Agent-based modeling systems are being used to model stock market fluctuations, predict the escape routes 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 uses.

Virtual Reality

Virtual reality is a computer-simulated environment that can be a simulation of the real world or an imaginary world. Virtual reality is a fast-growing area of artificial intelligence that had its origins in efforts to build more natural, realistic, multisensory human–computer interfaces. Virtual reality enables telepresence by which users can be anywhere in the world and use virtual reality systems to work alone or together at a remote site. Typically, this involves using a virtual reality system to enhance the sight and touch of a human who is remotely manipulating equipment to accomplish a task. Examples range from virtual surgery, during which surgeon and patient may be on opposite sides of the globe to the remote use of equipment in hazardous environments such as chemical plants and nuclear reactors.

Augmented reality is the viewing of the physical world with computer-generated layers of information added to it. ***Google Glass*** is a wearable computer with an optical head-mounted display (OHMD). Developed by Google, it adds an element of augmented reality to the user's world by displaying information in a smart phone–like hands-free format. Google Glass became officially available to the general public in May 2014. Before that, users were required to receive invitations before they could try Google Glass. A ***virtual workplace*** is a work environment that is not located in any one physical space. It is usually in a network of several places, connected through the Internet, without regard to geographic borders. Employees can interact in a collaborated environment regardless of where they may happen to be in the world. A virtual workplace integrates hardware, people, and online processes. A ***haptic interface*** uses technology allowing humans to interact with a computer through bodily sensations and movements—for example, a cell phone vibrating in your pocket. A haptic interface is primarily implemented and applied in virtual reality environments and is used in virtual workplaces to enable employees to shake hands, demonstrate products, and collaborate on projects.

section 2.2 Business Processes

LEARNING OUTCOMES

2.5 Explain the value of business processes for a company and differentiate between customer-facing and business-facing processes.

2.6 Demonstrate the value of business process modeling and compare As-Is and To-Be models.

2.7 Differentiate among automation, streamlining, and reengineering.

LO 2.5: Explain the value of business processes for a company and differentiate between customer-facing and business-facing processes.

MANAGING BUSINESS PROCESSES

Most companies pride themselves on providing breakthrough products and services for customers. But if customers do not receive what they want quickly, accurately, and hassle-free, even fantastic offerings will not prevent a company from annoying customers and ultimately eroding its own financial performance. To avoid this pitfall and protect its competitive advantage, a company must continually evaluate all the business processes in its value chain. Recall from Chapter 1 that 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. Understanding business processes helps a manager envision how the entire company operates.

Improving the efficiency and effectiveness of its business processes will improve the firm's value chain. The goal of this section is to expand on Porter's value chain analysis by detailing

BUSINESS DRIVEN INNOVATION

Long-Distance Hugs

Haptic technology digitizes touch. CuteCircuit created the Hug shirt that you can hug and send the exact hug, including strength, pressure, distribution, and even heartbeat, to a long-distance friend who is wearing the partner to your Hug shirt. Ben Hui at Cambridge University is creating hand-squeezes that can be sent by mobile phones. You simply squeeze the phone and your friend feels it, in some form, at the other end. The value of these haptic devices is based on the idea that physical touch is an important element to all human interactions, and if you can transfer the physical touch, you can replicate the emotion. In a group, create a new business product that uses a haptic interface. Share your product idea with your peers.[9]

face decision-making environments for all types of problems that require optimization techniques, such as the following:

- Business executives use genetic algorithms to help them decide which combination of projects a firm should invest in, taking complicated tax considerations into account.
- Investment companies use genetic algorithms to help in trading decisions.
- Telecommunication companies use genetic algorithms to determine the optimal configuration of fiber-optic cable in a network that may include as many as 100,000 connection points. The genetic algorithm evaluates millions of cable configurations and selects the one that uses the least amount of cable.

Intelligent Agents

An ***intelligent agent*** is a special-purpose, knowledge-based information system that accomplishes specific tasks on behalf of its users. 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 complete 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.

What do cargo transport systems, book distribution centers, the video game market, and a flu epidemic have in common with an ant colony? They are all complex adaptive systems. By observing parts of Earth's ecosystem, like ant 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 process of learning from ecosystems and adapting their characteristics to human and organizational situations is called biomimicry.

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

particular situation. Expert systems are the most common 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. The best-known systems play chess and assist in medical diagnosis.

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. Neural networks analyze large quantities of information to establish patterns and characteristics when the logic or rules are unknown. 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 finance industry is a veteran in the use of neural network technology and has been relying on various forms for over two decades. It uses neural networks to review loan applications and create patterns or profiles of applications that fall into two categories—approved or denied. Here are some examples of neural networks in finance:

- 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 that a U.S. Treasury note is selling for 1 cent less in Japan than in the United States. These snippets of information can make a big difference to Citibank's bottom line in a very competitive financial market.
- Visa, MasterCard, and many other credit card companies use a neural network to spot peculiarities in individual accounts and follow up by checking for fraud. MasterCard estimates neural networks save it $50 million annually.
- Insurance companies along with state compensation funds and other carriers use neural network software to identify fraud. The system searches for patterns in billing charges, laboratory tests, and frequency of office visits. A claim for which the diagnosis was a sprained ankle but treatment included an electrocardiogram would be flagged for the account manager.[8]

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. Zero represents information not included, whereas 1 represents inclusion or 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.

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. ***Mutation*** is the process within a genetic algorithm of randomly trying combinations and evaluating the success (or failure) of the outcome.

Genetic algorithms are best suited to decision-making environments in which thousands, or perhaps millions, of solutions are possible. Genetic algorithms can find and evaluate solutions with many more possibilities, faster and more thoroughly than a human. Organizations

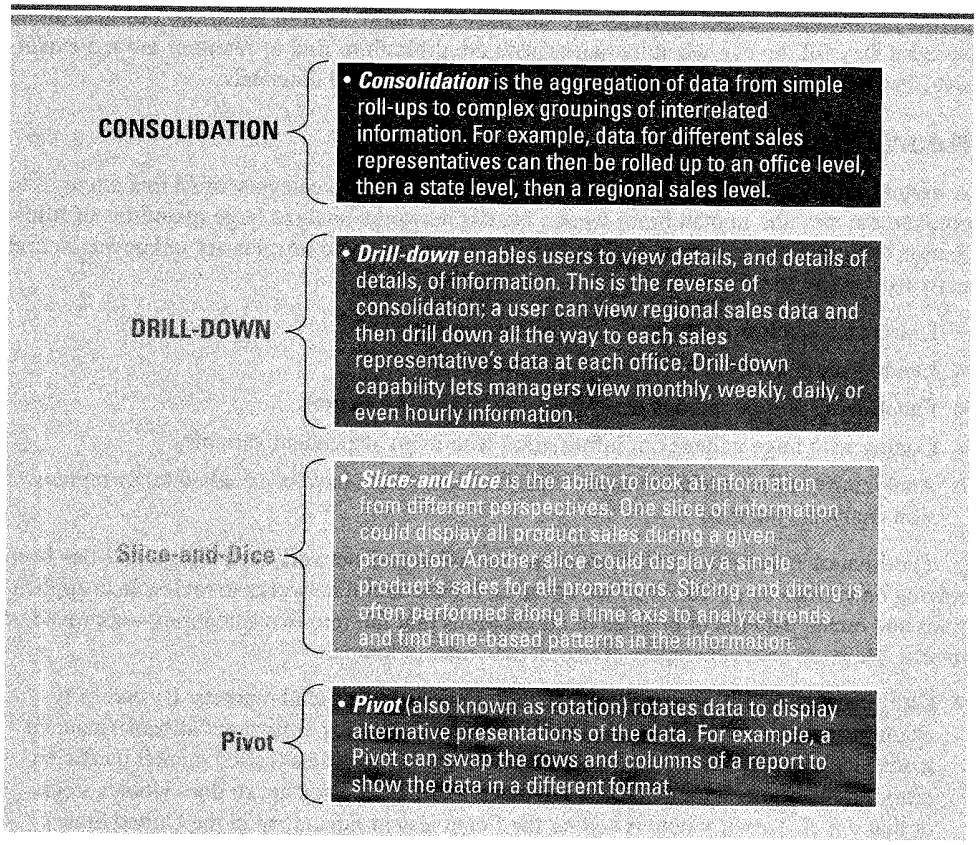


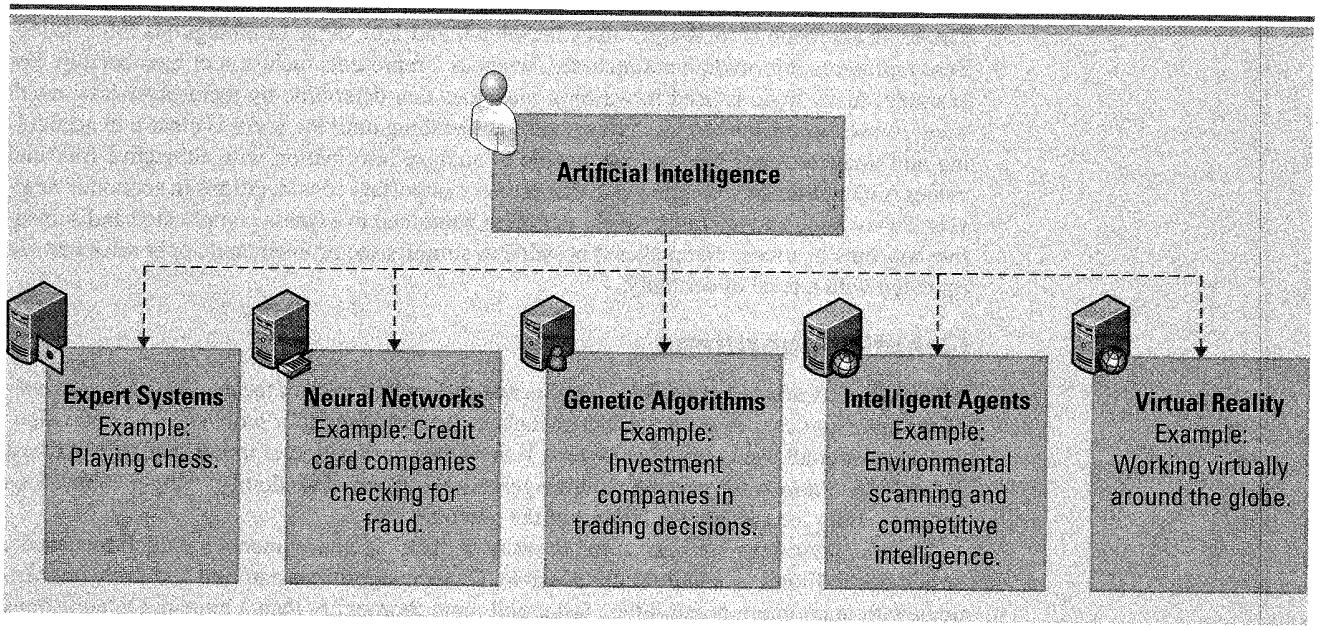
FIGURE 2.16
Digital Dashboard Analytical Capabilities

computing. There are many categories of AI systems; five of the most familiar are (1) expert systems, (2) neural networks, (3) genetic algorithms, (4) intelligent agents, and (5) virtual reality (see Figure 2.17).

Expert Systems

Expert systems are computerized advisory programs that imitate the reasoning processes of experts in solving difficult problems. Typically, they include a knowledge base containing various accumulated experience and a set of rules for applying the knowledge base to each

FIGURE 2.17
Examples of Artificial Intelligence



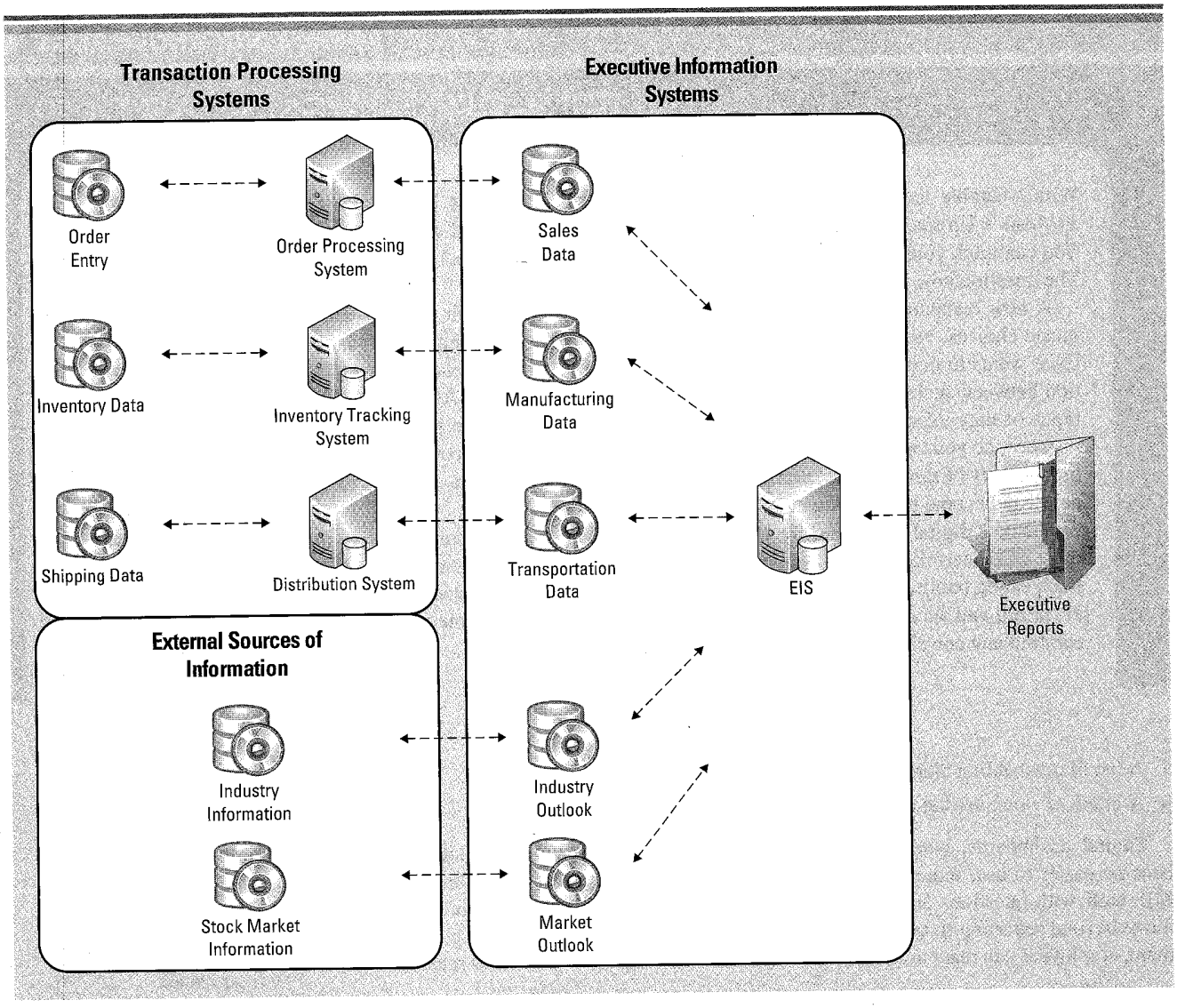


FIGURE 2.15
Interaction Between a TPS and EIS

solve problems, and change strategies daily instead of monthly. Digital dashboards offer the analytical capabilities illustrated in Figure 2.16.

One thing to remember when making decisions is the old saying, "Garbage in, garbage out." If the transactional data used in the support system are wrong, then the managerial analysis will be wrong and the DSS will simply assist in making a wrong decision faster. Managers should also ask, "What is the DSS *not* telling me before I make my final decision?"

LO 2.4: Describe artificial intelligence and identify its five main types.

USING AI TO MAKE BUSINESS DECISIONS

Executive information systems are starting to take advantage of artificial intelligence to facilitate unstructured strategic decision making. ***Artificial intelligence (AI)*** simulates human thinking and behavior, such as the ability to reason and learn. Its ultimate goal is to build a system that can mimic human intelligence.

Intelligent systems are various commercial applications of artificial intelligence. They include sensors, software, and devices that emulate and enhance human capabilities, learn or understand from experience, make sense of ambiguous or contradictory information, and even use reasoning to solve problems and make decisions effectively. Intelligent systems perform such tasks as boosting productivity in factories by monitoring equipment and signaling when preventive maintenance is required.

AI systems increase the speed and consistency of decision making, solve problems with incomplete information, and resolve complicated issues that cannot be solved by conventional

BUSINESS DRIVEN START-UP

TRACK YOUR LIFE

With wearable technology, you can track your entire life. Nike's Fuelband and Jawbone's Up tracks all of your physical activity, caloric burn, and sleep patterns. You can track your driving patterns, tooth-brushing habits, and even laundry status. The question now becomes how to track all of your trackers.

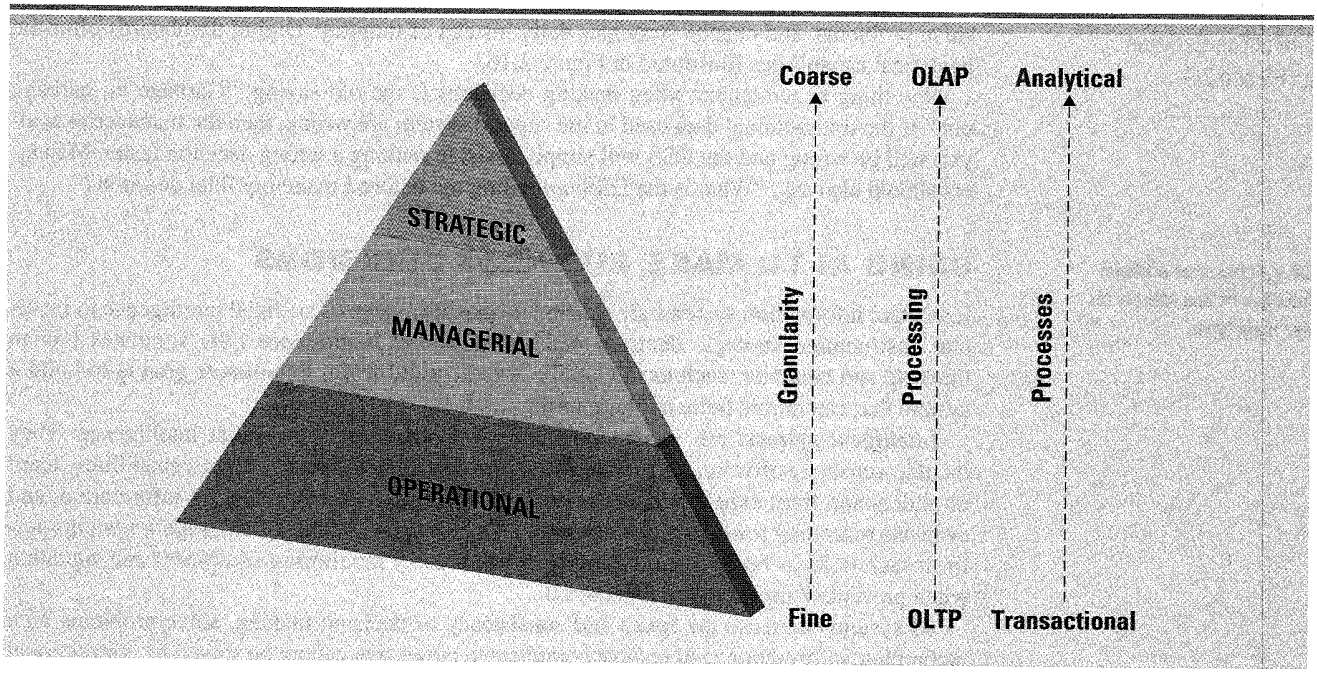
A new company called Exist incorporates tracking devices with weather data, music choices, Netflix favorites, and Twitter activity all in one digital dashboard. Exist wants to understand every area of your life and provide correlation information between such things as your personal productivity and mood. As the different types of data expand, so will the breadth of correlations Exist can point out. For instance, do you tweet more when you are working at home? If so, does this increase productivity? Exist wants to track all of your trackers and analyze the information to help you become more efficient and more effective.[7]

Create a digital dashboard for tracking your life. Choose four areas you want to track and determine three ways you would measure each area. For example, if you track eating habits, you might want to measure calories and place unacceptable levels in red and acceptable levels in green. Once completed, determine whether you can find any correlations among the areas in your life.

- A list of outstanding alerts and their resolution status.
- A graph of stock market prices.

Digital dashboards, whether basic or comprehensive, deliver results quickly. As they become easier to use, more employees can perform their own analyses without inundating MIS staff with questions and requests for reports. Digital dashboards enable employees to move beyond reporting to using information to increase business performance directly. With them, employees can react to information as soon as it becomes available and make decisions,

FIGURE 2.14
Information Levels Throughout an Organization



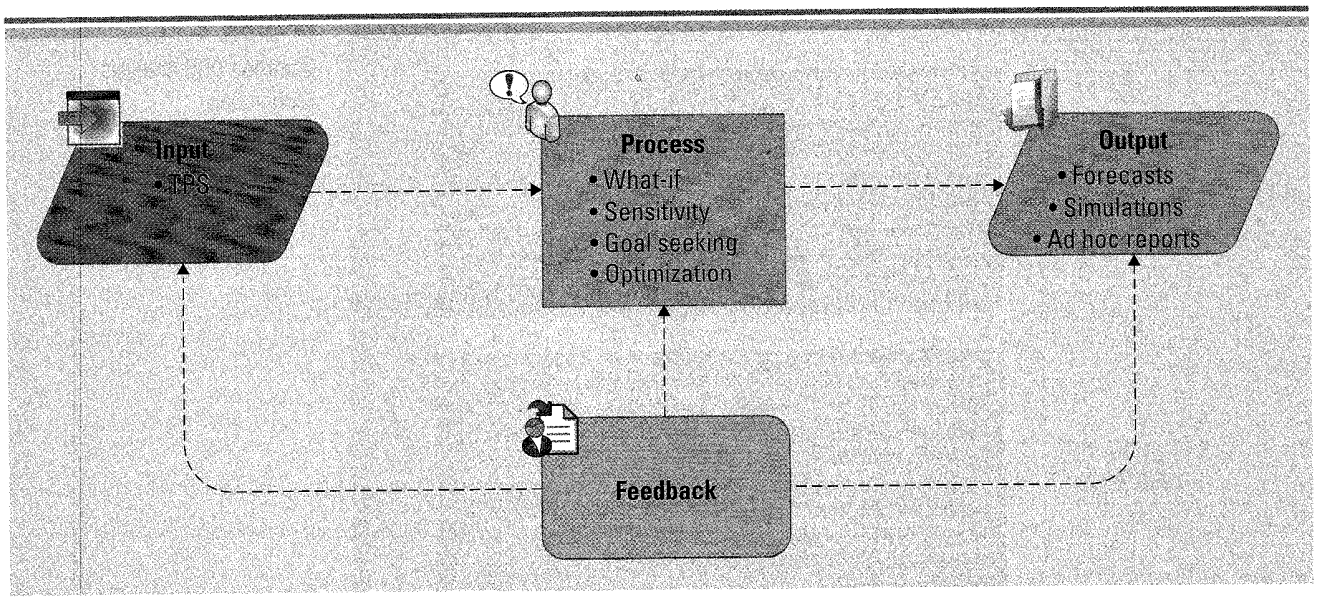


FIGURE 2.12

Systems Thinking Example of a DSS

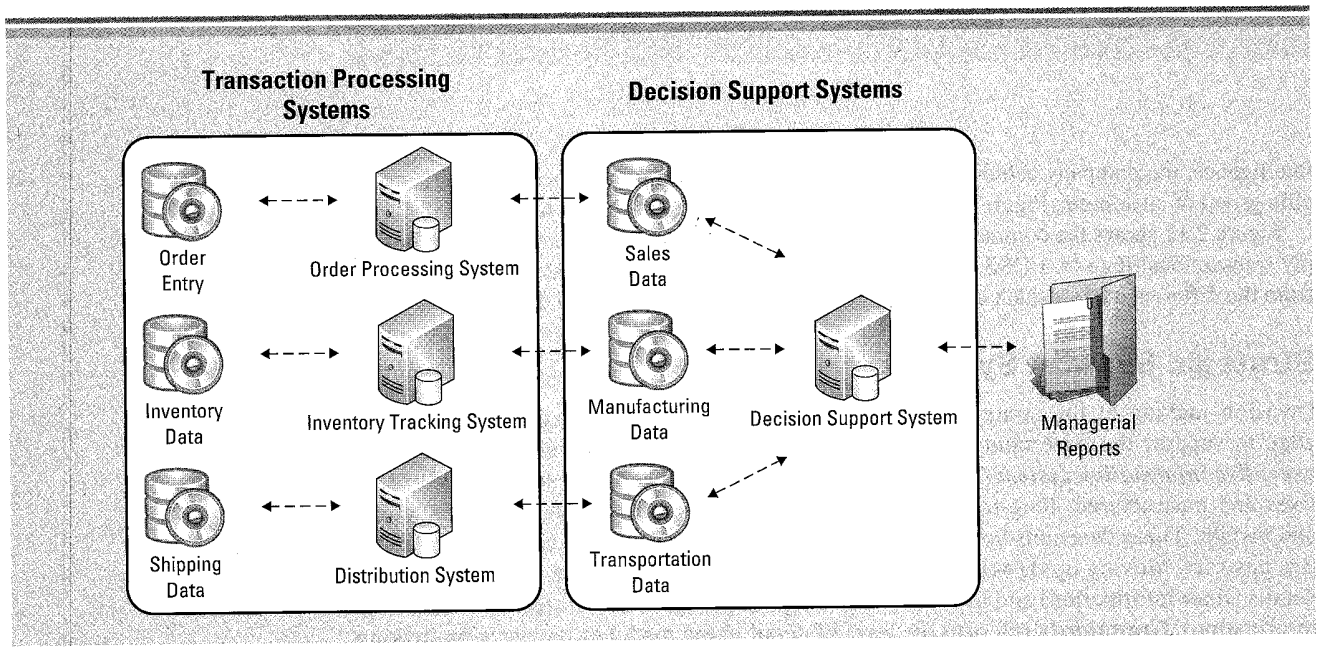
process. The greater the granularity, the deeper the level of detail or fineness of data (see Figure 2.14). A DSS differs from an EIS in that an EIS requires data from external sources to support unstructured decisions (see Figure 2.15). This is not to say that DSSs never use data from external sources, but typically DSS semistructured decisions rely on internal data only.

Visualization produces graphical displays of patterns and complex relationships in large amounts of data. Executive information systems use visualization to deliver specific key information to top managers at a glance, with little or no interaction with the system. A common tool that supports visualization is a ***digital dashboard,*** which tracks KPIs and CSFs by compiling information from multiple sources and tailoring it to meet user needs. Following is a list of potential features included in a dashboard designed for a manufacturing team:

- 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.

FIGURE 2.13

Interaction Between TPS and DSS to Support Semistructured Decisions



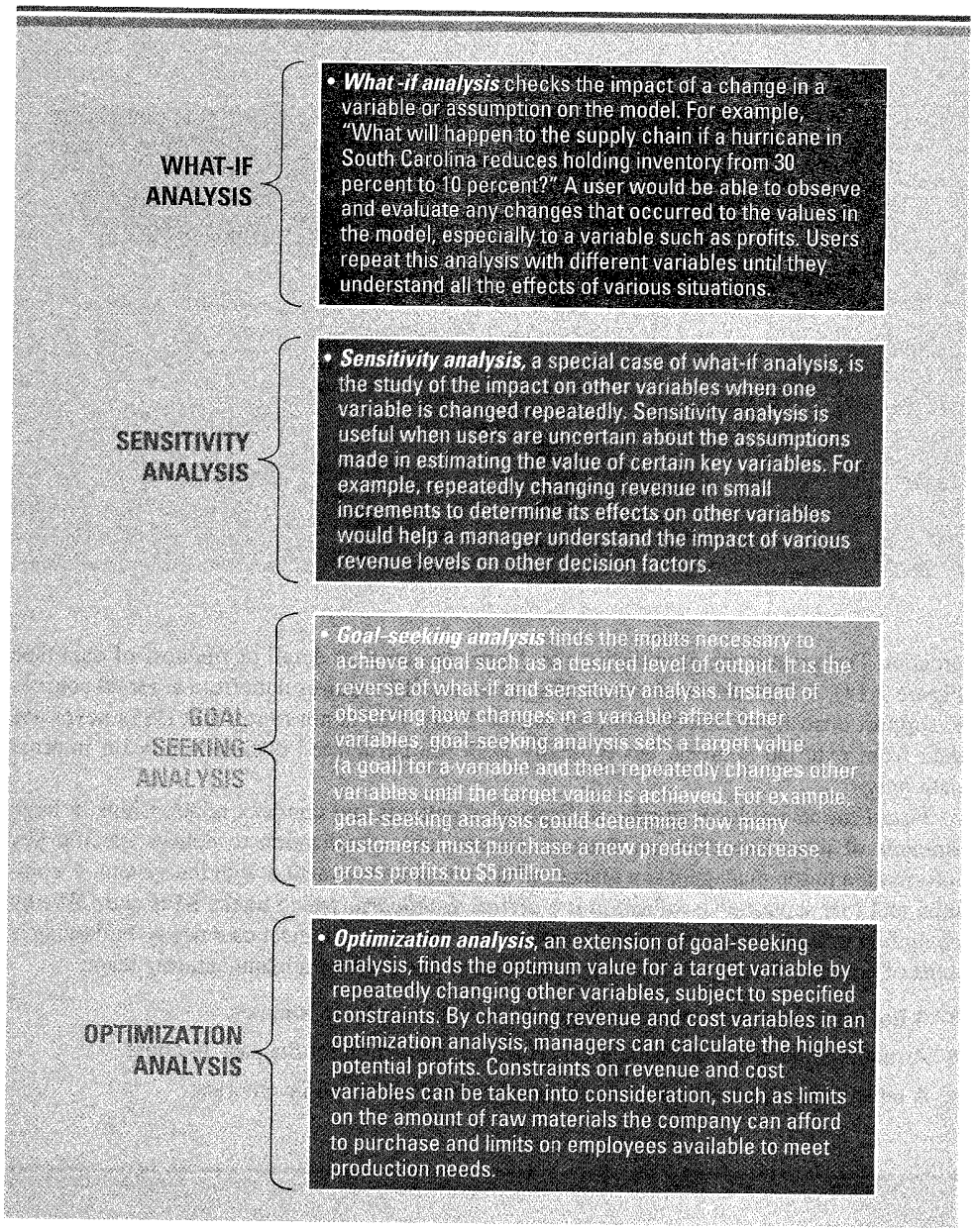


FIGURE 2.11
Common DSS Analysis Techniques

intelligence, the company achieved a cost advantage by lowering insurance rates to this specific group of customers. Figure 2.11 displays the common DSS analysis techniques.

Figure 2.12 shows the common systems view of a DSS. Figure 2.13 shows how TPSs supply transactional data to a DSS. The DSS then summarizes and aggregates the information from the different TPSs, which assist managers in making semistructured decisions.

Strategic Support Systems

Decision making at the strategic level requires both business intelligence and knowledge to support the uncertainty and complexity associated with business strategies. An ***executive information system (EIS)*** is a specialized DSS that supports senior-level executives and unstructured, long-term, nonroutine decisions requiring judgment, evaluation, and insight. These decisions do not have a right or wrong answer, only efficient and effective answers. Moving up through the organizational pyramid, managers deal less with the details (finer information) and more with meaningful aggregations of information (coarser information). ***Granularity*** refers to the level of detail in the model or the decision-making

BUSINESS DRIVEN ETHICS AND SECURITY

The Criminal in the Cube Next Door

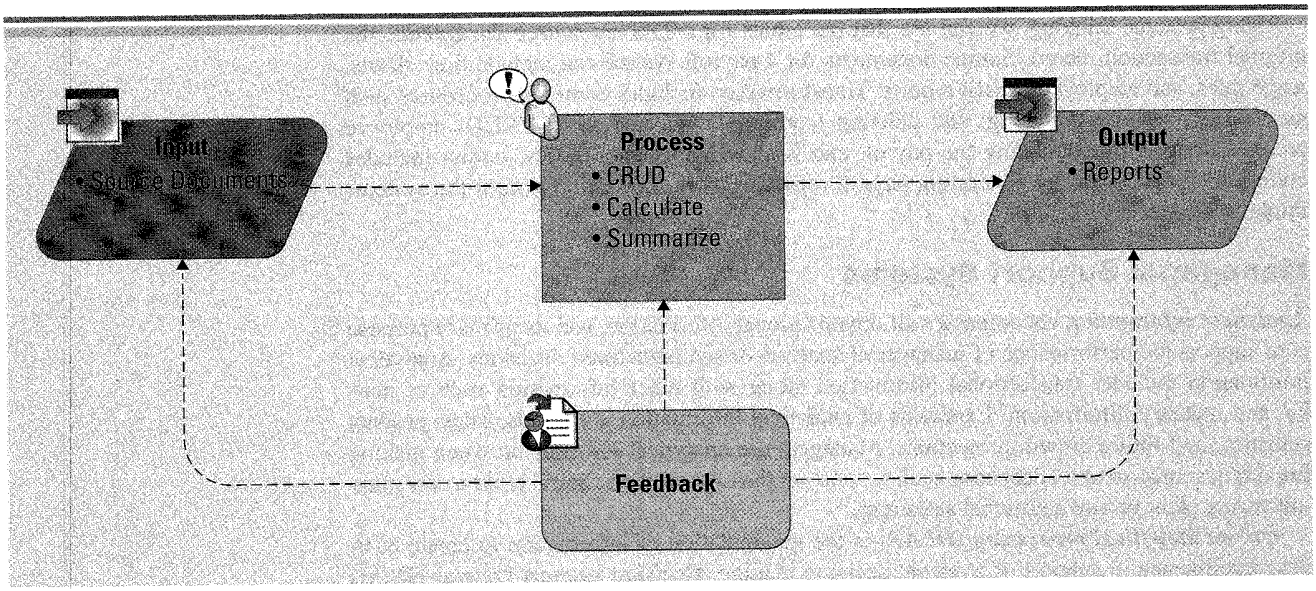
What if the person sitting in the cubicle next to you was running a scam that cost your company $7 billion? An employee at a French bank allegedly used his inside knowledge of business processes to bypass the system and place roughly $73 billion in bogus trades that cost the bank more than $7 billion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

Findings from the U.S. Secret Service's 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 their company. These insiders were authorized and active computer users 78 percent of the time, and a surprising 43 percent used their own user name and password to commit their crimes.[6]

This is a daunting reminder that every employee has the potential to become a knowledgeable insider and, if started on a criminal path, to do tremendous damage to your company. Many DSSs and EISs contain the business intelligence your company needs to operate effectively, and you need to protect these assets. What types of sensitive information are housed in a company's TPS, DSS, and EIS? What problems could you encounter if one of your employees decided to steal the information stored 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?

model information using OLAP, which provides assistance in evaluating and choosing among different courses of action. DSSs enable high-level managers to examine and manipulate large amounts of detailed data from different internal and external sources. Analyzing complex relationships among thousands or even millions of data items to discover patterns, trends, and exception conditions is one of the key uses associated with a DSS. For example, doctors may enter symptoms into a decision support system so it can help diagnose and treat patients. Insurance companies also use a DSS to gauge the risk of providing insurance to drivers who have imperfect driving records. One company found that married women who are homeowners with one speeding ticket are rarely cited for speeding again. Armed with this business

FIGURE 2.10
Systems Thinking Example of a TPS



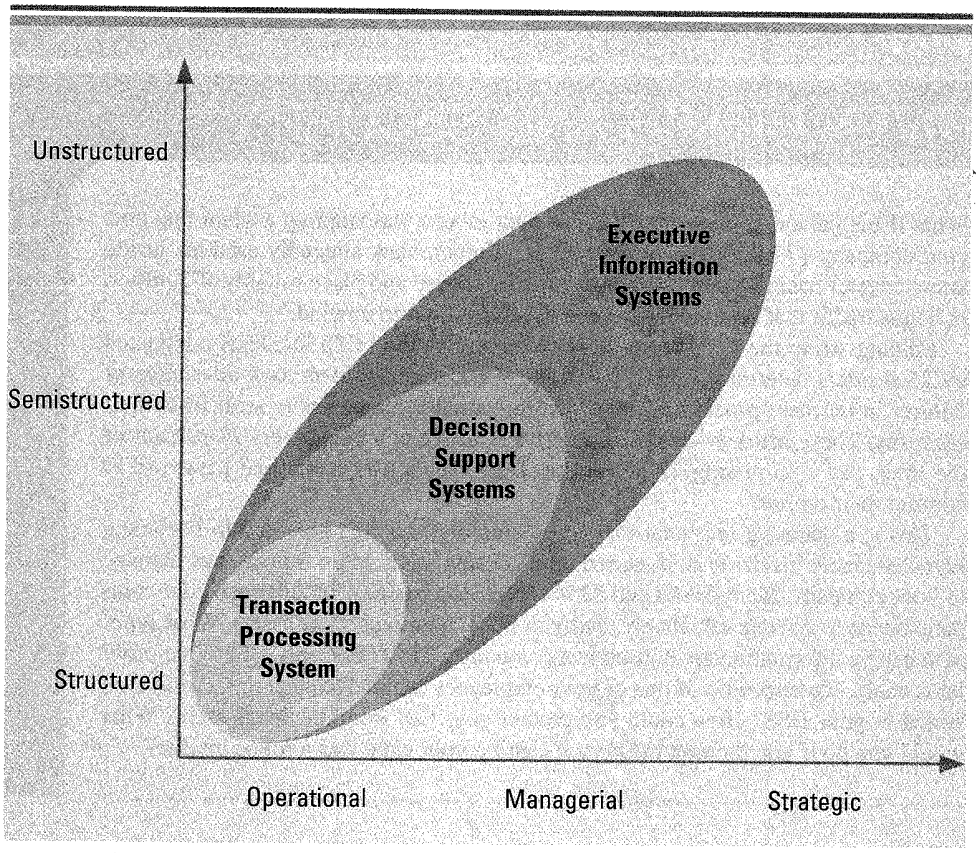


FIGURE 2.9
Primary Types of MIS Systems for Decision Making

an ATM. Managers use transactional information when making structured decisions at the operational level, such as when analyzing daily sales reports to determine how much inventory to carry.

Online transaction processing (OLTP) is the capture 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) and assists in making structured decisions. The most common example of a TPS is an operational accounting system such as a payroll system or an order-entry system.

Using systems thinking, we can see that the inputs for a TPS are ***source documents,*** the original transaction record. Source documents for a payroll system can include time sheets, wage rates, and employee benefit reports. Transformation includes common procedures such as creating, reading, updating, and deleting (commonly referred to as CRUD) employee records along with calculating the payroll and summarizing benefits. The output includes cutting the paychecks and generating payroll reports. Figure 2.10 demonstrates the systems thinking view of a TPS.[5]

Managerial Support Systems

Analytical information encompasses all organizational information, and its primary purpose is to support the performance of managerial analysis or semistructured decisions. 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 semistructured decisions such as whether the organization should build a new manufacturing plant or hire additional sales reps.

Online analytical processing (OLAP) is the manipulation of information to create business intelligence in support of strategic decision making. ***Decision support systems (DSSs)***

BUSINESS DRIVEN GLOBALIZATION

Get the Cow Out of the Ditch

Fortune magazine asked Anne Mulcahy, former Chairman and CEO of Xerox, what the best advice she had ever received in business was. She said it occurred at a breakfast meeting in Dallas, to which she had invited a group of business leaders. One of them, a plainspoken, self-made, streetwise guy, came up to Mulcahy and said:

> When everything gets really complicated and you feel overwhelmed, think about it this way. *You gotta do three things. First, get the cow out of the ditch. Second, find out how the cow got into the ditch. Third, make sure you do whatever it takes so the cow doesn't go into the ditch again.*[4]

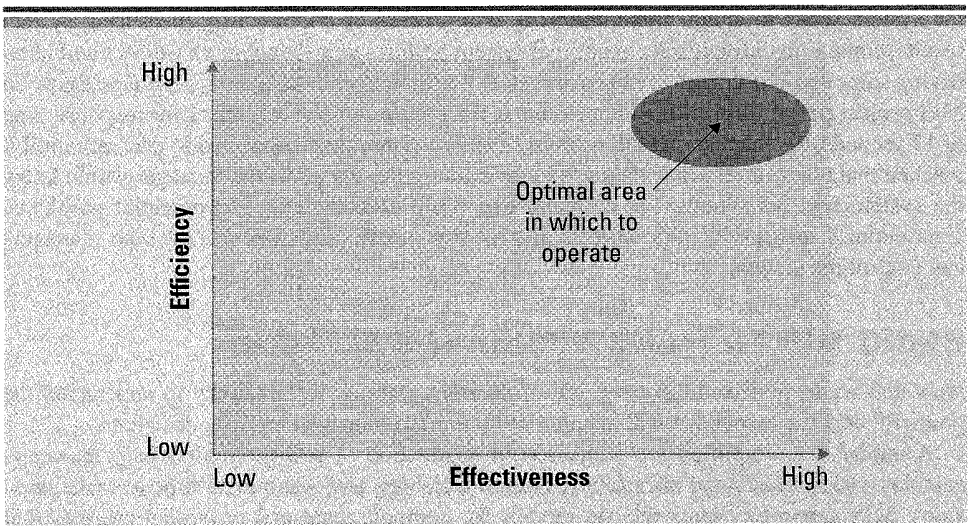
You are working for an international app developer that produces games. For months, you have been collecting metrics on usage by players from all over the world. You notice the metrics on the Asian and European players are falling sharply and sales are dropping. The United States and Canada metrics are still growing strongly, and sales are increasing. What can you do to get this cow out of the ditch?

mathematically express relationships among variables. For example, a spreadsheet program, such as Microsoft Excel, might contain models that calculate market share or ROI. MIS has the capability and functionality to express far more complex modeling relationships that provide information, business intelligence, and knowledge. Figure 2.9 highlights the three primary types of management information systems available to support decision making across the company levels.

Operational Support Systems

Transactional information encompasses all the information contained within a single business process or unit of work, and its primary purpose is to support the performance of daily operational or structured decisions. Transactional information is created, for example, when customers are purchasing stocks, making an airline reservation, or withdrawing cash from

FIGURE 2.8
The Interrelationships between Efficiency and Effectiveness



BUSINESS DRIVEN DISCUSSION

Making business decisions is a key skill for all managers. Review the following list and, in a group, determine whether the question is focusing on efficiency, effectiveness, or both.

IS IT EFFECTIVE OR IS IT EFFICIENT?

Business Decision	Efficiency	Effectiveness
What is the best route for dropping off products?		
Should we change suppliers?		
Should we reduce costs by buying lower-quality materials?		
Should we sell products to a younger market?		
Did we make our sales targets?		
What was the turnover rate of employees?		
What is the average customer spending?		
How many new customers purchased products?		
Did the amount of daily transactions increase?		
Is there a better way to restructure a store to increase sales?		

months. In the private sector, eBay continuously benchmarks its MIS projects for efficiency and effectiveness. Maintaining constant website availability and optimal throughput performance are CSFs for eBay.

Figure 2.8 depicts the interrelationships between efficiency and effectiveness. Ideally, a firm wants to operate in the upper right-hand corner of the graph, realizing significant increases in both efficiency and effectiveness. However, operating in the upper left-hand corner (minimal effectiveness with increased efficiency) or the lower right-hand corner (significant effectiveness with minimal efficiency) may be in line with an organization's particular strategies. In general, operating in the lower left-hand corner (minimal efficiency and minimal effectiveness) is not ideal for the operation of any organization.

Regardless of what process is measured, how it is measured, and whether it is performed for the sake of efficiency or effectiveness, managers must set ***benchmarks,*** or baseline values the system seeks to attain. ***Benchmarking*** is a process of continuously measuring system results, comparing those results to optimal system performance (benchmark values), and identifying steps and procedures to improve system performance. Benchmarks help assess how an MIS project performs over time. For instance, if a system held a benchmark for response time of 15 seconds, the manager would want to ensure response time continued to decrease until it reached that point. If response time suddenly increased to 1 minute, the manager would know the system was not functioning correctly and could start looking into potential problems. Continuously measuring MIS projects against benchmarks provides feedback so managers can control the system.

USING MIS TO MAKE BUSINESS DECISIONS

LO 2.3: Classify the different operational support systems, managerial support systems, and strategic support systems and explain how managers can use these systems to make decisions and gain competitive advantages.

Now that we've reviewed the essentials of decision making, we are ready to understand the powerful benefits associated with using MIS to support managers making decisions.

A ***model*** is a simplified representation or abstraction of reality. Models help managers calculate risks, understand uncertainty, change variables, and manipulate time to make decisions. MIS support systems rely on models for computational and analytical routines that

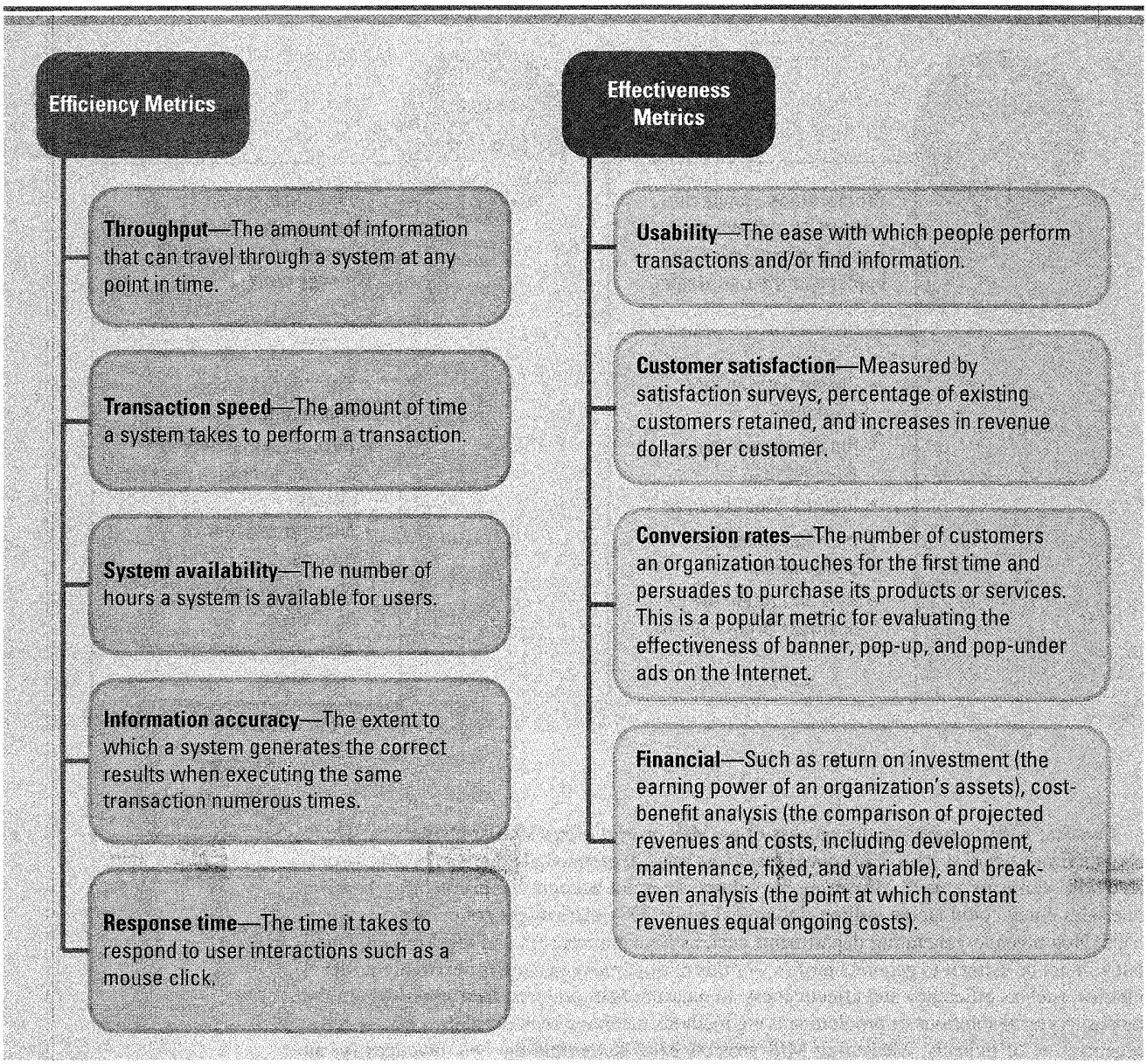


FIGURE 2.7

Common Types of Efficiency and Effectiveness Metrics

efficiency metrics, a manager would measure the number of daily transactions, the average amount per transaction, and the average speed per transaction to determine the success of the ATM. Although these offer solid metrics on how well the system is performing, they miss many of the intangible or value-added benefits associated with ATM effectiveness. Effectiveness MIS metrics might measure how many new customers joined the bank due to its ATM locations or the ATMs' ease of use. They can also measure increases in customer satisfaction due to reduced ATM fees or additional ATM services such as the sale of stamps and movie tickets, significant time savers and value-added features for customers. Being a great manager means using the added viewpoint offered by effectiveness MIS metrics to analyze all benefits associated with an MIS project.

Efficiency and effectiveness are definitely related. However, success in one area does not necessarily imply success in the other. Efficiency MIS metrics focus on the technology itself. Although these efficiency MIS metrics are important to monitor, they do not always guarantee effectiveness. Effectiveness MIS metrics are determined according to an organization's goals, strategies, and objectives. Here, it becomes important to consider a company's CSFs, such as a broad cost leadership strategy (Walmart, for example), as well as KPIs such as increasing new customers by 10 percent or reducing new-product development cycle times to six

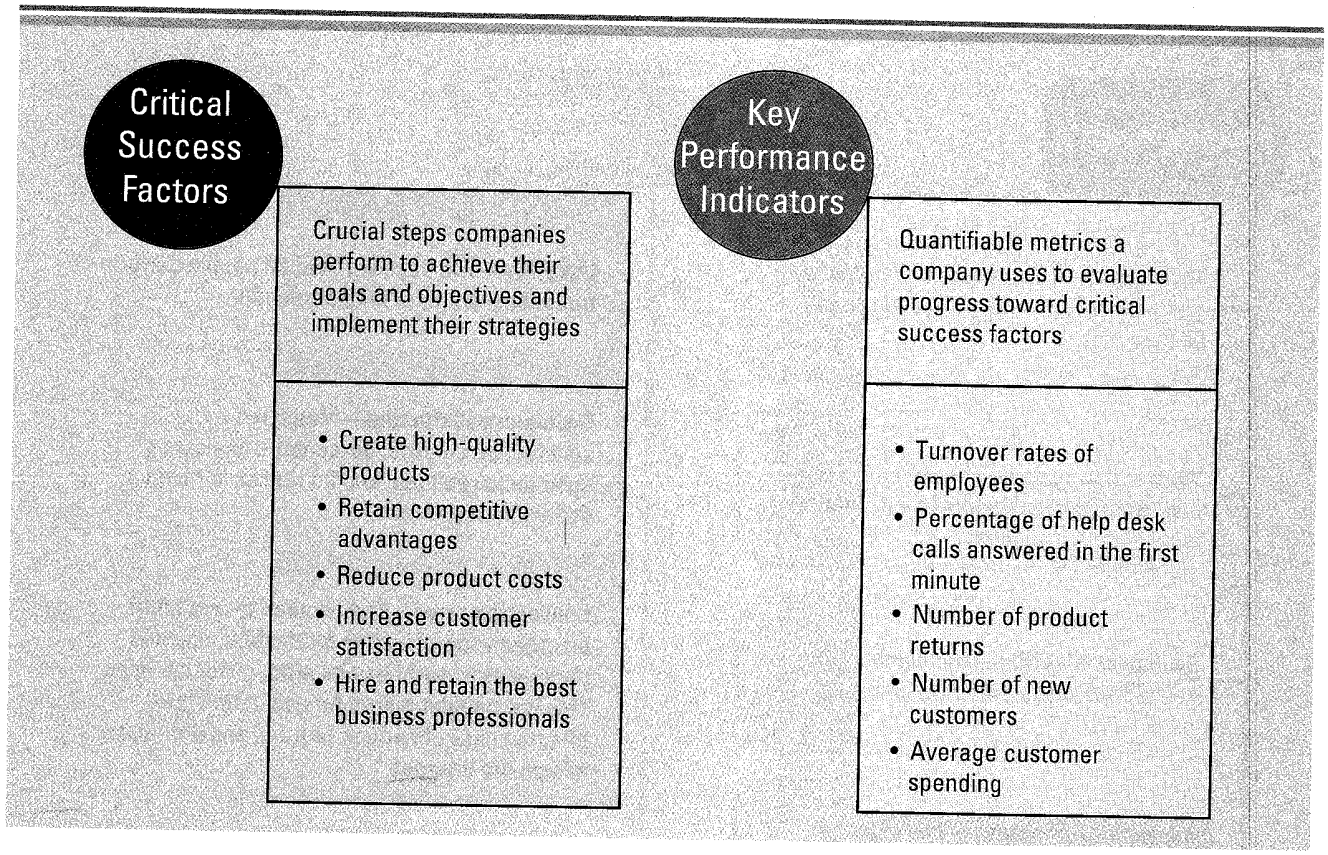


FIGURE 2.6
CSF and KPI Metrics

Creating KPIs to measure the success of an MIS project offers similar challenges. Think about a firm's email system. How could managers track departmental costs and profits associated with company email? Measuring by volume does not account for profitability because one sales email could land a million-dollar deal while 300 others might not generate any revenue. Non revenue-generating departments such as human resources and legal require email but will not be using it to generate profits. For this reason, many managers turn to higher-level metrics, such as efficiency and effectiveness, to measure MIS projects. ***Best practices*** are the most successful solutions or problem-solving methods that have been developed by a specific organization or industry. Measuring MIS projects helps determine the best practices for an industry.

Efficiency and Effectiveness Metrics

Efficiency MIS metrics measure the performance of MIS itself, such as throughput, transaction speed, and system availability. ***Effectiveness MIS metrics*** measure the impact MIS has on business processes and activities, including customer satisfaction and customer conversion rates. Efficiency focuses on the extent to which a firm is using its resources in an optimal way, whereas effectiveness focuses on how well a firm is achieving its goals and objectives. Peter Drucker offers a helpful distinction between efficiency and effectiveness: Doing things right addresses efficiency—getting the most from each resource. Doing the right things addresses effectiveness—setting the right goals and objectives and ensuring they are accomplished. Figure 2.7 describes a few of the common types of efficiency and effectiveness MIS metrics. KPIs that measure MIS projects include both efficiency and effectiveness metrics. Of course, these metrics are not as concrete as market share or ROI, but they do offer valuable insight into project performance.[3]

Large increases in productivity typically result from increases in effectiveness, which focus on CSFs. Efficiency MIS metrics are far easier to measure, however, so most managers tend to focus on them, often incorrectly, to measure the success of MIS projects. Consider measuring the success of automated teller machines (ATMs). Thinking in terms of MIS

that has a competitive advantage needs to adjust and revise its strategy constantly to remain ahead of fast-following competitors. Managerial decisions cover short- and medium-range plans, schedules, and budgets along with policies, procedures, and business objectives for the firm. They also allocate resources and monitor the performance of organizational subunits, including departments, divisions, process teams, project teams, and other work groups. These types of decisions are considered ***semistructured decisions;*** they occur in situations in which a few established processes help to evaluate potential solutions, but not enough to lead to a definite recommended decision. For example, decisions about producing new products or changing employee benefits range from unstructured to semistructured. Figure 2.5 highlights the essential elements required for managerial decision making.

Strategic At the ***strategic level,*** managers develop overall business strategies, goals, and objectives as part of the company's strategic plan. They also monitor the strategic performance of the organization and its overall direction in the political, economic, and competitive business environment. Strategic decisions are highly ***unstructured decisions,*** occurring in situations in which no procedures or rules exist to guide decision makers toward the correct choice. They are infrequent, extremely important, and typically related to long-term business strategy. Examples include the decision to enter a new market or even a new industry over, say, the next three years. In these types of decisions, managers rely on many sources of information, along with personal knowledge, to find solutions. Figure 2.5 highlights the essential elements required for strategic decision making.

MEASURING ORGANIZATIONAL BUSINESS DECISIONS

LO 2.2: Define critical success factors (CSFs) and key performance indicators (KPIs) and explain how managers use them to measure the success of MIS projects.

A ***project*** is a temporary activity a company undertakes to create a unique product, service, or result. For example, the construction of a new subway station is a project, as is a movie theater chain's adoption of a software program to allow online ticketing. Peter Drucker, a famous management writer, once said that if you cannot measure something, you cannot manage it. How do managers measure the progress of a complex business project?

Metrics are measurements that evaluate results to determine whether a project is meeting its goals. Two core metrics are critical success factors and key performance indicators. ***Critical success factors (CSFs)*** are the crucial steps companies perform to achieve their goals and objectives and implement their strategies (see Figure 2.6). ***Key performance indicators (KPIs)*** are the quantifiable metrics a company uses to evaluate progress toward critical success factors. KPIs are far more specific than CSFs.

It is important to understand the relationship between critical success factors and key performance indicators. CSFs are elements crucial for a business strategy's success. KPIs measure the progress of CSFs with quantifiable measurements, and one CSF can have several KPIs. Of course, both categories will vary by company and industry. Imagine *improve graduation rates* as a CSF for a college. The KPIs to measure this CSF can include:

- Average grades by course and gender.
- Student dropout rates by gender and major.
- Average graduation rate by gender and major.
- Time spent in tutoring by gender and major.

KPIs can focus on external and internal measurements. A common external KPI is ***market share,*** or the proportion of the market that a firm captures. We calculate it by dividing the firm's sales by the total market sales for the entire industry. Market share measures a firm's external performance relative to that of its competitors. For example, if a firm's total sales (revenues) are $2 million and sales for the entire industry are $10 million, the firm has captured 20 percent of the total market (2/10 = 20%) or a 20 percent market share.

A common internal KPI is ***return on investment (ROI),*** which indicates the earning power of a project. We measure it by dividing the profitability of a project by the costs. This sounds easy, and for many departments where the projects are tangible and self-contained it is; however, for projects that are intangible and cross departmental lines (such as MIS projects), ROI is challenging to measure. Imagine attempting to calculate the ROI of a fire extinguisher. If the fire extinguisher is never used, its ROI is low. If the fire extinguisher puts out a fire that could have destroyed the entire building, its ROI is astronomically high.

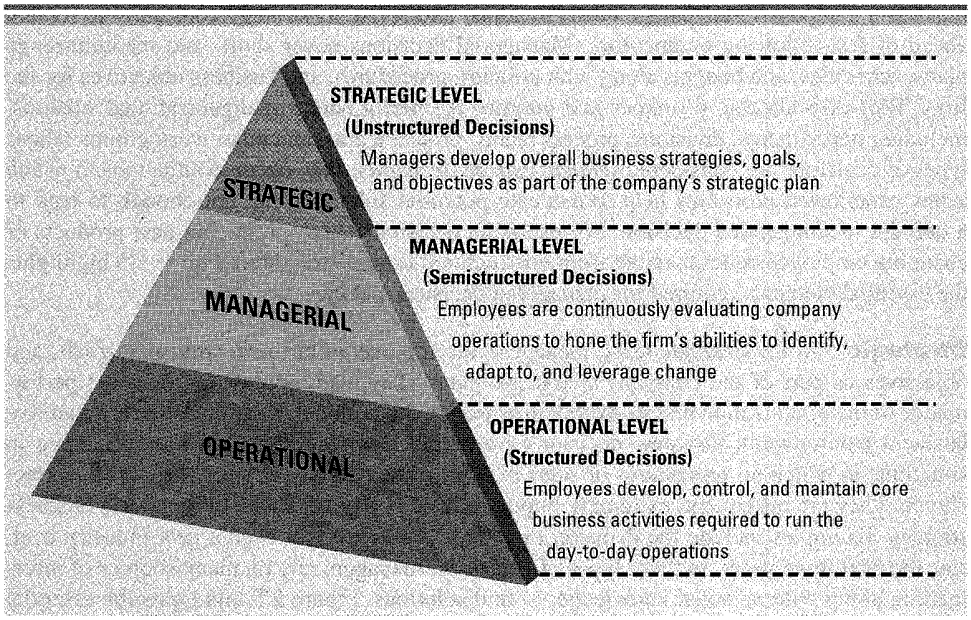


FIGURE 2.4
Common Company Structure

	STRATEGIC LEVEL	MANAGERIAL LEVEL	OPERATIONAL LEVEL
Employee Types	■ Senior management, presidents, leaders, executives	■ Middle management, managers, directors	■ Lower management, department managers, analysts, staff
Focus	■ External, industry, cross company	■ Internal, crossfunctional (sometimes external)	■ Internal, functional
Time Frame	■ Long term—yearly, multiyear	■ Short term, daily, monthly, yearly	■ Short term, day-to-day operations
Decision Types	■ Unstructured, nonrecurring, one time	■ Semistructured, ad hoc (unplanned) reporting	■ Structured, recurring, repetitive
MIS Types	■ Knowledge	■ Business intelligence	■ Information
Metrics	■ Critical success factors focusing on effectiveness	■ Key performance indicators focusing on efficiency, and critical success factors focusing on effectiveness	■ Key performance indicators focusing on efficiency
Examples	■ How will changes in employment levels over the next 3 years affect the company? ■ What industry trends are worth analyzing? ■ What new products and new markets does the company need to create competitive advantages? ■ How will a recession over the next year affect business? ■ What measures will the company need to prepare for due to new tax laws?	■ Who are our best customers by region, by sales representative, by product? ■ What are the sales forecasts for next month? How do they compare to actual sales for last year? ■ What was the difference between expected sales and actual sales for each month? ■ What was the impact of last month's marketing campaign on sales? ■ What types of ad hoc or unplanned reports might the company require next month?	■ How many employees are out sick? ■ What are next week's production requirements? ■ How much inventory is in the warehouse? ■ How many problems occurred when running payroll? ■ Which employees are on vacation next week? ■ How many products need to be made today?

FIGURE 2.5
Overview of Decision Making