficiency and risk problems due to its different execution in locations throughout Asia, Europe, and the United States. To establish uniform company standards, Chevron employed a BPI approach. The company analyzed "as is" operations across different geographical locations, identified best practices, and combined them into a common "to be" process. It then created documents that detailed these policies and procedures and distributed them to managers through the Web-based BPMS.

Chevron's BPM strategy is part of a larger companywide management system that focuses on operational excellence. The program requires all Chevron operating companies and business units to adopt a continuous improvement perspective, directed by guidelines, metrics, and targets that are reviewed and adapted every year. Apart from process efficiency, Chevron focuses on metrics related to safety, risk, and the environment. All employees participate in operational excellence activities, and managers receive specific operational excellence training to support the continuous improvement culture.


Questions
1. What was one of the main advantages of BPR at Chevron?
2. Why did Chevron adopt BPI?
3. How does Chevron apply BPM in its operations today?

before you go on...

1. What is business process reengineering?
2. What is business process improvement?
3. What is business process management?

2.3 Business Pressures, Organizational Responses, and Information Technology Support

Modern organizations compete in a challenging environment. To remain competitive they must react rapidly to problems and opportunities that arise from extremely dynamic conditions. In this section you examine some of the major pressures confronting modern organizations and the strategies that organizations employ to respond to these pressures.

Business Pressures

The business environment is the combination of social, legal, economic, physical, and political factors in which businesses conduct their operations. Significant changes in any of these
factors are likely to create business pressures on organizations. Organizations typically respond to these pressures with activities supported by IT. Figure 2.2 illustrates the relationships among business pressures, organizational performance and responses, and IT support. You will learn about three major types of business pressures: market, technology, and societal pressures.

**Market Pressures.** Market pressures are generated by the global economy, intense competition, the changing nature of the workforce, and powerful customers. Let’s look more closely at each of these factors.

**Globalization.** Globalization is the integration and interdependence of economic, social, cultural, and ecological facets of life, made possible by rapid advances in information technology. In his book *The World Is Flat*, Pulitzer Prize-winning author Thomas Friedman argues that technology is leveling the global competitive playing field, thereby making it “flat.”

Friedman identifies three eras of globalization. The first era, Globalization 1.0, lasted from 1492 to 1800. During this era, the force behind globalization was how much muscle, horsepower, wind power, or steam power a country could deploy.

The second era, Globalization 2.0, lasted from 1800 to 2000. In this era, the force behind globalization was the emergence of multinational companies; that is, companies that had their headquarters in one country but operated in several countries. In the first half of this era, globalization was driven by falling transportation costs, generated by the development of the steam engine and the railroads. In the second half, the driving force was falling telecommunications costs resulting from the telegraph, telephones, computers, satellites, fiber-optic cable, and the Internet and World Wide Web. The modern global economy began to evolve during this era.

**FIGURE 2.2** Business pressures, organizational performance and responses, and IT support.
Around the year 2000, the world entered Globalization 3.0. In this era, globalization has been driven by the convergence of ten forces that Friedman calls “flatteners.” Table 2.2 identifies these forces.

According to Friedman, each era has been characterized by a distinctive focus. The focus of Globalization 1.0 was on countries, the focus of Globalization 2.0 was on companies, and the focus of Globalization 3.0 is on groups and individuals.

As you look at Table 2.2, note that nine of Friedman’s ten flatteners directly relate to information technology (all except the fall of the Berlin Wall). These flatteners enable individuals to connect, compute, communicate, collaborate, and compete everywhere and anywhere,

| **Table 2.2** |  |
| **Friedman’s Ten Flatteners** |  |
|  | **Fall of the Berlin Wall on November 9, 1989** |
|  | ◦ Shifted the world toward free-market economies and away from centrally planned economies.  
  ◦ Led to the emergence of the European Union and early thinking about the world as a single, global market. |
|  | **Netscape goes public on August 9, 1995** |
|  | ◦ Popularized the Internet and the World Wide Web. |
|  | **Development of work-flow software** |
|  | ◦ Enabled computer applications to work with one another without human intervention.  
  ◦ Enabled faster, closer collaboration and coordination among employees, regardless of their location. |
|  | **Uploading** |
|  | ◦ Empowered all Internet users to create content and put it on the Web.  
  ◦ Led the transition from a passive approach to content to an active, participatory, collaborative approach. |
|  | **Outsourcing** |
|  | ◦ Contracting with an outside company to perform a specific function that your company was doing itself and then integrating their work back into your operation; for example, moving customer call centers to India. |
|  | **Offshoring** |
|  | ◦ Relocating an entire operation, or certain tasks, to another country; for example, moving an entire manufacturing operation to China. |
|  | **Supply chaining** |
|  | ◦ Technological revolution led to the creation of networks composed of companies, their suppliers, and their customers, all of which could collaborate and share information for increased efficiency. |
|  | **Insourcing** |
|  | ◦ Delegating operations or jobs within a business to another company that specializes in those operations; for example, Dell hires FedEx to “take over” Dell’s logistics process. |
|  | **Informing** |
|  | ◦ The ability to search for information, best illustrated by search engines. |
|  | **The Steroids** (computing, instant messaging and file sharing, wireless technologies, Voice over Internet Protocol, videoconferencing, and computer graphics) |
|  | ◦ Technologies that amplify the other flatteners.  
  ◦ Enable all forms of computing and collaboration to be digital, mobile, and personal.
SECTION 2.3 Business Pressures, Organizational Responses, and Information Technology Support

anytime and all the time; to access limitless amounts of information, services, and entertainment; to exchange knowledge; and to produce and sell goods and services. People and organizations can now operate without regard to geography, time, distance, or even language barriers. The bottom line? Globalization is markedly increasing competition.

These observations highlight the importance of market pressures for you. Simply put, you and the organizations you join will be competing with people and organizations from all over a flat world.

Let’s consider some examples of globalization. Regional agreements such as the North American Free Trade Agreement (NAFTA), which includes the United States, Canada, and Mexico, have contributed to increased world trade and increased competition. Further, the rise of India and China as economic powerhouses has increased global competition.

One important pressure that businesses in a global market must contend with is the cost of labor, which varies widely among countries. In general, labor costs are higher in developed countries like the United States and Japan than in developing countries such as China and El Salvador. Also, developed countries usually offer greater benefits, such as healthcare, to employees, driving the cost of doing business even higher. Therefore, many labor-intensive industries have moved their operations to countries with low labor costs. IT has made such moves much easier to implement.

However, manufacturing overseas is no longer the bargain it once was, and manufacturing in the United States is no longer as expensive. For example, manufacturing wages in China have more than doubled between 2002 and 2013, and they continue to rise. Meanwhile, the value of China’s currency has steadily risen.

The Changing Nature of the Workforce. The workforce, particularly in developed countries, is becoming more diversified. Increasing numbers of women, single parents, minorities, and persons with disabilities are now employed in all types of positions. IT is easing the integration of these employees into the traditional workforce. IT is also enabling people to work from home, which can be a major benefit for parents with young children and for people confronted with mobility and/or transportation issues.

Powerful Customers. Consumer sophistication and expectations increase as customers become more knowledgeable about the products and services they acquire. Customers can use the Internet to find detailed information about products and services, to compare prices, and to purchase items at electronic auctions.

Organizations recognize the importance of customers and they have increased their efforts to acquire and retain them. Modern firms strive to learn as much as possible about their customers to better anticipate and address their needs. This process, called customer intimacy, is an important component of customer relationship management (CRM), an organization-wide effort toward maximizing the customer experience. You will learn about CRM in Chapter 11.

Technology Pressures. The second category of business pressures consists of those pressures related to technology. Two major technology-related pressures are technological innovation and information overload.

Technological Innovation and Obsolescence. Few and improved technologies rapidly create or support substitutes for products, alternative service options, and superb quality. As a result, today’s state-of-the-art products may be obsolete tomorrow. For example, how fast are new versions of your smartphone being released? How quickly are electronic versions of books, magazines, and newspapers replacing traditional hard copy versions? These changes force businesses to keep up with consumer demands.

Consider the Apple iPad (www.apple.com/ipad). Apple released the first iPad in April 2010 and sold 3 million of the devices in 50 days. Rather than taking time to enjoy its success, Apple made its iPad 2 available for sale on March 11, 2011, only 11 months later. Apple released the iPad 3 on March 7, 2012, and the company released the iPad 4 on November 2, 2012.

An interesting aspect of technological innovation is “bring your own device (BYOD).” BYOD refers to the policy of permitting employees to bring personally owned mobile devices (laptops, tablet computers, and smartphones) to the workplace, and use those devices to connect to the
Hamilton Fraser (www.hamiltonfraser.co.uk), located in North London, is an insurance company that specializes in home insurance. The firm is one of Great Britain’s major contractors for its deposit protection system, which assigns an independent arbitrator to both tenants and landlords to resolve any disputes when a tenant moves from a rented property.

The company’s IT manager, Pete Agathangelou, claims that information security is his highest priority because credibility is critical to his company’s success. He began to focus specifically on security threats from “bring your own device (BYOD)” in 2012 when he observed basic changes in his office environment. For example, he noticed that at lunchtime younger employees utilized their mobile devices to play games and contact their friends on social networks. He also observed that many senior executives were accessing their e-mail on mobile devices when they were out of the office.

Hamilton Fraser had already embraced mobile computing by allowing its employees to have iPhones and iPads. However, employees were using other devices—particularly Android devices—on the company network. Agathangelou concluded that he needed a system to manage all of the mobile devices that the employees were utilizing.

The first step in creating this system was to find a vendor who could manage the issue of employees accessing the corporate network with their own mobile devices. The company ultimately selected MobileIron (www.mobileiron.com), a firm that provides mobile device management and security to large enterprises.

MobileIron allowed Hamilton Fraser to identify which mobile devices the company would support. The MobileIron software enabled Hamilton Fraser to keep track of how many employees were accessing the firm’s network for business purposes (as opposed to, e.g., playing games or shopping) and whether they were using an approved device. The company’s human resources department developed an acceptable use policy, and it began to conduct short training sessions to raise awareness of this policy among employees. The policy dictates that employees who use mobile devices must download an application to their smartphone or tablet that will enable the IT department to erase any corporate data from the device if it is lost or stolen, or to erase all data from the device if the employee so wishes.


Questions
1. What are the advantages of allowing employees to use any mobile device to connect to the corporate network? The disadvantages?
2. Why is it necessary to be able to erase corporate data if a mobile device is lost or stolen?

Information Overload. The amount of information available on the Internet doubles approximately every year, and much of it is free. The Internet and other telecommunications networks are bringing a flood of information to managers. To make decisions effectively and efficiently, managers must be able to access, navigate, and utilize these vast stores of data, information, and knowledge. Information technologies, such as search engines (discussed in Chapter 6) and data mining (Chapter 12) provide valuable support in these efforts.

Societal/Political/Legal Pressures. The third category of business pressures includes social responsibility, government regulation/deregulation, spending for social programs, spending to protect against terrorism, and ethics. This section will explain how all of these elements affect modern businesses. We start with social responsibility.

Social Responsibility. Social issues that affect businesses and individuals range from the state of the physical environment, to company and individual philanthropy, to education. Some corporations and individuals are willing to spend time and/or money to address various social problems. These efforts are known as organizational social responsibility or individual social responsibility.
One critical social problem is the state of the physical environment. A growing IT initiative, called **green IT**, is addressing some of the most pressing environmental concerns. IT is instrumental in organizational efforts to “go green” in at least four areas.

- **Facilities design and management**: Organizations are creating more sustainable work environments. Many organizations are pursuing Leadership in Energy and Environmental Design (LEED) certification from the U.S. Green Building Council, a nonprofit group that promotes the construction of environmentally friendly buildings. One impact of this development is that IT professionals are expected to help create green facilities. Consequently, IT personnel have to consider how their computing decisions influence sustainable design and, in turn, how the building’s design influences the IT infrastructure. Green design influences the type of IT devices a company uses and the locations where IT clusters personal computers, people, and servers. IT must become familiar with the metering and monitoring systems employed in green buildings and the requirements of buildings’ computerized infrastructure.

- **Carbon management**: As companies try to reduce their carbon footprints, they are turning to IT executives to develop the systems needed to monitor carbon throughout the organization and its supply chain, which can be global in scope. Therefore, IT employees need to become knowledgeable about embedded carbon and how to measure it in the company’s products and processes.

  Consider, for example, application development. IT managers will have to ask whether an application will require new hardware to test and run, or how much additional server space (and thus energy) it will require—and how these issues translate into carbon output.

- **International and U.S. state environmental laws**: IT executives must deal with federal and state laws and international regulations that impact everything from the IT products they buy, to how they dispose of them, to their company’s carbon footprint. IT managers must understand environmental compliance issues so they can ask their vendors the right questions regarding specific state, national, and international environmental standards before they purchase, deploy, and dispose of equipment.

- **Energy management**: IT executives must understand their entire organization’s energy needs for several reasons. First, energy management systems are becoming increasingly sophisticated. To employ these systems effectively and to make intelligent consumption decisions, IT personnel must understand the system’s complex monitors and sensors. Second, utilities are offering incentives to commercial customers who take certain energy conservation steps, such as enabling computer power management across their networks and designing energy-efficient data centers. Finally, utilities are offering variable rate incentives depending on when companies use electricity and how much they use. Addressing these issues requires IT systems that can regulate electricity use.

Continuing our discussion of social responsibility, social problems all over the world may be addressed through corporate and individual philanthropy. In some cases, questions arise as to what percentage of contributions actually goes to the intended causes and recipients and what percentage goes to the charity’s overhead. Another problem that concerns contributors is that they often exert little influence over the selection of projects their contributions will support. The Internet can help address these concerns and facilitate generosity and connection. Consider the following examples:

- **PatientsLikeMe** (www.patientslikeme.com), or any of the thousands of message boards dedicated to infertility, cancer, and various other ailments. People use these sites and message boards to obtain information about life-and-death decisions based on volunteered information, while also receiving much-needed emotional support from strangers.

- **GiftFlow** (www.giftflow.org): GiftFlow is a virtual community where you can obtain things you need for free and find people who need the “stuff” you have to give away. GiftFlow connects community organizations, businesses, governments, and neighbors in a network of reciprocity.
OurGoods (www.ourgoods.org): OurGoods enables creative people to help one another produce independent projects. More work is accomplished in networks of shared respect and shared resources than in competitive isolation.

Sparked (www.sparked.com): Sparked is an online “microvolunteering” Web site where large and small organizations list opportunities for people looking to volunteer.

Thredup (www.thredup.com): Thredup is a Web site where parents trade children’s clothing and toys.

Collaborative Consumption (www.collaborativeconsumption.com): This Web site is an online hub for discussions about the growing business of sharing, resale, reuse, and barter (with many links to Web sites engaged in these practices).

Kiva (www.kiva.org): Kiva is a nonprofit enterprise that provides a link between lenders in developed countries and entrepreneurs in developing countries. Users pledge interest-free loans rather than tax-deductible donations. Kiva directs 100 percent of the loans to borrowers.

DonorsChoose (www.donorschoose.org): DonorsChoose is an education-oriented Web site that functions entirely within the United States. Users make donations rather than loans. The Web site addresses the huge problem of underfunded public schools.

Still another social problem that affects modern business is the digital divide. The digital divide refers to the wide gap between those individuals who have access to information and communications technology and those who do not. This gap exists both within and among countries. IT’s About Business 2.4 provides an example of how modern information technologies are enabling the Surui people of the Amazon region in Brazil to bridge the digital divide.

IT’s [about business]

2.4 The Surui Tribe of the Amazon

Chief Almir of the Surui tribe of the Brazilian Amazon is using Google to help his tribe maintain its traditional way of life. In 1969, the Surui experienced their first contact with outsiders, who brought with them disease, violence, and death. Then, loggers arrived and laid waste to the Surui’s homeland.

Chief Almir assumed a leadership role in his tribe at age 17, and he became the tribe’s first member to attend college. In 2006, he fled briefly to the United States when loggers put a bounty on his head. The following year he stumbled upon Google Earth in an Internet café.

During this time Chief Almir came to believe that his tribe’s survival depended on outreach. To realize this goal, he partnered with Google to create an online “cultural map” of the Surui with stories provided by the tribe’s elders, which are uploaded onto YouTube, as well as a geographical map of their territory created with GPS-equipped smartphones provided by Google. In 2009, Google employees taught the Surui to use cell phones to record illegal logging on their land. Tribal members can now take photos and videos that are geo-tagged and then immediately upload the images to Google Earth. Law enforcement officials can no longer claim ignorance of the problem when evidence of the deforestation is publicly available online. Satellite pictures indicate that the Surui territory is the only remaining intact piece of rainforest in the area. This fact confirms that the Surui use of technology has been highly effective.

Chief Almir views his partnership with Google not only as a way to sustain his traditions and his land, but also as an opportunity to teach other peoples about the Surui. Furthermore, the tribe has mounted an ambitious reforestation plan to combat the aggressive logging that is destroying the Surui’s 600,000 acres of land. The tribe now uses smartphones to document cleared areas in the forest and to create planting strategies. The Surui intend to plant 100 million saplings in the next decade. They hope to raise millions of dollars through a United Nations program that awards carbon credits, which recipients can trade for cash, to countries and tribes that maintain their forests. The money would fund new homes, a hospital, and a school. The Surui have created a word for Google in their language: ragogmakann, meaning “the messenger.”

In the summer of 2012, Google unveiled a cultural map of the Surui. This map serves as a digital tool to help the tribe share their vast knowledge of the rainforest while fighting illegal logging. The map, which is the result of a five-year partnership between Chief Almir and Google, is a collection of picture and videos mapping historical sites and offering three-dimensional visualization of Surui territory. The map is available on the Web site www.paiter.org, as well as on Google Earth.

A Google spokesperson stated that the company hoped that the methodology used to develop the Surui cultural map would be employed to help other indigenous peoples around the world. By late 2012, similar projects were planned for two tribes who are
neighbors of the Surui. The Surui themselves are the trainers for the new cultural maps. In addition, Google has been contacted by tribes from all over the world, including the aboriginal First Nations in Canada, the Maoris in New Zealand, and many other Amazon tribes.


Questions
1. Describe the benefits that all of us gain from the Surui’s use of IT.
2. Provide specific examples of how the Surui could make further use of IT to improve their lives.

Many government and international organizations are trying to close the digital divide. As technologies develop and become less expensive, the speed at which the gap can be closed will accelerate. On the other hand, the rapid pace of technological development can make it more difficult for groups with few resources to keep up with more affluent groups.

One well-known project to narrow the divide is the One Laptop per Child (OLPC) project (http://one.laptop.org). OLPC is a nonprofit association dedicated to developing a very inexpensive laptop—a technology that aims to revolutionize how the world can educate its children.

The first generation of inexpensive laptops appeared in 2007 with a price of $188, which was too high for individuals and groups with limited resources. The second generation was scrapped because the price remained too high. The next generation, a touchscreen tablet computer for schoolchildren in the developing world, uses less power than a light bulb and is unbreakable, waterproof, and half as thick as an iPhone. This computer will be a single sheet of plastic, and will have a projected price of $75.

Compliance with Government Regulations. Another major source of business pressures is government regulations regarding health, safety, environmental protection, and equal opportunity. Businesses tend to view government regulations as expensive constraints on their activities. In general, government deregulation intensifies competition.

In the wake of 9/11 and numerous corporate scandals, the U.S. government passed many new laws, including the Sarbanes-Oxley Act, the USA PATRIOT Act, the Gramm-Leach-Bliley Act, and the Health Insurance Portability and Accountability Act (HIPAA). Organizations must be in compliance with the regulations contained in these statutes. The process of becoming and remaining compliant is expensive and time consuming. In almost all cases, organizations rely on IT support to provide the necessary controls and information for compliance.

Protection against Terrorist Attacks. Since September 11, 2001, organizations have been under increased pressure to protect themselves against terrorist attacks. In addition, employees who are in the military reserves have been called up for active duty, creating personnel problems. Information technology can help protect businesses by providing security systems and possibly identifying patterns of behavior associated with terrorist activities, including cyberattacks (discussed in Chapter 4).

An example of protection against terrorism is the Department of Homeland Security’s (DHS) US-Visit program. US-Visit is a network of biometric-screening systems, such as fingerprint and ocular (eye) scanners, that ties into government databases and watch lists to check the identities of millions of people entering the United States. The system is now operational in more than 300 locations, including major international ports of entry by air, sea, and land. As another example, refer to the chapter opening case on the Palantir system.

Ethical Issues. Ethics relates to general standards of right and wrong. Information ethics relates specifically to standards of right and wrong in information-processing practices. Ethical issues are very important because, if handled poorly, they can damage an organization’s image and destroy its employees’ morale. The use of IT raises many ethical issues, ranging from monitoring e-mail to invading the privacy of millions of customers whose data are stored in private and public databases. Chapter 3 covers ethical issues in detail.
Clearly, then, the pressures on organizations are increasing, and organizations must be prepared to take responsive actions if they are to succeed. You will learn about these organizational responses in the next section.

Organizational Responses
Organizations are responding to the various pressures just discussed by implementing IT such as strategic systems, customer focus, make-to-order and mass customization, and e-business. This section explores each of these responses.

Strategic Systems. Strategic systems provide organizations with advantages that enable them to increase their market share and/or profits, to better negotiate with suppliers, and to prevent competitors from entering their markets. As an example, the IT department at P&G (www.pg.com) developed a virtualized environment that the company uses for product design work, product placement research, and consumer feedback studies. P&G utilizes virtual reality models to test design ideas for the next breakthroughs in products such as diapers and cosmetics. Within these “cyberworlds,” P&G can rapidly test product performance as well as consumer responses to various kinds of ingredient and packaging choices. IT’s About Business 2.5 provides another example of how strategically important information systems can be, by examining the Massachusetts Mutual Life Insurance Company.

IT’s [about business]

2.5 Massachusetts Mutual Transforms Its Information Systems

Founded in 1851, Massachusetts Mutual Life Insurance Company (MassMutual; www.massmutual.com) is a leading mutual life insurance company with 1,800 offices and 13 million clients located throughout the world. Although MassMutual does not guarantee dividends, it has paid them to eligible participating policyholders every year since the 1860s. The company provides products to help meet its clients’ financial needs, including life insurance, disability income insurance, long-term care insurance, retirement/401(k) plan services, and annuities.

In 2008, MassMutual undertook a complete transformation of its 1,200-person information technology department. At that time, the firm’s IT infrastructure consisted of 60 years of legacy information systems (old systems that had been in use for many years). The company realized that these outdated systems seriously jeopardized its ability to successfully compete, much less gain competitive advantage, in an increasingly dynamic marketplace. As a result, MassMutual initiated the massive project to change IT into a more innovative, flexible organization that focused on company growth, market agility, seizing opportunities, and enabling innovation in the company as a whole. The project required the right people, the right processes, and the right technology—in that order. The mandate was that the project was a business initiative, and anything it accomplished had to benefit the entire company, not just the IT group. To emphasize this point, the project included MassMutual business units as partners.

In the project’s first phase, the IT organization, along with PricewaterhouseCoopers (www.pwc.com) as consultants, conducted a comprehensive assessment of itself against its peers in the insurance industry and against best-in-class organizations in other industries. It then shared its findings with the entire organization.

As a result of this assessment, MassMutual redefined every job in the IT organization, and it reduced more than 100 existing job descriptions to 35 industry-standard roles. This reclassification also created new career opportunities in IT. Extensive training helped make the reclassification successful. The firm also used virtual reality training, as well as off-site “boot camps” that featured interactive activities.

MassMutual has created a culture in its IT group that values sharing ideas and making those ideas better. The company began rewarding people for sharing information rather than hoarding it. IT personnel were encouraged to take risks and make mistakes, as long as they learned from those mistakes and shared the lessons they learned with the entire organization.

To make sharing information an ongoing process, MassMutual developed a knowledge management system. The system is a collaborative effort, and employees from IT and the business units continually add information to it. This knowledge base has enabled the firm to capture knowledge and to share ideas throughout the organization.

The IT organization also implemented standard processes. As part of this standardization process, IT created “Communities of Practice.” These are teams that share stories and ideas and determine whether the existing processes are working. If they are not, then the teams devise strategies to improve them. The teams also institutionalize those processes that are working effectively. Interestingly, all Communities of Practice include people from the company’s business units.
Customer Focus. Organizational attempts to provide superb customer service can make the difference between attracting and retaining customers versus losing them to competitors. Numerous IT tools and business processes have been designed to keep customers happy. Consider Amazon, for example. When you visit Amazon’s Web site anytime after your first visit, the site welcomes you back by name and it presents you with information about items that you might like, based on your previous purchases. In another example, Dell guides you through the process of purchasing a computer by providing information and choices that help you make an informed buying decision.

Make-to-Order and Mass Customization. Make-to-order is a strategy of producing customized (made to individual specifications) products and services. The business problem is how to manufacture customized goods efficiently and at a reasonably low cost. Part of the solution is to change manufacturing processes from mass production to mass customization. In mass production, a company produces a large quantity of identical items. In mass customization, it also produces a large quantity of items, but it customizes them to fit the needs and preferences of individual customers. Mass customization is simply an attempt to perform make-to-order on a large scale. Bodymetrics (www.bodymetrics.com) is an excellent example of mass customization involving men’s and women’s jeans.

Example

Well-fitting jeans are notoriously difficult to find. To address this problem, Bodymetrics developed a “body scanner” that scans the customer’s body, captures more than 150 measurements, and produces a digital replica of the customer’s size and shape. This scan is then used to provide three services: made-to-measure jeans, body-shape jeans, and online virtual try-on.

With made-to-measure jeans, the scan is used to create a pattern for the jeans, which are hand-tailored to the exact lines and contours of the customer’s body. The jeans are ready in three to six weeks, at which time the customer has a final fitting with a Bodymetrics tailor.

Based on its experience with made-to-measure jeans, Bodymetrics has identified three body shapes: straight, semicurvy, and curvy. Body-shape jeans are specifically designed to fit these different body shapes. After customers are scanned, a Bodymetrics jeans expert helps them determine their body shapes. Customers can then instantly purchase jeans matching their body shapes off the rack in the store.

The online virtual try-on allows customers who have been scanned to try on jeans virtually on their own bodies without physically trying on jeans in a dressing room. The service creates an avatar (a three-dimensional graphical representation of the customer), which has an amazing resemblance to her or him. Then, the customer can pick various styles of jeans and “virtually see” what the jeans look like on her or his avatar.

Questions

1. Explain why the MassMutual IT transformation project requires the right people, the right processes, and the right technology, in that particular order.
2. Describe the benefits of the knowledge management system implemented at MassMutual.
3. Why are people from the business units included in IT Communities of Practice?
4. What should MassMutual’s IT organization do next?

E-Business and E-Commerce. Conducting business electronically is an essential strategy for companies that are competing in today’s business environment. Electronic commerce (EC or e-commerce) describes the process of buying, selling, transferring, or exchanging products, services, or information via computer networks, including the Internet. E-business is a somewhat broader concept. In addition to the buying and selling of goods and services, e-business also refers to servicing customers, collaborating with business partners, and performing electronic transactions within an organization. Chapter 7 focuses extensively on this topic. In addition, e-commerce applications appear throughout the text.

You now have a general overview of the pressures that affect companies in today’s business environment and the responses that they choose to manage these pressures. To plan for the most effective responses, companies formulate strategies. In the new digital economy, these strategies rely heavily on information technology, especially strategic information systems. You examine these topics in the next section.

before you go on...

1. What are the characteristics of the modern business environment?

2. Discuss some of the pressures that characterize the modern global business environment.

3. Identify some of the organizational responses to these pressures. Are any of these responses specific to a particular pressure? If so, which ones?

2.4 Competitive Advantage and Strategic Information Systems

A competitive strategy is a statement that identifies a business’s approach to compete, its goals, and the plans and policies that will be required to carry out those goals (Porter, 1985). A strategy, in general, can apply to a desired outcome, such as gaining market share. A competitive strategy focuses on achieving a desired outcome when competitors want to prevent you from reaching your goal. Therefore, when you create a competitive strategy, you must plan your own moves, but you must also anticipate and counter your competitors’ moves.

Through its competitive strategy, an organization seeks a competitive advantage in an industry. That is, it seeks to outperform its competitors in a critical measure such as cost, quality, and time-to-market. Competitive advantage helps a company function profitably with a market and generate larger-than-average profits.

Competitive advantage is increasingly important in today’s business environment, as you will note throughout the text. In general, the core business of companies has remained the same. That is, information technologies simply offer tools that can enhance an organization’s success through its traditional sources of competitive advantage, such as low cost, excellent customer service, and superior supply chain management. Strategic information systems (SISs) provide a competitive advantage by helping an organization implement its strategic goals and improve its performance and productivity. Any information system that helps an organization either achieve a competitive advantage or reduce a competitive disadvantage, qualifies as a strategic information system.
Porter’s Competitive Forces Model

The best-known framework for analyzing competitiveness is Michael Porter’s competitive forces model (Porter, 1985). Companies use Porter’s model to develop strategies to increase their competitive edge. Porter’s model also demonstrates how IT can make a company more competitive.

Porter’s model identifies five major forces that can endanger or enhance a company’s position in a given industry. Figure 2.3 highlights these forces. Although the Web has changed the nature of competition, it has not changed Porter’s five fundamental forces. In fact, what makes these forces so valuable as analytical tools is that they have not changed for centuries. Every competitive organization, no matter how large or small, or what business it is in, is driven by these forces. This observation applies even to organizations that you might not consider competitive, such as local governments. Although local governments are not for-profit enterprises, they compete for businesses to locate in their districts, for funding from higher levels of government, for employees, and for many other things.

Significantly, Porter (2001) concludes that the overall impact of the Web is to increase competition, which generally diminishes a firm’s profitability. Let’s examine Porter’s five forces and the ways that the Web influences them.

1. The threat of entry of new competitors. The threat that new competitors will enter your market is high when entry is easy and low when there are significant barriers to entry. An entry barrier is a product or service feature that customers have learned to expect from organizations in a certain industry. A competing organization must offer this feature in order to survive in the marketplace. There are many types of entry barriers. Consider, for example, legal requirements such as admission to the bar to practice law or a license to serve liquor, where only a certain number of licenses are available.

Suppose you want to open a gasoline station. In order to compete in that industry, you would have to offer pay-at-the-pump service to your customers. Pay-at-the-pump is an IT-based barrier to entering this market because you must offer it for free. The first gas station that offered this service gained first-move advantage and established barriers to entry. This advantage did not last, however, because competitors quickly offered the same service and thus overcame the entry barrier.

For most firms, the Web increases the threat that new competitors will enter the market because it sharply reduces traditional barriers to entry, such as the need for a sales force or a physical storefront. Today, competitors frequently need only to set up a Web site. This threat
of increased competition is particularly acute in industries that perform an *intermediation* role, which is a link between buyers and sellers (e.g., stock brokers and travel agents), as well as in industries where the primary product or service is digital (e.g., the music industry). In addition, the geographical reach of the Web enables distant competitors to compete more directly with an existing firm.

In some cases the Web increases barriers to entry. This scenario occurs primarily when customers have come to expect a nontrivial capability from their suppliers. For example, the first company to offer Web-based package tracking gained a competitive advantage from that service. Competitors were forced to follow.

2. **The bargaining power of suppliers.** Supplier power is high when buyers have few choices from whom to buy and low when buyers have many choices. Therefore, organizations would rather have more potential suppliers so they will be in a stronger position to negotiate price, quality, and delivery terms.

   The Internet’s impact on suppliers is mixed. On the one hand, it enables buyers to find alternative suppliers and to compare prices more easily, thereby reducing the supplier’s bargaining power. On the other hand, as companies use the Internet to integrate their supply chains, participating suppliers prosper by locking in customers.

3. **The bargaining power of customers (buyers).** Buyer power is high when buyers have many choices from whom to buy and low when buyers have few choices. For example, in the past, there were few locations where students could purchase textbooks (typically, one or two campus bookstores). In this situation, students had low buyer power. Today, the Web provides students with access to a multitude of potential suppliers as well as detailed information about textbooks. As a result, student buyer power has increased dramatically.

   In contrast, *loyalty programs* reduce buyer power. As their name suggests, loyalty programs reward customers based on the amount of business they conduct with a particular organization (e.g., airlines, hotels, and rental car companies). Information technology enables companies to track the activities and accounts of millions of customers, thereby reducing buyer power. That is, customers who receive “perks” from loyalty programs are less likely to do business with competitors. (Loyalty programs are associated with customer relationship management, which you will study in Chapter 11.)

4. **The threat of substitute products or services.** If there are many alternatives to an organization’s products or services, then the threat of substitutes is high. If there are few alternatives, then the threat is low. Today, new technologies create substitute products very rapidly. For example, customers today can purchase wireless telephones instead of land-line telephones, Internet music services instead of traditional CDs, and ethanol instead of gasoline in cars.

   Information-based industries experience the greatest threat from substitutes. Any industry in which digitized information can replace material goods (e.g., music, books, and software) must view the Internet as a threat because the Internet can convey this information efficiently and at low cost and high quality.

   Even when there are many substitutes for their products, however, companies can create a competitive advantage by increasing switching costs. *Switching costs* are the costs, in money and time, imposed by a decision to buy elsewhere. For example, contracts with smartphone providers typically include a substantial penalty for switching to another provider until the term of the contract expires (quite often, two years). This switching cost is monetary.

   As another example, when you buy products from Amazon, the company develops a profile of your shopping habits and recommends products targeted to your preferences. If you switch to another online vendor, that company will need time to develop a profile of your wants and needs. In this case, the switching cost involves time rather than money.

5. **The rivalry among existing firms in the industry.** The threat from rivalry is high when there is intense competition among many firms in an industry. The threat is low when the competition is among fewer firms and is not as intense.

   In the past, proprietary information systems—systems that belong exclusively to a single organization—have provided strategic advantage to firms in highly competitive industries.
Today, however, the visibility of Internet applications on the Web makes proprietary systems more difficult to keep secret. In simple terms, when I see my competitor’s new system online, I will rapidly match its features to remain competitive. The result is fewer differences among competitors, which leads to more intense competition in an industry.

To understand this concept, consider the highly competitive grocery industry, where Walmart, Kroger, Safeway, and other companies compete essentially on price. Some of these companies have IT-enabled loyalty programs in which customers receive discounts and the store gains valuable business intelligence on customers’ buying preferences. Stores use this business intelligence in their marketing and promotional campaigns. (You will learn about business intelligence in Chapter 12.)

Grocery stores are also experimenting with wireless technologies such as radio-frequency identification (RFID, discussed in Chapter 8) to speed up the checkout process, track customers through the store, and notify customers of discounts as they pass by certain products. Grocery companies also use IT to tightly integrate their supply chains for maximum efficiency and thus reduce prices for shoppers.

Competition also is being affected by the extremely low variable cost of digital products. That is, once a digital product has been developed, the cost of producing additional “units” approaches zero. Consider the music industry as an example. When artists record music, their songs are captured in digital format. Physical products, such as CDs or DVDs of the songs for sale in music stores, involve costs. The costs of a physical distribution channel are much higher than those involved in delivering the songs digitally over the Internet.

In fact, in the future companies might give away some products for free. For example, some analysts predict that commissions for online stock trading will approach zero because investors can search the Internet for information to make their own decisions regarding buying and selling stocks. At that point, consumers will no longer need brokers to give them information that they can obtain themselves, virtually for free.

Porter’s Value Chain Model
Organizations use the Porter competitive forces model to design general strategies. To identify specific activities where they can use competitive strategies for greatest impact, they use his value chain model (1985). A value chain is a sequence of activities through which the organization’s inputs, whatever they are, are transformed into more valuable outputs, whatever they are. The value chain model identifies points where an organization can use information technology to achieve competitive advantage (see Figure 2.4).

According to Porter’s value chain model, the activities conducted in any organization can be divided into two categories: primary activities and support activities. Primary activities relate to the production and distribution of the firm’s products and services. These activities create value for which customers are willing to pay. The primary activities are buttressed by support activities. Unlike primary activities, support activities do not add value directly to the firm’s products or services. Rather, as their name suggests, they contribute to the firm’s competitive advantage by supporting the primary activities.

Next, you will see examples of primary and support activities in the value chain of a manufacturing company. Keep in mind that other types of firms, such as transportation, healthcare, education, retail, and others, have different value chains. The key point is that every organization has a value chain.

In a manufacturing company, primary activities involve purchasing materials, processing the materials into products, and delivering the products to customers. Manufacturing companies typically perform five primary activities in the following sequence:

1. Inbound logistics (inputs)
2. Operations (manufacturing and testing)
3. Outbound logistics (storage and distribution)
4. Marketing and sales
5. Services
As work progresses in this sequence, value is added to the product in each activity. Specifically, the following steps occur:

1. The incoming materials are processed (in receiving, storage, and so on) in activities called **inbound logistics**.
2. The materials are used in operations, where value is added by turning raw materials into products.
3. These products are prepared for delivery (packaging, storing, and shipping) in the outbound logistics activities.
4. Marketing and sales sell the products to customers, increasing product value by creating demand for the company's products.
5. Finally, the company performs after-sales service for the customer, such as warranty service or upgrade notification, adding further value.

As noted above, the primary activities are buttressed by support activities. Support activities consist of:

1. The firm’s infrastructure (accounting, finance, management)
2. Human resources management
3. Product and technology development (R&D)
4. Procurement

Each support activity can be applied to any or all of the primary activities. In addition, the support activities can also support one another.

A firm’s value chain is part of a larger stream of activities, which Porter calls a **value system**. A value system, or an **industry value chain**, includes the suppliers that provide the inputs necessary...
to the firm along with their value chains. After the firm creates products, these products pass through the value chains of distributors (which also have their own value chains), all the way to the customers. All parts of these chains are included in the value system. To achieve and sustain a competitive advantage, and to support that advantage with information technologies, a firm must understand every component of this value system.

Strategies for Competitive Advantage

Organizations continually try to develop strategies to counter the five competitive forces identified by Porter. You will learn about five of those strategies here. Before we go into specifics, however, it is important to note that an organization’s choice of strategy involves trade-offs. For example, a firm that concentrates only on cost leadership might not have the resources available for research and development, leaving the firm unable to innovate. As another example, a company that invests in customer happiness (customer-orientation strategy) will experience increased costs.

Companies must select a strategy and then stay with it, because a confused strategy cannot succeed. This selection, in turn, decides how a company will utilize its information systems. A new information system that can improve customer service but will increase costs slightly will be welcomed at a high-end retailer such as Nordstrom’s, but not at a discount store like Walmart. The following list presents the most commonly used strategies. Figure 2.5 provides an overview of these strategies.

1. **Cost leadership strategy.** Produce products and/or services at the lowest cost in the industry. An example is Walmart’s automatic inventory replenishment system, which enables Walmart to reduce inventory storage requirements. As a result, Walmart stores use floor space only to sell products, and not to store them, thereby reducing inventory costs.

2. **Differentiation strategy.** Offer different products, services, or product features than your competitors. Southwest Airlines, for example, has differentiated itself as a low-cost, short-haul, express airline. This has proved to be a winning strategy for competing in the highly competitive airline industry. Also, Dell has differentiated itself in the personal computer market through its mass-customization strategy.

3. **Innovation strategy.** Introduce new products and services, add new features to existing products and services, or develop new ways to produce them. A classic example is the introduction of automated teller machines (ATMs) by Citibank. The convenience and cost-cutting features of this innovation gave Citibank a huge advantage over its competitors. Like

![FIGURE 2.5 Strategies for Competitive Advantage.](image-url)
many innovative products, the ATM changed the nature of competition in the banking industry. Today, an ATM is a competitive necessity for any bank.

4. **Operational effectiveness strategy.** Improve the manner in which a firm executes its internal business processes so that it performs these activities more effectively than its rivals. Such improvements increase quality, productivity, and employee and customer satisfaction while decreasing time to market.

5. **Customer-orientation strategy.** Concentrate on making customers happy. Web-based systems are particularly effective in this area because they can create a personalized, one-to-one relationship with each customer.

**before you go on...**

1. What are strategic information systems?
2. According to Porter, what are the five forces that could endanger a firm’s position in its industry or market places?
3. Describe Porter’s value chain model. Differentiate between Porter’s competitive forces model and his value chain model.
4. What strategies can companies use to gain competitive advantage?

### 2.5 Business—Information Technology Alignment

The “holy grail” of organizations is business–information technology alignment, or strategic alignment (which we will call simply *alignment*). **Business–information technology alignment** is the tight integration of the IT function with the organization’s strategy, mission, and goals. That is, the IT function directly supports the business objectives of the organization. There are six characteristics of excellent alignment:

- Organizations view IT as an engine of innovation that continually transforms the business, often creating new revenue streams.
- Organizations view their internal and external customers and their customer service function as supremely important.
- Organizations rotate business and IT professionals across departments and job functions.
- Organizations provide overarching goals that are completely clear to each IT and business employee.
- Organizations ensure that IT employees understand how the company makes (or loses) money.
- Organizations create a vibrant and inclusive company culture.

Unfortunately, many organizations fail to achieve this type of close alignment. In fact, according to a McKinsey & Company survey on IT strategy and spending, only 16 percent of the IT and business executives who participated agreed that their organization had adequate alignment between IT and the business. Given the importance of business–IT alignment, why do so many organizations fail to implement this policy? The major reasons are:

- Business managers and IT managers have different objectives.
- The business and IT departments are ignorant of the other group’s expertise.
- A lack of communication.

Put simply, business executives often know little about information technology, and IT executives understand the technology but may not understand the real needs of the business. One solution to this problem is to adopt a process view, as explained in Sections 2.1 and 2.2, to map and improve business and IT processes to achieve greater alignment.
Businesses can also utilize enterprise architecture to foster alignment. Originally developed as a tool to organize a company’s IT initiatives, the enterprise architecture concept has evolved to encompass both a technical specification (the information and communication technologies and the information systems used in an organization) and a business specification (a collection of core business processes and management activities).

**before you go on...**

1. What is business—IT alignment?
2. Give examples of business—IT alignment at your university, regarding student systems. (Hint: What are the “business” goals of your university with regard to student registration, fee payment, grade posting, etc.?)

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**For all Majors**

All of the functional areas of any organization are literally composed of a variety of business processes. Regardless of your major, you will be involved in a variety of business processes from your first day on the job. Some of these processes you will do by yourself, some will involve only your group or department, and others will involve several (or all) of the organization’s functional areas.

It is important for you to be able to visualize processes, understand the inputs and outputs of each process, and identify the “customer” of each process. These capabilities will enable you to make the organization’s business processes more efficient and effective, eliminate waste, and safeguard company resources through appropriate controls. This task generally involves incorporating information technology in the process. It is also important for you to appreciate how each process interacts with other processes in the organization and how each process fits into your organization’s strategy.

All functional areas in any organization must work together in an integrated fashion in order for the firm to respond adequately to business pressures. These responses typically require each functional area to utilize a variety of information systems to support, document, and manage cross-functional business processes. In today’s competitive global marketplace, the timeliness and accuracy of these responses is even more critical.

Closely following this discussion, all functional areas must work together for the organization to gain competitive advantage in its marketplace. Again, the functional areas use a variety of strategic information systems to achieve this goal. BPR and BPI process change efforts contribute to the goal as well.

You have seen why companies must be concerned with strategic advantage. But why is this chapter so important for you? There are several reasons. First, the business pressures you have learned about have an impact on your organization, but they also affect you as an individual. So, it is critical that you understand how information systems can help you, and eventually your organization, respond to these pressures.

In addition, achieving competitive advantage is essential for your organization’s survival. In many cases, you, your team, and all your colleagues will be responsible for creating a competitive advantage. Therefore, having general knowledge about strategy and about how information systems affect the organization’s strategy and competitive position will help you in your career.

You also need a basic knowledge of your organization’s strategy, mission, and goals, as well as its business problems and how it makes (or loses) money. You now know how to analyze your organization’s strategy and value chain, as well as the strategies and value chains of your competitors. You also have acquired a general knowledge of how information technology contributes to organizational strategy. This knowledge will help you to do your job better, to be promoted more quickly, and to contribute significantly to the success of your organization.
Summary

1. Discuss ways in which information systems enable cross-functional business processes and business processes for a single functional area.

A business process is an ongoing collection of related activities that produce a product or a service of value to the organization, its business partners, and/or its customers. Examples of business processes in the functional areas are managing accounts payable, managing accounts receivable, managing post-sale customer follow-up, managing bills of materials, managing manufacturing change orders, applying disability policies, hiring employees, training staff and computer users, and applying Internet use policy.

2. Compare and contrast business process improvement, business process reengineering, and business process management to determine the different advantages and disadvantages of each.

*Business process reengineering* is a radical redesign of an organization’s business processes that is intended to improve the efficiency and effectiveness of these processes. The key to BPR is for enterprises to examine their business processes from a “clean sheet” perspective and then determine how they could best reconstruct those processes to improve their business functions. Because BPR proved difficult to implement, organizations have turned to business process improvement.

*Business process improvement* is an incremental approach to enhancing the efficiency and effectiveness of a process that is less risky and less costly than BPR. BPI relies on a structured approach (define, measure, analyze, improve, and control, or DMAIC), and many methodologies, such as Six Sigma, can be used to support these required steps.

*Business process management* is a management technique that includes methods and tools to support the documentation, design, analysis, implementation, management, and optimization of business processes. BPM coordinates individual BPI activities and creates a central repository of a company’s processes, generally by utilizing software such as BPMS.

3. Identify effective IT responses to different kinds of business pressures.

- **Market pressures**: An example of a market pressure is powerful customers. Customer relationship management is an effective IT response that helps companies achieve customer intimacy.
- **Technology pressures**: An example of a technology pressure is information overload. Search engines and business intelligence applications enable managers to access, navigate, and utilize vast amounts of information.
- **Societal/political/legal pressures**: An example of a societal/political/legal pressure is social responsibility, such as the state of the physical environment. Green IT is one response that is intended to improve the environment.

4. Describe the strategies that organizations typically adopt to counter Porter’s five competitive forces.

Porter’s five competitive forces:

- **The threat of entry of new competitors**: For most firms, the Web increases the threat that new competitors will enter the market by reducing traditional barriers to entry. Frequently, competitors need only to set up a Web site to enter a market. The Web can also increase barriers to entry, as when customers come to expect a nontrivial capability from their suppliers.
- **The bargaining power of suppliers**: The Web enables buyers to find alternative suppliers and to compare prices more easily, thereby reducing suppliers’ bargaining power. From a different perspective, as companies use the Web to integrate their supply chains, participating suppliers can lock in customers, thereby increasing suppliers’ bargaining power.
• The bargaining power of customers (buyers): The Web provides customers with incredible amounts of choices for products, as well as information about those choices. As a result, the Web increases buyer power. However, companies can implement loyalty programs in which they use the Web to monitor the activities of millions of customers. Such programs reduce buyer power.

• The threat of substitute products or services: New technologies create substitute products very rapidly, and the Web makes information about these products available almost instantly. As a result, industries (particularly information-based industries) are in great danger from substitutes (e.g., music, books, newspapers, magazines, software). However, the Web also can enable a company to build in switching costs, so that it will cost customers time and/or money to switch from your company to a competitor.

• The rivalry among existing firms in the industry: In the past, proprietary information systems provided strategic advantage for firms in highly competitive industries. The visibility of Internet applications on the Web makes proprietary systems more difficult to keep secret. Therefore, the Web makes strategic advantage more short-lived.

The five strategies are as follows:

• Cost leadership strategy—produce products and/or services at the lowest cost in the industry;
• Differentiation strategy—offer different products, services, or product features;
• Innovation strategy—introduce new products and services, put new features in existing products and services, or develop new ways to produce them;
• Operational effectiveness strategy—improve the manner in which internal business processes are executed so that a firm performs similar activities better than its rivals;
• Customer-orientation strategy—concentrate on making customers happy.

5. Describe the characteristics of effective business–information technology alignment.

Business–IT alignment is the tight integration of the IT function with the strategy, mission, and goals of the organization. There are six characteristics of effective alignment:

• Organizations view IT as an engine of innovation that continually transforms the business.
• Organizations view customers and customer service as supremely important.
• Organizations rotate business and IT professionals across departments and job functions.
• Organizations provide clear, overarching goals for all employees.
• Organizations ensure that IT employees understand how the company makes (or loses) money.
• Organizations create a vibrant and inclusive company culture.

[ Chapter Glossary ]

**business environment** The combination of social, legal, economic, physical, and political factors in which businesses conduct their operations.

**business–information technology alignment** The tight integration of the IT function with the strategy, mission, and goals of the organization.

**business process** A collection of related activities that produce a product or a service of value to the organization, its business partners, and/or its customers.

**business process improvement (BPI)** A methodology for achieving incremental improvements in the effectiveness and efficiency of a process.

**business process management (BPM)** A management technique that includes methods and tools to support the design, analysis, implementation, management, and optimization of business processes.

**business process reengineering (BPR)** A radical redesign of a business process that improves its efficiency and effectiveness, often by beginning with a “clean sheet” (from scratch).
**competitive advantage** An advantage over competitors in some measure such as cost, quality, or speed; leads to control of a market and to larger-than-average profits.

**competitive forces model** A business framework devised by Michael Porter that analyzes competitiveness by recognizing five major forces that could endanger a company’s position.

**cross-functional business process** A process in which no single functional area is responsible for its completion; multiple functional areas collaborate to perform the function.

**digital divide** The gap between those who have access to information and communications technology and those who do not.

**entry barrier** Product or service feature that customers expect from organizations in a certain industry; an organization trying to enter this market must provide this product or service at a minimum to be able to compete.

**globalization** The integration and interdependence of economic, social, cultural, and ecological facets of life, enabled by rapid advances in information technology.

**individual social responsibility** See organizational social responsibility.

**make-to-order** The strategy of producing customized products and services.

**mass customization** A production process in which items are produced in large quantities but are customized to fit the desires of each customer.

**organizational social responsibility** (also individual social responsibility) Efforts by organizations to solve various social problems.

**primary activities** Those business activities related to the production and distribution of the firm’s products and services, thus creating value.

**Six Sigma** A methodology for continuous BPI focused on reducing defects in process outputs by using statistical methods.

**strategic information systems (SISs)** Systems that help an organization gain a competitive advantage by supporting its strategic goals and/or increasing performance and productivity.

**support activities** Business activities that do not add value directly to a firm’s product or service under consideration but support the primary activities that do add value.

**value chain** A sequence of activities through which the organization’s inputs, whatever they are, are transformed into more valuable outputs, whatever they are.

**value chain model** Model that shows the primary activities that sequentially add value to the profit margin; also shows the support activities.

**value system** Includes the producers, suppliers, distributors, and buyers, all with their value chains.

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**Discussion Questions**

1. Consider the student registration business process at your university:
   - Describe the steps necessary for you to register for your classes each semester.
     Who are the customers of the process? What inputs and outputs does the process have? What organizational resources are used in the process?
   - Describe how information technology is used in each step of the process (or is not used).
     Evaluate the process performance. Is it efficient? Is it effective? Why or why not?

2. Explain how an organization may choose between applying business process improvement versus business process reengineering to solving a process performance problem.

3. Why is it so difficult for an organization to actually implement business process reengineering?

4. How can organizations benefit from BPM?

5. Is IT necessary for BPM? Why or why not?

6. Explain why IT is both a business pressure and an enabler of response activities that counter business pressures.

7. What does a flat world mean to you in your choice of a major? In your choice of a career? Will you have to be a “lifelong learner”? Why or why not?

8. What might the impact of a flat world be on your standard of living?

9. Is IT a strategic weapon or a survival tool? Discuss.

10. Why might it be difficult to justify a strategic information system?

11. Describe the five forces in Porter’s competitive forces model, and explain how the Internet has affected each one.

12. Describe Porter’s value chain model. What is the relationship between the competitive forces model and the value chain model?

13. Describe how IT can be used to support different value chains for different companies.

14. Discuss the idea that an information system by itself can rarely provide a sustainable competitive advantage.
**[Problem-Solving Activities]**

1. Surf the Internet for information about the Department of Homeland Security. Examine the available information, and comment on the role of information technologies in the department.

2. Compare and contrast the shopping process at a bricks and mortar store such as Macy’s or Target and at an Internet retailer such as Amazon.com. How are these processes different? (Hint: Consider the process steps, the inputs, outputs, resources, and customers.) Are there differences in the performance (effectiveness and efficiency) of the two processes? Which process is superior, and why?


4. Access www.go4customer.com. What does this company do and where is it located? Who are its customers? Which of Friedman’s flatteners does this company fit? Provide examples of how a U.S. company would use its services.

5. Enter Walmart China (www.wal-martchina.com/english/index.htm). How does Walmart China differ from your local Walmart (consider products, prices, services, etc.)? Describe these differences.

6. Apply Porter’s value chain model to Costco (www.costco.com). What is Costco’s competitive strategy? Who are Costco’s major competitors? Describe Costco’s business model. Describe the tasks that Costco must accomplish for each primary value chain activity. How would Costco’s information systems contribute to Costco’s competitive strategy, given the nature of its business?

7. Apply Porter’s value chain model to Dell (www.dell.com). What is Dell’s competitive strategy? Who are Dell’s major competitors? Describe Dell’s business model. Describe the tasks that Dell must accomplish for each primary value chain activity. How would Dell’s information systems contribute to Dell’s competitive strategy, given the nature of its business?

8. The market for optical copiers is shrinking rapidly. It is expected that by 2010 as much as 90 percent of all duplicated documents will be done on computer printers. Can a company such as Xerox Corporation survive?
   b. Identify all the business pressures on Xerox.
   d. Identify the role of IT as a contributor to the business technology pressures (e.g., obsolescence).
   e. Identify the role of IT as a facilitator of Xerox’s critical response activities.

**[Team Assignments]**

1. (a) As a class, describe the business pressures on your university. Each group will then create an online group for studying one of these business pressures, and how your university uses IT to respond to this pressure. Each member of the group must have a Yahoo! e-mail account (free). Form your groups in Google Groups (http://groups.google.com).

2. Divide the class into teams. Each team will select a country’s government and visit its official Web site (e.g., try the United States, Australia, New Zealand, Singapore, Norway, Canada, the United Kingdom, the Netherlands, Denmark, Germany, and France). For example, the official Web portal for the U.S. government is www.firstgov.gov. Review and compare the services offered by each country. How does the United States stack up? Are you surprised at the number of services offered by countries through Web sites? Which country offers the most services? The least?

**[Closing Case IBM’s Watson]**

**The Problem**

Computer scientists have long sought to design computer-based information systems (CBISs) that possess general problem-solving skills. That is, researchers want CBIS to interact in natural human terms across a range of applications and processes, comprehending the questions that humans ask and providing answers that humans can understand. An important step toward this goal is the development of the IBM Watson system.

**An Interesting IT Solution**

IBM (www.ibm.com) has developed an artificial intelligence (we discuss artificial intelligence in Technology Guide 4) CBIS capable of answering questions posed in natural language. IBM named the system “Watson,” after the company’s founder, Thomas J. Watson, Sr. IBM describes Watson as an application of advanced natural language processing, information retrieval, knowledge representation and reasoning, and machine learning.
IBM developed Watson specifically to answer questions on the quiz show *Jeopardy!*. In 2011, Watson competed on *Jeopardy!* against former winners Brad Rutter and Ken Jennings. Watson won the game series and received the first prize of $1 million. (In *Jeopardy!* the host reads the answer, and the contestants must then provide the correct question.) For *Jeopardy!* Watson had access to 200 million pages of structured and unstructured content consuming 4 terabytes of disk storage, including the full text of Wikipedia (see www .wikipedia.org). Significantly, however, Watson was not connected to the Internet during the game. For each clue, Watson's three most probable responses were displayed on the television screen. The probabilities represented Watson's level of confidence in any given answer. Watson consistently outperformed its human opponents, but it did experience problems responding to a few categories, notably those having short clues containing only a few words.

Following the television performance, IBM executives immediately turned their attention to commercializing Watson. They decided to focus on a field in which Watson could have a distinctive social impact while also proving its ability to master a complex body of knowledge. The team chose medicine.

Medicine was a logical choice. Although some health information is structured—for example, blood pressure readings and cholesterol counts—the vast majority is unstructured. This information includes textbooks, medical journals, patient records, and nurse and doctor notes. In fact, modern medicine entails so much unstructured information that its rapid growth has surpassed the ability of practitioners to keep up. Keep in mind that IBM has made it clear that Watson is not intended to replace doctors. Rather, its purpose is to assist them in avoiding medical errors and sharpening their medical diagnoses.

Enter Watson. Watson can ingest more data in one day than any human could in a lifetime. It can read all of the world’s medical journals in seconds. Simultaneously, it can read patient histories, monitor the latest drug trials, examine the potency of new therapies, and closely follow state-of-the-art guidelines that help doctors choose the best treatments. Watson can also analyze images such as MRIs and EKGs. Watson never goes on vacation; never forgets a fact (in fact, Watson keeps on learning); never gets tired; and works 24/7/365.

**The Results: Initial Uses of Watson**

**Watson at WellPoint.** IBM partnered with WellPoint (www .wellpoint.com), the largest managed for-profit healthcare company in the Blue Cross and Blue Shield association, to increase the efficiency of health insurance decisions and claims by utilizing Watson’s analytic capabilities. At WellPoint, Watson was trained with more than 25,000 test case scenarios and 1,500 real-life cases. It acquired the ability to analyze queries in the context of complex medical data and human natural language, including doctor’s notes, patient records, and medical annotations and clinical feedback. In addition, nurses spent more than 14,700 hours of hands-on training with Watson. Watson continues to learn on the job, while working with the WellPoint nurses who originally conducted its training.

In December 2012, Watson started processing common medical procedure requests by physicians for members in WellPoint-affiliated health plans in five physician offices in the Midwest. The overall goal is for Watson to streamline the review processes between a patient’s physician and his or her health plan.

**Watson at Memorial Sloan-Kettering.** IBM also sent Watson to the Memorial Sloan-Kettering Cancer Center (MSK; www.mskcc.org) in Manhattan to help physicians diagnose and treat lung cancer. Watson’s role is to analyze a patient’s specific symptoms, medical history, and hereditary history, and then synthesize those data with available unstructured and structured medical information, including published medical books and articles. By February 2013, Watson had ingested more than 600,000 pieces of medical information and 2 million pages of text from 42 medical journals and clinical trials in the area of oncology research. (Oncology is the study and treatment of cancer.) MSK has immersed Watson in the complexities of cancer as well as the explosion of genetic research that has set the stage for changing treatment practices for many cancer patients by basing their treatments on their personal genetic profiles. Starting with 1,500 actual lung cancer cases, MSK clinicians are training Watson to extract and interpret physician notes, lab results, and clinical research, while sharing its expertise with other physicians.

**Watson at the Cleveland Clinic.** The Cleveland Clinic Lerner College of Medicine of Case Western Reserve University is continuing Watson’s medical training by increasing its health expertise. As with other installations of Watson, the goal is for Watson to assist medical professionals in diagnosing and treating patients.

**Watson at MCCM and Westmed.** In February 2013, IBM announced that oncologists at the Maine Center for Cancer Medicine (www.mccm.org) and Westmed Medical Group (www.westmedgroup.com) in New York had started to use Watson to help diagnose lung cancer and recommend treatment.

**Watson at Rensselaer.** On January 30, 2013, the Rensselaer Polytechnic Institute (RPI) (www.rpi.edu) received Watson. Watson will be housed at the Institute’s technology park and will be available to researchers and students.

**Watson at Citigroup.** IBM intends to use Watson in other information-intensive fields, such as telecommunications, financial services, and government. At Citigroup (www.citigroup.com), for example, Watson analyzes financial, regulatory, economic, and social data across financial exchanges, currencies, and funds to help simplify and improve the bank’s digital interactions with its customers.
One last interesting point: In March 2013, IBM executives noted that Watson’s performance had improved by 240 percent since its Jeopardy! appearance. Buoyed by this success, IBM is now planning for “Watson 2.0,” which will be sufficiently energy efficient to function on smartphones and tablet computers.


Questions

1. What applications can you think of for Watson in a university setting?
2. What are potential disadvantages of using Watson in healthcare settings?
3. Would you consider being diagnosed only by Watson? Why or why not?
4. Would you consider being diagnosed by your personal physician, if he or she consulted Watson? Why or why not?

[ Internship Activity ]

Healthcare Industry

Information Systems have drastically altered the way we conduct business in healthcare. Every day there it seems there is a break through in research, product development, treatments and much of it is made possible by technology. Electronic Health Records have taken the forefront in the last few years because of the strong positives and horrifying negatives it brings to the table. But for those who are in the business of running a healthcare business, the Practice Management side of technology has made more difference.

For this Internship Activity, you will work for Chad Prince, Practice Administrator for Anniston Orthopaedics Associates in Anniston, AL. Chad has recently taken on the role of Practice Administrator and is learning the ins and outs of managing a healthcare organization. His first role is to learn about the market offerings of Practice Management. A quick web search for “Healthcare Practice Management Software” will reveal plenty of information on the relationship between Practice Management and Electronic Health Records.

Please visit the Book Companion Site to receive the full set of instructions on how you can help Chad make a good decision that will be in line with the long-term strategy of Anniston Orthopaedics.