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This chapter describes various types of decision-making information systems used to run basic business processes and facilitate sound and proper decision making. Using decision-making information systems to improve and reengineer businesses processes can significantly help organizations by improving efficiency and effectiveness, and even by redefining industry standards.

You, as a business student, can gain valuable insight into an organization by understanding the types of information systems that exist in and across enterprises. When you understand how to utilize these systems to improve decision making and problem solving you can vastly improve organizational performance. After reading this chapter, you should have gained an appreciation of the various kinds of information systems employed by organizations and how you can use them to help make strategically informed decisions.
Decision-making and problem-solving abilities are now the most sought-after traits in up-and-coming executives, according to a recent survey of 1,000 executives by Caliper Associates, as reported in The Wall Street Journal. To put it mildly, decision makers and problem solvers have limitless career potential.  

Decision making and problem solving in today's electronic world encompass large-scale, opportunity-oriented, strategically focused solutions. The traditional "cookbook" approach to decision making simply will not work. This chapter focuses on technology to help make decisions, solve problems, and find new innovative opportunities. The chapter also highlights how to bring people together with the best IT processes and tools in complete, flexible solutions that can seize business opportunities and combat business challenges (see Figure 2.1).

Driving While Breast Feeding—For Real?

How do people make decisions? Almost daily you can read about someone who makes a decision the majority of the population finds completely unbelievable and the law finds absolutely unacceptable. Listed here are a few of the recent news headlines that simply defy rational thinking and boggle the decision-making psyche.

- **Mother Caught Driving While Breast-Feeding and Talking on a Cell Phone:** A woman in Ohio was charged with child endangerment after police said she admitted to breastfeeding her child and talking on a cell phone while she was driving her other children to school. We have all heard of multitasking, but this is taking it to the extreme.

- **Souper Drive:** A woman in South Florida was caught driving, talking on a cell phone that she placed on her left shoulder, and eating from a cup of soup placed in her left hand. The woman would take her hands off the wheel and use her right hand to spoon soup, while she continued to talk on the phone. It is common knowledge that it is inappropriate to talk with your mouth full. Perhaps she didn’t understand that it was also inappropriate to drive!

- **Driving and Swimming:** A man in California was cited for driving while carrying a swimming pool. Yes, this man decided that it was a good decision to drive with one hand, while he used the other hand to hold onto his new swimming pool that was placed on the roof of his car. Not only was this a bad decision, but he also decided to enlist the help of his three children who were leaning out of the car windows, not wearing seat belts, and also helping to hold onto the swimming pool. Perhaps this man should invest in some rope or bungee cords?

- **Diaper Duty:** A woman in Baltimore was charged with diapering while driving. Yes, this woman decided that the best time to change her child’s diaper was while she was driving 65 mph down the highway. If you have ever changed a diaper, you know that it definitely requires two hands, and the fact that her child was not in a car seat and located in the front of the car just makes you wonder why anyone would make such a dreadful decision.

If people make such terrible decisions about something as highly policed as driving, just imagine the problems that are going to occur when they start making decisions about a business. What can you do to ensure your employees are making solid business decisions? Find an example of a company that found itself in a terrible mess because its employees made bad decisions. What could the company do to protect itself from employee blunders?
Business is accelerating at a breakneck pace. The more information a business acquires, the more difficult it becomes to make decisions. The amount of information people must understand to make good decisions is growing exponentially. In the past, people could rely on manual processes to make decisions because they had limited amounts of information to process. Today, with massive volumes of available information it is almost impossible for people to make decisions without the aid of information systems. Highly complex decisions—involving far more information than the human brain can comprehend—must be made in increasingly shorter time frames. Figure 2.2 highlights the primary reasons dependence on information systems to make decisions is growing and will continue to grow.

A model is a simplified representation or abstraction of reality. Models can be used to calculate risks, understand uncertainty, change variables, and manipulate time. Decision-making information systems work by building models out of organizational information to lend insight into important...
Confirming Pages

of managerial analysis tasks. Analytical information includes transactional information along with other information such as market and industry information. Examples of analytical information are trends, sales, product statistics, and future growth projections. Managers use analytical information when making important ad hoc decisions such as whether the organization should build a new manufacturing plant or hire additional sales personnel.

The structure of a typical organization is similar to a pyramid. Organizational activities occur at different levels of the pyramid. People in the organization have unique information needs and thus require various sets of IT tools (see Figure 2.4). At the lower levels of the pyramid, people perform daily tasks such as processing transactions. Online transaction processing (OLTP) is the capturing of transaction and event information using technology to (1) process the information according to defined business rules, (2) store the information, and (3) update existing information to reflect the new information. During OLTP, the organization must capture every detail of transactions and events. A transaction processing system (TPS) is the basic business system that serves the operational level (analysts) in an organization. The most common example of a TPS is an operational accounting system such as a payroll system or an order-entry system.

Moving up through the organizational pyramid, people (typically managers) deal less with the details (“finer” information) and more with meaningful aggregations of information business issues and opportunities. Figure 2.3 displays three common types of decision-making information systems used in organizations today—transaction processing systems, decision support systems, and executive information systems. Each system uses different models to assist in decision making, problem solving, and opportunity capturing.

**LO2.1**

Explain the difference between transactional information and analytical information. Be sure to provide an example of each.

**LO2.2**

Define TPS, DSS, and EIS and explain how an organization can use these systems to make decisions and gain competitive advantages.

### TRANSACTION PROCESSING SYSTEMS

**Transactional information** encompasses all of the information contained within a single business process or unit of work, and its primary purpose is to support the performing of daily operational tasks. Examples of transactional information include purchasing stocks, making an airline reservation, or withdrawing cash from an ATM. Organizations use transactional information when performing operational tasks and repetitive decisions such as analyzing daily sales reports to determine how much inventory to carry.

**Analytical information** encompasses all organizational information, and its primary purpose is to support the performing
(“coarser” information) that help them make broader decisions for the organization. (Granularity means fine and detailed or “coarse” and abstract information.)

**Online analytical processing (OLAP)** is the manipulation of information to create business intelligence in support of strategic decision making. Business intelligence is a broad, general term describing information that people use to support their decision-making efforts.

- **LO2.2**
  Define TPS, DSS, and EIS and explain how an organization can use these systems to make decisions and gain competitive advantages.

- **LO2.3**
  Describe the three quantitative models typically used by decision support systems.

#### DECISION SUPPORT SYSTEMS

At limousine and transportation company BostonCoach, managers must dispatch fleets of hundreds of vehicles as efficiently as possible. BostonCoach requires a real-time dispatching system that considers inventory, customer needs, and soft dimensions such as weather and traffic. Researchers at IBM’s Thomas J. Watson Research Center built BostonCoach a mathematical algorithm for a custom dispatch system that combines information about weather, traffic conditions, driver locations, and customer pickup requests and determines which cars to assign to which customers. The system is so efficient that, after launching it in Atlanta, BostonCoach experienced a 20 percent increase in revenues.³

A decision support system (DSS), such as BostonCoach’s, models information to support managers and business professionals during the decision-making process. Three quantitative models often used by DSS include:

1. **Sensitivity analysis** is the study of the impact that changes in one (or more) parts of the model have on other parts of the model. Users change the value of one variable repeatedly and observe the resulting changes in other variables.

2. **What-if analysis** checks the impact of a change in an assumption on the proposed solution. For example, “What will happen to the supply chain if a hurricane in South Carolina reduces holding inventory from 30 percent to 10 percent?” Users repeat this analysis until they understand all the effects of various situations. Figure 2.5 displays an example of what-if analysis using Microsoft Excel. The tool is calculating the net effect of a 35 percent increase in sales on the company’s bottom line.

3. **Goal-seeking analysis** finds the inputs necessary to achieve a goal such as a desired level of output. Instead of observing how changes in a variable affect other variables as in what-if analysis, goal-seeking analysis sets a target value (a goal) for a variable and then repeatedly changes other variables until the target value is achieved. For example, “How many customers are required to purchase a new product to increase gross profits to $5 million?” Figure 2.6 displays a goal-seeking scenario using Microsoft Excel.

   The model is determining how many bikes Hauger will need to sell to break-even, or a profit of 0. Hauger will need to sell 46 bikes at $3,500 each to break-even.

   One national insurance company uses DSSs to analyze the amount of risk the company is undertaking when it insures drivers who have a history of driving under the influence of alcohol. The DSS discovered that only 3 percent of married male homeowners in their forties received more than one DUI. The company decided to lower rates for customers falling into this category, which increased its revenue while mitigating its risk.⁴
FIGURE 2.5 Example of What-if Analysis in Microsoft Excel

FIGURE 2.6 Example of Goal-Seeking Analysis in Microsoft Excel
Circle 2.7 displays how a TPS is used within a DSS. The TPS supplies transaction-based data to the DSS. The DSS summarizes and aggregates the information from the many different TPS systems, which assists managers in making informed decisions. Burlington Northern and Santa Fe Railroad (BNSF) regularly tests its railroad tracks. Each year hundreds of train derailments result from defective tracks. Using a DSS to schedule train track replacements helped BNSF decrease its rail-caused derailments by 33 percent.5

What if the person sitting in the cube next to you was running a scam that cost your company $7 billion? An employee at a French bank allegedly used his inside knowledge of business processes to bypass the systems and make roughly $73 billion in bogus trades that cost the bank more than $7 billion to unwind.

Findings from the U.S. Secret Service and its examination of 23 incidents conducted by 26 insiders determined that 70 percent of the time, insiders took advantage of failures in business process rules and authorization mechanisms to steal from the company. Seventy-eight percent of the time, insiders were authorized and active computer users, and a surprising 43 percent used their own username and passwords to commit their crime.

This is a daunting reminder that every employee has the potential to become a knowledgeable insider, and if they ever turned bad in a fraudulent, criminal, even destructive way, they could do tremendous damage to your company. You need to protect your company’s assets, and many of your DSS and EIS systems contain the business intelligence your company needs to operate effectively. What types of sensitive information is housed in a company’s TPS, DSS, and EIS? What issues could you encounter if one of your employees decided to steal the information housed in your DSS? How could you protect your EIS from unethical users? What would you do if you thought the person sharing your cube was a rogue insider?

Figure 2.7 displays how a TPS is used within a DSS. The TPS supplies transaction-based data to the DSS. The DSS summarizes and aggregates the information from the many different TPS systems, which assists managers in making informed decisions. Burlington Northern and Santa Fe Railroad (BNSF) regularly tests its railroad tracks. Each year hundreds of train derailments result from defective tracks. Using a DSS to schedule train track replacements helped BNSF decrease its rail-caused derailments by 33 percent.5

L02.2
Define TPS, DSS, and EIS and explain how an organization can use these systems to make decisions and gain competitive advantages.

L02.4
Describe the relationship between digital dashboards and executive information systems.
EXECUTIVE INFORMATION SYSTEMS

An executive information system (EIS) is a specialized DSS that supports senior-level executives within the organization. An EIS differs from a DSS because an EIS typically contains data from external sources as well as data from internal sources (see Figure 2.8).

Consolidation, drill-down, and slice-and-dice are a few of the capabilities offered in most EISs.

- **Consolidation** involves the aggregation of information and features simple roll-ups to complex groupings of interrelated information. Many organizations track financial information at a regional level and then consolidate the information at a single global level.

- **Drill-down** enables users to view details, and details of details, of information. Viewing monthly, weekly, daily, or even hourly information represents drill-down capability.

- **Slice-and-dice** is the ability to look at information from different perspectives. One slice of information could display all product sales during a given promotion. Another slice could display a single product’s sales for all promotions.

Digital Dashboards

A common feature of an EIS is a digital dashboard. Digital dashboards integrate information from multiple components and tailor the information to individual preferences. Digital dashboards commonly use indicators to help executives quickly identify the status of key information or critical success factors. Following is a list of features included in a dashboard designed for a senior executive of an oil refinery:

- A hot list of key performance indicators, refreshed every 15 minutes.
- A running line graph of planned versus actual production for the past 24 hours.
- A table showing actual versus forecasted product prices and inventories.
- A list of outstanding alerts and their resolution status.
- A graph of crude-oil stock market prices.
- A scroll of headline news from Petroleum Company news, an industry news service.

Digital dashboards, whether basic or comprehensive, deliver results quickly. As digital dashboards become easier to use, more executives can perform their own analysis without inundating...
Got Junk? Get a Hunk!

Do you enjoy kidnapping your rival’s team mascot or toilet-papering their frat houses? If so, you might find your ideal career at College Hunks Hauling Junk. The company launched in 2005 and hires college students and recent college grads to pick up junk. The founder, Nick Friedman, had a goal of capturing that friendly rivalry so often associated with college life and turn it into profits. When the company first launched, the haulers from Virginia found that their truck had been lathered in shaving cream and draped with a University of Maryland flag. The Virginia haulers retaliated and, soon after, dead fish were found coating the seats of the Maryland’s truck. Friedman decided to use this energy as an incentive instead of reprimanding the rather unorthodox behavior. “We wanted to harness that competitive, prankster enthusiasm and channel it for good,” states Friedman.

Friedman made a bold move and decided that instead of tracking typical key performance metrics such as revenue, average job size, customer loyalty, etc., he would track volume of junk collected and amount of junk donated or recycled. The winning team gains such things as bragging rights and banners, modest monetary prizes, and ‘first table to eat’ at the annual company meeting. Most employees check the dashboard daily to view their own and rivals’ latest standings. Why do you think competition is helping College Hunks Hauling Junk exceed its revenue goals? If you were to build a team competition dashboard for your school or your work, what types of metrics would it track? What types of motivators would you use to ensure your team is always in the green? What types of external information would you want tracked in your dashboard? Could an unethical person use the information from your dashboard to hurt your team or your organization? What can you do to mitigate these risks?

Executive information systems are starting to take advantage of artificial intelligence to help executives make strategic decisions.

EIS systems, such as digital dashboards, allow executives to move beyond reporting to using information to directly impact business performance. Digital dashboards help executives react to information as it becomes available and make decisions, solve problems, and change strategies daily instead of monthly.

Verizon Communications CIO Shaygan Kheradpir tracks 100-plus major IT systems on a single screen called “The Wall of Shaygan.” Every 15 seconds, a new set of charts communicating Verizon’s performance flashes onto a giant LCD screen in Kheradpir’s office. The 44 screen shots cycle continuously, all day long, every day. The dashboard includes more than 300 measures of business performance that fall into one of three categories:

1. Market pulse—examples include daily sales numbers, market share, and subscriber turnover.
2. Customer service—examples include problems resolved on the first call, call center wait times, and on-time repair calls.
3. Cost driver—examples include number of repair trucks in the field, repair jobs completed per day, and call center productivity.

Kheradpir has memorized the screens and can tell at a glance when the lines on the charts are not trending as expected. The system informs him of events such as the percentage of customer calls resolved by voice systems, number of repair trucks in the field, and amount of time to resolve an IT system issue. The dashboard works the same way for 400 managers at every level of Verizon.

L02.5
Identify the four types of artificial intelligence systems.

ARTIFICIAL INTELLIGENCE

Executive information systems are starting to take advantage of artificial intelligence to help executives make strategic decisions. RivalWatch, based in Santa Clara, California, offers a strategic business information service using artificial intelligence that enables organizations to track the product offerings, pricing policies, and promotions of online competitors.
FIGURE 2.9 Visual Mining NetCharts Corporate Financial Dashboard

FIGURE 2.10 Visual Mining NetCharts Marketing Communications Dashboard
Clients can determine the competitors they want to watch and the specific information they wish to gather, ranging from products added, removed, or out of stock to price changes, coupons offered, and special shipping terms. Clients can check each competitor, category, and product either daily, weekly, monthly, or quarterly.

“Competing in the Internet arena is a whole different ballgame than doing business in the traditional brick-and-mortar world because you’re competing with the whole world rather than the store down the block or a few miles away,” said Phil Lumish, vice president of sales and marketing at RivalWatch.com. “With new products and campaigns being introduced at a breakneck pace, ebusinesses need new tools to monitor the competitive environment, and our service is designed specifically to meet that need.”

**Intelligent systems** are various commercial applications of artificial intelligence. Artificial intelligence (AI) simulates human intelligence such as the ability to reason and learn. AI systems can learn or understand from experience, make sense of ambiguous or contradictory information, and even use reasoning to solve problems and make decisions effectively. AI systems can perform such tasks as boosting productivity in factories by monitoring equipment and signaling when preventive maintenance is required. The ultimate goal of AI is the ability to build a system that can mimic human intelligence. AI systems are beginning to show up everywhere:

- At Manchester Airport in England, the Hefner AI Robot Cleaner alerts passengers to security and nonsmoking rules while it scrubs up to 65,600 square feet of floor per day. Laser scanners and ultrasonic detectors keep it from colliding with passengers.
- Shell Oil’s SmartPump keeps drivers in their cars on cold, wet winter days. It can service any automobile built after 1987 that has been fitted with a special gas cap and a windshield-mounted transponder that tells the robot where to insert the pump.

**Expert Systems**

Expert systems are computerized advisory programs that imitate the reasoning processes of experts in solving difficult problems. Human expertise is transferred to the expert system, and users can access the expert system for specific advice. Most expert systems reflect expertise from many humans and can therefore perform better analysis than any single expert. Typically, the system includes a knowledge base containing various accumulated experience and a set of rules for applying the knowledge base to each particular situation. The best-known expert systems play chess and assist in medical diagnosis. Expert systems are the most commonly used form of AI in the business arena because they fill the gap when human experts are difficult to find or retain, or are too expensive.

**Neural Networks**

A neural network, also called an artificial neural network, is a category of AI that attempts to emulate the way the human brain works. The types of decisions for which neural networks are most useful are those that involve pattern or image recognition because a neural network can learn from the information it processes. Neural networks analyze large quantities of
information to establish patterns and characteristics in situations where the logic or rules are unknown.

The finance industry is a veteran in neural network technology and has been relying on various forms of it for over two decades. The industry uses neural networks to review loan applications and create patterns or profiles of applications that fall into two categories: approved or denied. One neural network has become the standard for detecting credit card fraud. Since 1992, this technology has slashed fraud by 70 percent for U.S. Bancorp. Now, even small credit unions are required to use the software in order to qualify for debit-card insurance from Credit Union National Association.11

Additional examples of neural networks include:

- Citibank uses neural networks to find opportunities in financial markets. By carefully examining historical stock market data with neural network software, Citibank financial managers learn of interesting coincidences or small anomalies (called market inefficiencies). For example, it could be that whenever IBM stock goes up, so does Unisys stock. Or it might be that a U.S. Treasury note is selling for 1 cent less in Japan than it is in the United States. These snippets of information can make a big difference to Citibank’s bottom line in a very competitive financial market.

- In Westminster, California, a community of 87,000 people, police use neural network software to fight crime. With crime reports as input, the system detects and maps local crime patterns. Police say that with this system they can better predict crime trends, improve patrol assignments, and develop better crime prevention programs.

- Fingerhut, the mail-order company based in Minnesota, has 6 million people on its customer list. To determine which customers were and were not likely to order from its catalog, Fingerhut recently switched to neural network software. The company finds that the new software is more effective and continues washing until the water is clean). In accounting and finance, fuzzy logic is used in washing machines that determine themselves how much water to use or how long to wash (they continue washing until the water is clean). In accounting and finance, fuzzy logic allows people to analyze information with subjective financial values (intangibles such as goodwill) that are very important considerations in economic analysis. Fuzzy logic and neural networks are often combined to express complicated and subjective concepts in a form that makes it possible to simplify the problem and apply rules that are executed with a level of certainty.12

- FleetBoston Financial Corporation uses a neural network to watch transactions with customers. The neural network can detect patterns that may indicate a customer’s growing dissatisfaction with the company. The neural network looks for signs such as decreases in the number of transactions or in the account balance of one of FleetBoston’s high-value customers.

Neural networks’ many features include:

- Learning and adjusting to new circumstances on their own.
- Lending themselves to massive parallel processing.
- Functioning without complete or well-structured information.
- Coping with huge volumes of information with many dependent variables.
- Analyzing nonlinear relationships in information (they have been called fancy regression analysis systems).

The biggest problem with neural networks to date has been that the hidden layers are hidden. It is difficult to see how the neural network is learning and how the neurons are interacting. Newer neural networks no longer hide the middle layers. With these systems, users can manually adjust the weights or connections, giving them more flexibility and control.

Fuzzy logic is a mathematical method of handling imprecise or subjective information. The basic approach is to assign values between 0 and 1 to vague or ambiguous information. The higher the value, the closer it is to 1. The value zero is used to represent nonmembership, and the value one is used to represent membership. For example, fuzzy logic is used in washing machines that determine by themselves how much water to use or how long to wash (they continue washing until the water is clean). In accounting and finance, fuzzy logic allows people to analyze information with subjective financial values (intangibles such as goodwill) that are very important considerations in economic analysis. Fuzzy logic and neural networks are often combined to express complicated and subjective concepts in a form that makes it possible to simplify the problem and apply rules that are executed with a level of certainty.12

Genetic Algorithms
A genetic algorithm is an artificial intelligence system that mimics the evolutionary, survival-of-the-fittest process to generate increasingly better solutions to a problem. A genetic algorithm is essentially an optimizing system: It finds the combination of inputs that gives the best outputs.
Nations and the International Federation of Robotics, more than half the AI robots will be toys and the other half will perform services. Bots will deactivate bombs, clean skyscraper windows, and vacuum homes.14

Multi-Agent Systems and Agent-Based Modeling What do cargo transport systems, book distribution centers, the video game market, a flu epidemic, and an ant colony have in common? They are all complex adaptive systems and thus share some characteristics. By observing parts of the ecosystem, like ant or bee colonies, artificial intelligence scientists can use hardware and software models that incorporate insect characteristics and behavior to (1) learn how people-based systems behave; (2) predict how they will behave under a given set of circumstances; and (3) improve human systems to make them more efficient and effective. This concept of learning from ecosystems and adapting their characteristics to human and organizational situations is called biomimicry.

In the last few years, AI research has made much progress in modeling complex organizations as a whole with the help of multi-agent systems. In a multi-agent system, groups of intelligent agents have the ability to work independently and to interact with each other. The simulation of a human organization using a multi-agent system is called agent-based modeling. Agent-based modeling is a way of simulating human organizations using multiple intelligent agents, each of which follows a set of simple rules and can adapt to changing conditions.

Agent-based modeling systems are being used to model stock market fluctuations, predict the escape routes that people seek in a burning building, estimate the effects of interest rates on consumers with different types of debt, and anticipate how changes in conditions will affect the supply chain, to name just a few. Examples of companies that have used agent-based modeling to their advantage include:

• Southwest Airlines—to optimize cargo routing.
• Procter & Gamble—to overhaul its handling of what the company calls its “supply network” of 5 billion consumers in 140 countries.

Intelligent Agents

An intelligent agent is a special-purpose knowledge-based information system that accomplishes specific tasks on behalf of its users. Intelligent agents use their knowledge base to make decisions and accomplish tasks in a way that fulfills the intentions of a user. Intelligent agents usually have a graphical representation such as “Sherlock Holmes” for an information search agent.

One of the simplest examples of an intelligent agent is a shopping bot. A shopping bot is software that will search several retailer websites and provide a comparison of each retailer’s offerings including price and availability. Increasingly, intelligent agents handle the majority of a company’s Internet buying and selling and handle such processes as finding products, bargaining over prices, and executing transactions. Intelligent agents also have the capability to handle all supply chain buying and selling.

Another application for intelligent agents is in environmental scanning and competitive intelligence. For instance, an intelligent agent can learn the types of competitor information users want to track, continuously scan the web for it, and alert users when a significant event occurs.

By 2010, some 4 million AI robots are expected to populate homes and businesses, performing everything from pumping gas to delivering mail. According to a new report by the United...
• Air Liquide America—to reduce production and distribution costs of liquefied industrial gases.
• Merck & Co.—to find more efficient ways of distributing anti-AIDS drugs in Africa.
• Ford Motor Co.—to build a model of consumer preferences and find the best balance between production costs and customers’ demands.
• Edison Chouest Offshore LLC—to find the best way to deploy its service and supply vessels in the Gulf of Mexico.15

Data Mining
Walmart consolidates point-of-sale details from its 3,000 stores and uses AI to transform the information into business intelligence. Data-mining systems sift instantly through the information to uncover patterns and relationships that would elude an army of human researchers. The results enable Walmart to predict sales of every product at each store with uncanny accuracy, translating into huge savings in inventories and maximum payoff from promotional spending.16

Data-mining software typically includes many forms of AI such as neural networks and expert systems. Data-mining tools apply algorithms to information sets to uncover inherent trends and patterns in the information, which analysts use to develop new business strategies. Analysts use the output from data-mining tools to build models that, when exposed to new information sets, perform a variety of data analysis functions. The analysts provide business solutions by putting together the analytical techniques and the business problem at hand, which often reveals important new correlations, patterns, and trends in information. A few of the more common forms of data-mining analysis capabilities include cluster analysis, association detection, and statistical analysis. Data mining is covered in detail in Chapter 9.

SECTION 2.2 Business Processes

LEARNING OUTCOMES

L02.6 Describe business processes and their importance to an organization.
L02.7 Differentiate between customer facing processes and business facing processes.
L02.8 Compare business process improvement and business process reengineering.
L02.9 Describe the importance of business process modeling (or mapping) and business process models.
L02.10 Explain business process management along with the reason for its importance to an organization.

L02.6
Describe business processes and their importance to an organization.

L02.7
Differentiate between customer facing processes and business facing processes.

Virtual Nonprofits Helping Sustainability—What Are You Talking About?

SecondLife is an online 3D virtual world where its millions of residents create the content. Virtual worlds are exciting for any innovative businessperson who wants to find new ways to collaborate, train employees, and market products. A few business possibilities in a virtual world include:

• Holding a virtual meeting with sales managers located in Europe and Asia, which saves money and reduces carbon emissions.
• Presenting new sales initiatives and product ideas and discussing them with a virtual focus group, which reduces the amount of mail required for promotional materials.
• Selling products and services in Second Life by creating an event to promote the product: a concert, a class, a famous speaker, a party, a contest. Innovative individuals are pursuing ways to use SecondLife to help nonprofits such as Global Kids. Global Kids is a nonprofit group working to prepare urban youth to become global citizens and community leaders. With help from Main Grid content creators and consultants like The Magicians and the Electric Sheep Company, Global Kids created a program in which students in New York City collaborate with Teen Grid Residents from around the world. The teens had to finish the interactive adventure to participate in a real-world essay contest. Winners of the contest received cash prizes (in U.S. dollars) and were part of an awards ceremony co-broadcast into the Teen Grid and on stage in New York City.

The benefits for social entrepreneurship and sustainability in a virtual world are endless. Identify a way you could use SecondLife to help tackle an environmental issue, sustainable business idea, or social entrepreneurship endeavor. What types of roadblocks do you expect to encounter as you deploy your SecondLife project? What types of security and ethical issues do you anticipate encountering in a virtual world?
UNDERSTANDING THE IMPORTANCE OF BUSINESS PROCESSES

Businesses gain a competitive edge when they minimize costs and streamline their business processes. Columbia Sportswear Company is a global leader in the design, production, marketing, and distribution of outdoor apparel and footwear. The company is always looking to make the members of its highly mobile workforce more responsive and efficient while also helping them enjoy better work–life balance. Columbia Sportswear wanted new ways to streamline its operations to get up-to-the-minute information to employees working across multiple time zones. The company deployed innovative Microsoft messaging software to give its workers flexible, safeguarded access to messages from anywhere in the world. This helps the company speed every aspect of its business, and gives employees more freedom to enjoy an active lifestyle.

Most organizations pride themselves on providing breakthrough products and services for customers. Unfortunately, if customers do not receive what they want quickly, accurately, and hassle-free even fantastic offerings will not save an organization from annoying its customers and ultimately eroding the firm’s financial performance.

"The best way an organization can satisfy customers and spur profits is by completely understanding all of its business processes."

The best way an organization can satisfy customers and spur profits is by completely understanding all of its business processes. Waiting in line at a grocery store is a great example of the need for an organization to understand and improve its business processes. In this case, the “process” is called checkout, and the purpose is to pay for and bag groceries. The process begins when a customer steps into line and ends when the customer receives the receipt and leaves the store. The process steps are the activities the customer and store personnel do to complete the transaction. A business process is a standardized set of activities that accomplish a specific task, such as processing a customer’s order.

Business processes transform a set of inputs into a set of outputs (goods or services) for another person or process by using people and tools. This simple example describes a customer checkout process. Imagine other business processes: developing new products, building a new home, ordering clothes from mail-order companies, requesting new telephone service from a telephone company, and administering Social Security payments. Making the checkout procedure quick and easy is a great way for grocery stores to increase profits. How long will a customer wait in line to pay for groceries? Automatic checkout systems at grocery stores are an excellent example of business process improvement.

Examining business processes helps an organization determine bottlenecks, eliminate duplicate activities, combine related activities, and identify smooth-running processes. To stay competitive, organizations must optimize and automate their business processes. Organizations are only as effective as their business processes. Developing logical business processes can help an organization achieve its goals. For example, an automobile manufacturer might have a goal to reduce the time it takes to deliver a car to a customer. The automobile manufacturer cannot hope to meet this goal with an inefficient ordering process or a convoluted distribution process. Sales representatives might be making mistakes when completing order forms, data-entry clerks might not accurately code order information, and dock crews might be inefficiently loading cars onto trucks. All of these errors increase the time it will take to get the car to the customer. Improving any one of these business processes can have a significant effect on the total distribution process, made up of the order entry, production scheduling, and transportation processes. Figure 2.11 displays several sample business processes.

Some processes (such as a programming process) may be contained wholly within a single department. However, most processes (such as ordering a product) are cross-departmental,
### ACCOUNTING/FINANCE BUSINESS PROCESSES
- Accounts payable
- Accounts receivable
- Bank account reconciliation
- Depreciation, Invoicing
- Month-end closing procedures

### ENVIRONMENTAL BUSINESS PROCESSES
- Environmental protection
- Hazardous waste management
- Air/water/soil resource management

### HUMAN RESOURCES BUSINESS PROCESSES
- Disabilities employment policies
- Employee hiring policies
- Health care benefits
- Resignations and terminations
- Workplace safety rules and guidelines

### MANAGEMENT INFORMATION SYSTEMS BUSINESS PROCESSES
- Disaster recovery procedures
- Backup/Recovery procedures
- Service agreements
- Emergency services
- Internet use policy
- Email policy

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*Figure 2.11 Sample Business Processes*
CHAPTER 2 | Strategic Decision Making

Figure 2.13 illustrates the basic steps for business process improvement. Organizations begin by documenting what they currently do, and then they establish a way to measure the process, follow the process, measure the performance, and finally identify improvement opportunities based on the collected information. The next step is to implement process improvements and measure the performance of the new improved process. The loop repeats over and over again as it is continuously improved.21

Business processes should drive technology choices. Not the other way around. Businesses that choose technology and then attempt to implement business processes based on the technology typically fail. All business processes should be based on business strategies and goals. After determining the most efficient and effective business process, an organization can find the technology that can be used to support the business process. Of course, this does not always happen and often individuals find themselves in the difficult position of changing a business process because the technology cannot support the ideal solution. This method for improving business processes is effective to obtain gradual, incremental improvement. However, several factors have accelerated the need to radically improve business processes. The most obvious is technology. New technologies (like the Internet and wireless) rapidly bring new capabilities to businesses, thereby raising the competitive bar and the need to improve business processes dramatically. For example, Amazon.com reinvented the supply chain of selling books by using the Internet. Amazon is a book-selling business, yet it fundamentally changed the way customers purchase books.

Another apparent trend is the flattening of the global world through technology bringing more companies and more customers into the marketplace and greatly increasing competition. A customer today can just as easily order a bottle of wine from a winery in France as a wholesaler in the United States. In today’s marketplace, major technological and business changes are required just to stay in the game. As a result, companies have requested methods for faster business process improvement. Also, companies want breakthrough performance changes, not just incremental changes, and they want it now. Because the rate of change has increased for everyone, few businesses can afford a slow change process. One approach for rapid change and dramatic improvement is business process reengineering.

L02.8

Compare business process improvement and business process reengineering.

BUSINESS PROCESS IMPROVEMENT

Improving business processes is paramount to stay competitive in today’s electronic marketplace. Organizations must improve their business processes because customers are demanding better products and services; if customers do not receive what they want from one supplier, they can simply click a mouse and have many other choices. Business process improvement attempts to understand and measure the current process and make performance improvements accordingly.

spanning the entire organization. Figure 2.12 displays the different categories of cross-departmental business processes. Customer facing processes result in a product or service that is received by an organization’s external customer. Business facing processes are invisible to the external customer but essential to the effective management of the business and include goal setting, day-to-day planning, performance feedback, rewards, and resource allocation.20

L02.8

Compare business process improvement and business process reengineering.

L02.8

Compare business process improvement and business process reengineering.
Figure 2.14 displays the basic steps in a business process reengineering effort. It begins with defining the scope and objectives of the reengineering project, and then goes through a learning process (with customers, employees, competitors, noncompetitors, and new technology). Given this knowledge base, the designers can create a vision for the future and design new business processes by creating a plan of action based on the gap between current processes, technologies, structures, and process vision. It is then a matter of implementing the chosen solution.

Finding Opportunity Using BPR

Companies frequently strive to improve their business processes by performing tasks faster, cheaper, and better. Figure 2.15 displays different ways to travel the same road. A company could improve the way that it travels the road by moving from foot to horse and then from horse to car. However, true BPR would look at taking a different path. A company could forget about traveling on the same old road and use an airplane to get to its final destination. Companies often follow the same indirect path for doing business,
not realizing there might be a different, faster, and more direct way of doing business.24

Creating value for the customer is the leading factor for instituting BPR, and information technology often plays an important enabling role. Radical and fundamentally new business processes enabled Progressive Insurance to slash the claims settlement from 31 days to four hours. Typically, car insurance companies follow this standard claims resolution process: The customer gets into an accident, has the car towed, and finds a ride home. The customer then calls the insurance company to begin the claims process, which usually takes over a month (see Figure 2.16).

Progressive Insurance improved service to its customers by offering a mobile claims process. When a customer has a car accident, he or she calls in the claim on the spot. The Progressive claims adjustor comes to the accident and performs a mobile claims process, surveying the scene and taking digital photographs. The adjustor then offers the customer on-site payment, towing services, and a ride home. (see Figure 2.16) 25

A true BPR effort does more for a company than simply improve it by performing a process better, faster, and cheaper. Progressive Insurance’s BPR effort redefined best practices for its entire industry. Figure 2.17 displays the different types of change an organization can achieve, along with the magnitude of change and the potential business benefit.26

“Business process reengineering (BPR) is the analysis and redesign of workflow within and between enterprises.”

- Is the process broken?
- Is it feasible that reengineering of this process will succeed?
- Does it have a high impact on the agency’s strategic direction?
- Does it significantly impact customer satisfaction?
- Is it antiquated?
- Does it fall far below best-in-class?
- Is it crucial for productivity improvement?
- Will savings from automation be clearly visible?
- Is the return on investment from implementation high and preferably immediate?

**Selecting a Process for Reengineering**

An organization can reengineer its cross-departmental business processes or an individual department’s business processes according to its needs. When selecting a business process to reengineer, wise organizations will focus on those core processes that are critical to their performance, rather than marginal processes that have little impact. Reengineering practitioners can use several criteria to determine the importance of the process:

**Pitfalls of BPR**

One hazard of BPR is that the company becomes so wrapped up in fighting its own demons that it fails to keep up with its competitors in offering new products or services. While American Express tackled a comprehensive reengineering of its credit card business, MasterCard and Visa introduced a new product—the corporate procurement card. American Express lagged a full year behind before offering its customers the same service.

**LO2.9**

Describe the importance of business process modeling (or mapping) and business process models.
BUSINESS PROCESS MODELING

After choosing the processes to reengineer, the organization must determine the most efficient way to begin revamping the processes. To determine whether each process is appropriately structured, organizations should create a cross-functional team to build process models that display input–output relationships among process-dependent operations and departments. They should create business process models documenting a step-by-step process sequence for the activities that are required to convert inputs to outputs for the specific process.

Business process modeling (or mapping) is the activity of creating a detailed flowchart or process map of a work process showing its inputs, tasks, and activities, in a structured sequence. A business process model is a graphic description of a process, showing the sequence of process tasks, which is developed for a specific purpose and from a selected viewpoint. A set of one or more process models details the many functions of a system or subject area with graphics and text, and its purpose is to:

- Expose process detail gradually and in a controlled manner.
- Encourage conciseness and accuracy in describing the process model.
- Focus attention on the process model interfaces.
- Provide a powerful process analysis and consistent design vocabulary.27

A business process model typically displays activities as boxes and uses arrows to represent data and interfaces. Business process modeling usually begins with a functional process representation of what the process problem is or an As-Is process model. As-Is process models represent the current state of the operation that has been mapped, without any specific improvements or changes to existing processes. The next step is to build a To-Be process model that displays how the process problem will be solved or implemented. To-Be process models show the results of applying change improvement opportunities to the current (As-Is) process model. This approach ensures that the process is fully and clearly understood before the details of a process solution are decided. The To-Be process model shows how the what is to be realized. Figure 2.18 displays the As-Is and To-Be process models for ordering a hamburger.28

Analyzing As-Is business process models leads to success in business process reengineering since these diagrams are very powerful in visualizing the activities, processes, and data flow of an organization. As-Is and To-Be process models are integral in process reengineering projects. Figure 2.19 illustrates
FIGURE 2.18 As-Is and To-Be Process Model for Ordering a Hamburger

As-Is Burger Order Process
- Customer approaches cashier
- Order burger
- Want fries? Yes → Order fries
- Want drink? Yes → Order drink
- Customer pays cashier

To-Be Burger Order Process
- Customer approaches cashier
- Order combo meal
- Customer pays cashier

FIGURE 2.19 As-Is Process Model for Order Fulfillment

As-Is Order Fulfillment Process

<table>
<thead>
<tr>
<th>Process</th>
<th>Customer</th>
<th>Sales</th>
<th>Billing</th>
<th>Inventory</th>
<th>Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Payment</td>
<td>Order Generated</td>
<td>Order Submitted</td>
<td>Credit Issues Assessed</td>
<td>Credit OK? Yes</td>
<td>Order Canceled</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Credit OK? No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Credit OK? Yes</td>
<td>Credit Approved</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Credit OK? No</td>
<td>Invoice Prepared</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Invoice Prepared</td>
<td>Shipped Order?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shipped Order?</td>
<td>Invoice Sent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Invoice Sent</td>
<td>Order Picked and Packaged</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Order Picked and Packaged</td>
<td>Order Shipped</td>
<td></td>
</tr>
</tbody>
</table>
Recently the firm helped a large financial services company slash costs and improve productivity in its Manufactured Housing Finance Division. Turnaround time for loan approval was reduced by half, using 40 percent fewer staff members.

Modeling helped the team analyze the complex aspects of the project. "In parts of the loan origination process, a lot of things happen in a short period of time," according to team leader Bob Karrick of KPMG. "During data capture, information is pulled from a number of different sources, and the person doing the risk assessment has to make judgment calls at different points throughout the process. There is often a need to stop, raise questions, make follow-up calls, and so on and then continue with the process modeling effort. Modeling allows us to do a thorough analysis that takes into account all these decision points and variables."

LO2.10

Explain business process management along with the reason for its importance to an organization.
BUSINESS PROCESS MANAGEMENT

A key advantage of technology is its ability to improve business processes. Working faster and smarter has become a necessity for companies. Initial emphasis was given to areas such as production, accounting, procurement, and logistics. The next big areas to discover technology’s value in business process were sales and marketing automation, customer relationship management, and supplier relationship management. Some of these processes involve several departments of the company and some are the result of real-time interaction of the company with its suppliers, customers, and other business partners. The latest area to discover the power of technology in automating and reengineering business process is business process management.

Business process management (BPM) integrates all of an organization’s business process to make individual processes more efficient. BPM can be used to solve a single glitch or to create one unifying system to consolidate a myriad of processes.

Many organizations are unhappy with their current mix of software applications and dealing with business processes that are subject to constant change. These organizations are turning to BPM systems that can flexibly automate their processes and glue their enterprise applications together. Figure 2.21 outlines a few key reasons organizations are embracing BPM technologies.

BPM technologies effectively track and orchestrate the business process. BPM can automate tasks involving information from multiple systems, with rules to define the sequence in which the tasks are performed as well as responsibilities, conditions, and other aspects of the process. BPM can benefit an organization by updating processes in real-time, reducing expenses, automating key decisions, and improving productivity. BPM not only allows a business process to be executed more efficiently, but it also provides the tools to measure performance and identify opportunities for improvement—as well as to easily make changes in processes to act upon those opportunities such as:

- Bringing processes, people, and information together.
- Breaking down the barriers between business areas and finding owners for the processes.
- Managing business processes within the enterprise and outside the enterprise with suppliers, business partners, and customers.
- Looking at automation horizontally instead of vertically.32

Is BPM for Business or Information Technology?

A good BPM solution requires two great parts to work together as one. Since BPM solutions cross application and system boundaries, they often need to be sanctioned and implemented by the IT organization, while at the same time BPM products are business tools that business managers need to own. Therefore, confusion often arises as to whether business or IT managers should be responsible for driving the selection of a new BPM solution.

The key requirement for BPM’s success in an organization is the understanding that it is a collaboration of business and IT, and thus both parties need to be involved in evaluating, selecting, and implementing a BPM solution. IT managers
need to understand the business drivers behind the processes, and business managers need to understand the impact the BPM solution may have on the infrastructure. Generally, companies that have successfully deployed BPM solutions are those whose business and IT groups have worked together as a cohesive team.

All companies can benefit from a better understanding of their key business processes, analyzing them for areas of improvement and implementing improvements. BPM applications have been successfully developed to improve complex business issues of some medium-to-large-sized companies. Like many large-scale implementation projects, BPM solutions are most successful in companies with a good understanding of their technology landscape and management willing to approach business in a new way. BPM solutions are truly driven by the business process and the company’s owners. Effective BPM solutions allow business owners to manage many aspects of the technology through business rules they develop and maintain. Companies that cannot support or manage cultural and organizational changes may lack positive BPM results.

BPM Risks and Rewards

If an organization is considering BPM, it must be aware of the risks involved in implementing these systems. One factor that commonly derails a BPM project has nothing to do with technology and everything to do with people. BPM projects involve cultural and organizational changes that companies must make to support the new management approach required for success. Where 10 area leaders once controlled 10 pieces of an end-to-end process, now a new group is involved in implementing a BPM solution across all these areas. Suddenly the span of control is consolidated and all are accountable to the whole process, not just one piece of the puzzle.

The added benefit of BPM is not only a technology solution, but also a business solution. BPM is a new business architecture and approach to managing the process and enabling proactive, continuous improvement. The new organizational structure and roles created to support BPM help maximize the continuous benefits to ensure success.

An IT director from a large financial services company gave this feedback when asked about his experience in using a BPM solution to improve the company’s application help desk process. “Before BPM, the company's application help desk was a manual process, filled with inefficiencies, human error, and no personal accountability. In addition, the old process provided no visibility into the process. There was absolutely no way to track requests, since it was all manual. Business user satisfaction with the process was extremely low. A BPM solution provided a way for the company to automate, execute, manage, and monitor the process in real time. The biggest technical challenge in implementation was ensuring that the user group was self-sufficient. While the company recognized that the IT organization is needed, it wanted to be able to maintain and implement any necessary process changes with little reliance on IT. It views process management as empowering the business users to maintain, control, and monitor the process. BPM goes a long way to enable this process.”

If It Ain’t Broke, Don’t Fix It

Do you hate waiting in line at the grocery store? Do you find it frustrating when you go to the video store and cannot find the movie you wanted to rent? Do you get annoyed when the pizza delivery person brings you the wrong order? This is your chance to reengineer the annoying process that drives you crazy. Choose a problem you are currently experiencing, and reengineer the process to make it more efficient and effective. Be sure to provide an As-Is and To-Be business process model.

One factor that commonly derails a BPM project has nothing to do with technology and everything to do with people.
Business Process Modeling Examples
A picture is worth a thousand words. Just ask Wayne Kendrick, a system analyst for Mobil Oil Corporation in Dallas, Texas. Kendrick, whose work involves planning and designing complex processes, was scheduled to make a presentation to familiarize top management with a number of projects his group was working on. “I was given 10 minutes for my presentation, and I had 20 to 30 pages of detailed documentation to present. Obviously, I could not get through it all in the time allocated.” Kendrick turned to business process models to help communicate his projects. “I think people can relate to pictures better than words,” Kendrick said. He applied his thinking to his presentation by using Microsoft’s Visio to create business process models and graphs to represent the original 30 pages of text. “It was an effective way to get people interested in my projects and to quickly see the importance of each project,” he stated. The process models worked and Kendrick received immediate approval to proceed with all of his projects. Figures 2.22 through 2.27 offer examples of business process models.
2.25 FIGURE eBay Buyer Business Process Model

Purchase an Item on eBay Business Process

Decides to Purchase Item

Reviews Auction Listing

Places Bid

Wins Bid

Receives Invoice

Pays Invoice

Receives Item

Rates Seller

Ends Sale

2.24 FIGURE Customer Order Business Process Model

Order Business Process

Call Center

Customer

Online Order

Item Shipped

Item Packed

Process Payment

Customer Notified of Backorder

Item in stock

No

Yes

Inventory Check

Item in stock

Yes

No
FIGURE 2.26 eBay Seller Business Process Model

Sell an Item on eBay Business Process

1. Decides to Sell Item
2. Lists Item on eBay
3. Sets Initial Price
4. Sets Auction Length
5. Invoices Winning Bid
6. Receives Payment
7. Ships Item
8. Rates Buyer
9. Ends Sale

FIGURE 2.27 Business Process Improvement Model

Process Improvement Model

1. Identify a process
2. Is there an additional step?
   - Yes: Identify one of the steps in the process
   - No: Remove the step
3. Is the step necessary?
   - Yes: Keep the step
   - No: Document improved step
4. Can the step be improved?
   - Yes: Implement new process
   - No: Model improved process
5. Are resources available to implement the change?
   - Yes: Implement new process
   - No: Model improved process

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