information systems 6e

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m: information systems 6e

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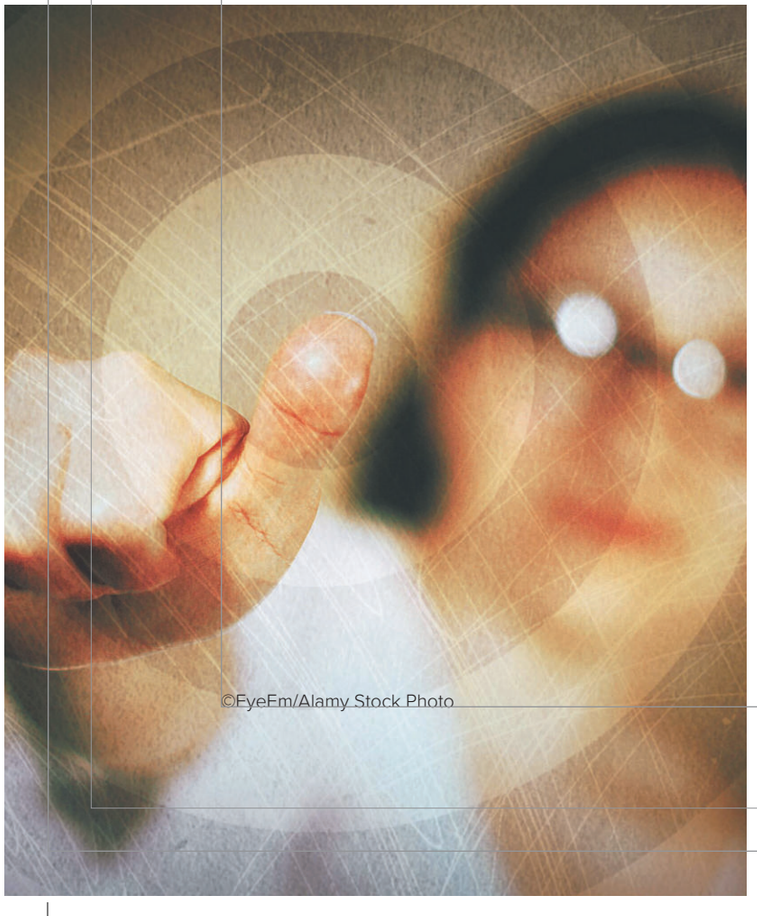

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Appendixes A–E are available only as online resources

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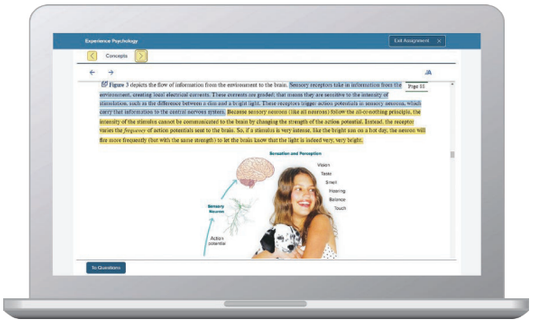

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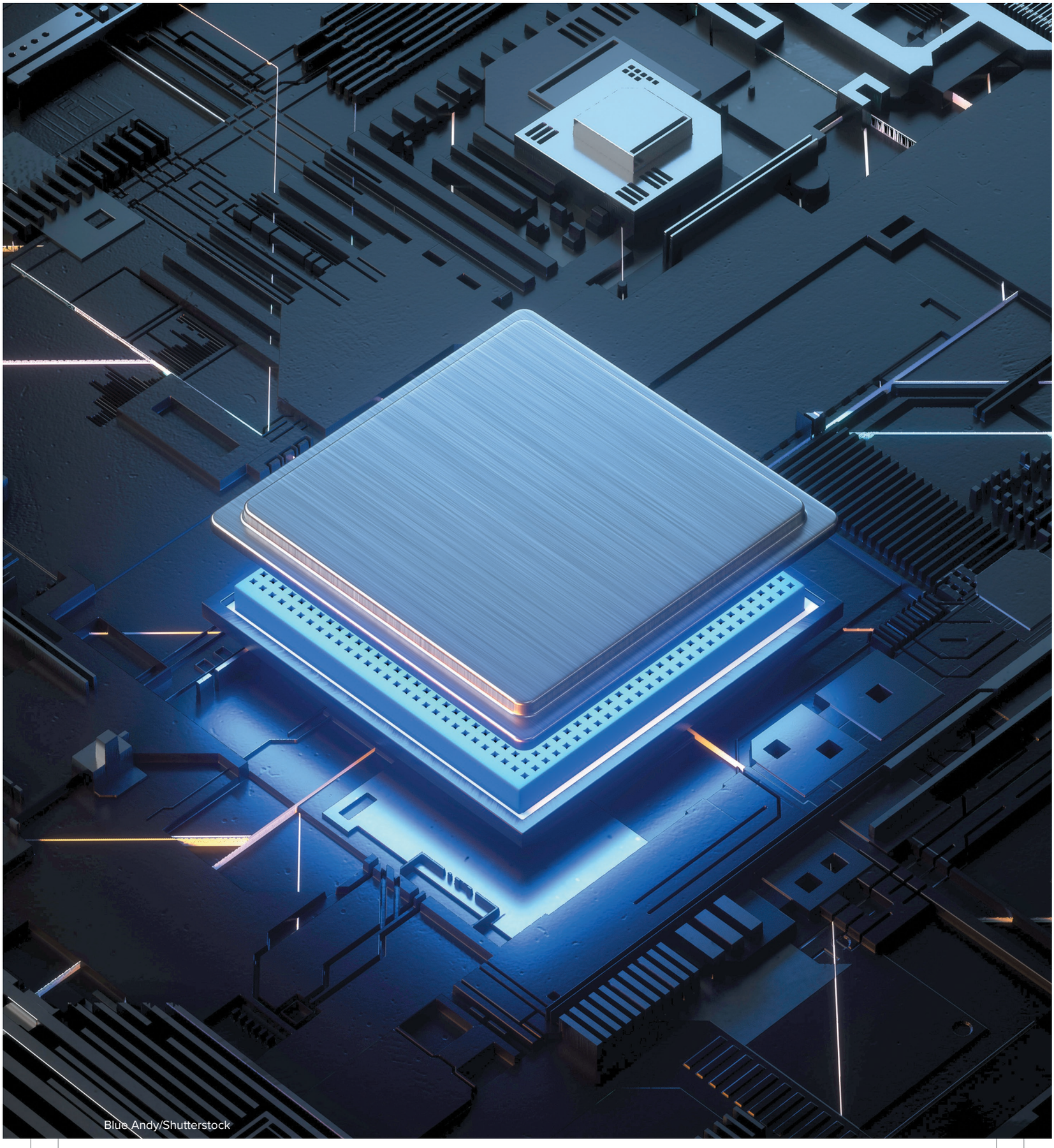

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module one

coming up

Most companies today rely heavily on the use of management information systems (MIS) to run various aspects of their businesses. Whether they need to order and ship goods, interact with customers, or conduct other business functions, management information systems are often the underlying infrastructure performing the activities. Management information systems allow companies to remain competitive in today's fast-paced world and especially when conducting business on the Internet. Organizations must adapt to technological advances and innovations to keep pace with today's rapidly changing environment. Their competitors certainly will!

No matter how exciting technology is, successful companies do not use it simply for its own sake. Companies should have a solid business reason for implementing technology. Using a technological solution just because it is available is not a good business strategy.

The purpose of Module 1 is to raise your awareness of the vast opportunities made possible by the tight correlation between business and technology. Business strategies and processes should always drive your technology choices. Although awareness of an emerging technology can sometimes lead us in new strategic directions, the role of information systems, for the most part, is to support existing business strategies and processes. ■

BUSINESS DRIVEN MIS

module one

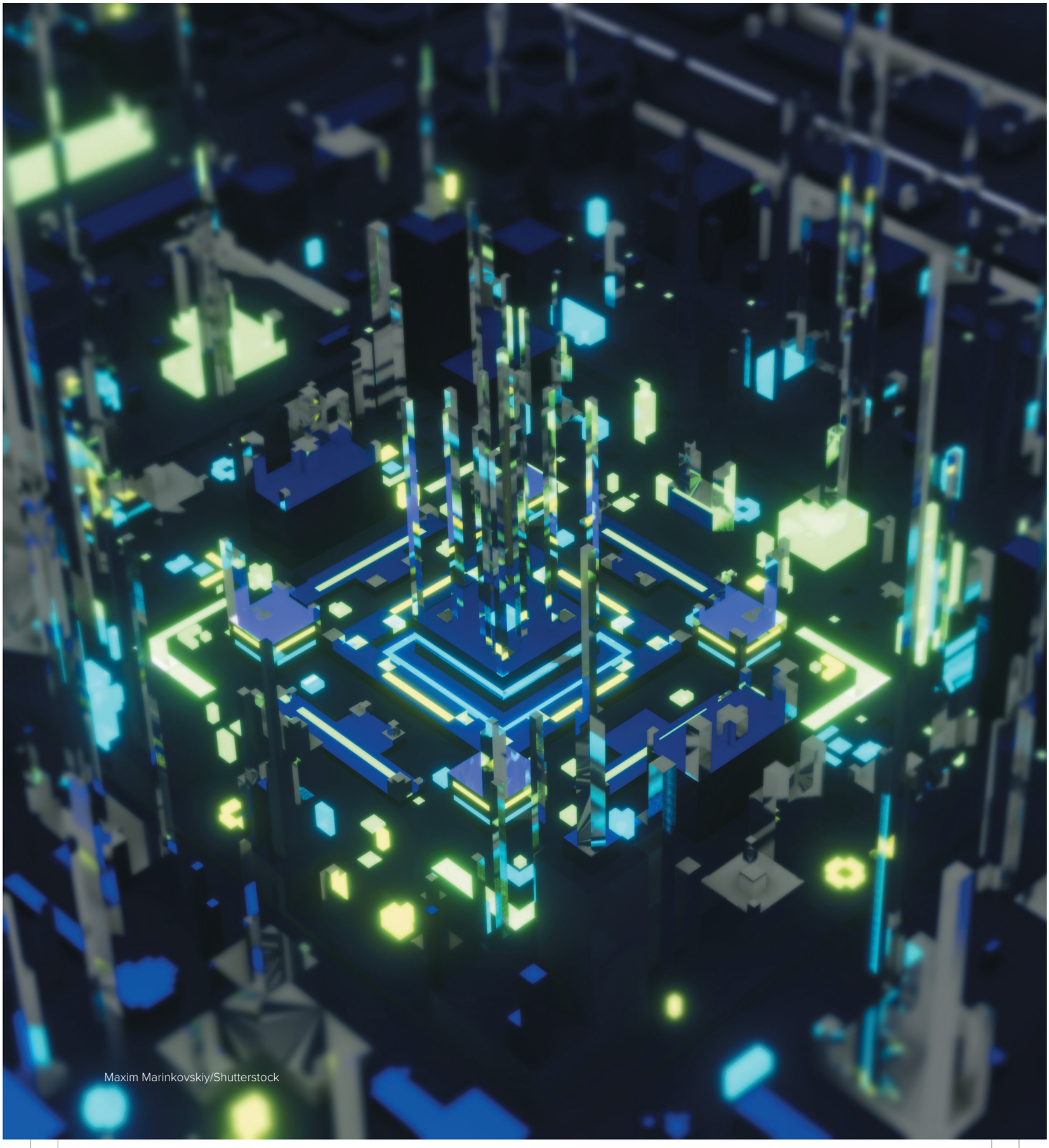
BUSINESS DRIVEN MIS

module two

TECHNICAL FOUNDATIONS OF MIS

module three

ENTERPRISE MIS



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chapter one

management information systems: business driven MIS

what's in IT for me?

This chapter sets the stage for the textbook. It starts from ground zero by providing a clear description of what information is and how it fits into business operations, strategies, and systems. It provides an overview of how companies operate in competitive environments and why they must continually define and redefine their business strategies to create competitive advantages. Doing so allows them to survive and thrive. Information systems are key business enablers for successful operations in competitive environments.

You, as a business student, must understand the tight correlation between business and technology. You must first recognize information's role in daily

continued on p.6

CHAPTER OUTLINE

fact The confirmation or validation of an event or object.

information age The present time, during which infinite quantities of facts are widely available to anyone who can use a computer.

Internet of Things (IoT) A world where interconnected, Internet-enabled devices or "things" can collect and share data without human intervention.

machine-to-machine (M2M) Devices that connect directly to other devices.

continued from p.5

business activities and then understand how information supports and helps implement global business strategies and competitive advantages. After reading this chapter, you should have a solid understanding of business driven information systems and their role in managerial decision making and problem solving. ■

{SECTION 1.1}
Business Driven MIS

LEARNING OUTCOMES

LO1.1 Describe the information age and the differences among data, information, business intelligence, and knowledge.

LO1.2 Explain systems thinking and how management information systems enable business communications.

COMPETING IN THE INFORMATION AGE LO1.1

Did you know that . . .

- The movie *Avatar* took more than 4 years to create and cost $450 million.
- Lady Gaga's real name is Stefani Joanne Angelina Germanotta.
- Customers pay $5.25 million for a 30-second advertising time slot during the Super Bowl.[1]

A **fact** is the confirmation or validation of an event or object. In the past, people primarily learned facts from books. Today, by simply pushing a button people can find out anything, from anywhere, at any time. We live in the **information age**, when infinite quantities of facts are widely available to anyone who can use a computer. The impact of information technology on the global business environment is equivalent to the printing press's impact on publishing and electricity's impact on productivity. College student start-ups were mostly unheard of before the information age. Now, it's not at all unusual to read about a business student starting a multimillion-dollar company from their dorm room. Think of Mark Zuckerberg, who started Facebook from his dorm, or Michael Dell (Dell Computers) and Bill Gates (Microsoft), who both founded their legendary companies as college students.

You may think only students well versed in advanced technology can compete in the information age. This is simply not true. Many business leaders have created exceptional opportunities by coupling the power of the information age with traditional business methods. Here are just a few examples:

- Amazon is not a technology company; its original business focus was to sell books.
- Netflix is not a technology company; its original business focus was to rent videos.
- Zappos is not a technology company; its primary business focus was to sell shoes.

Amazon's founder, Jeff Bezos, at first saw an opportunity to change the way people purchase books. Using the power of the information age to tailor offerings to each customer and speed the payment process, he in effect opened millions of tiny virtual bookstores, each with a vastly larger selection and far cheaper product than traditional bookstores. The success of his original business model led him to expand Amazon to carry many other types of products. The founders of Netflix and Zappos have done the same thing for movies and shoes. All these entrepreneurs were business professionals, not technology experts. However, they understood enough about the information age to apply it to a particular business, creating innovative companies that now lead entire industries. Students who understand business along with the power associated with the information age will create their own opportunities and perhaps even new industries.

Today data is being created on a scale far beyond a human's ability to process. Future business leaders must be able to collect, analyze, and evaluate massive amounts of data daily to remain competitive. Over 20 years ago, a few professors at the Massachusetts Institute of Technology (MIT) began describing the **Internet of Things (IoT)**, a world where interconnected Internet-enabled devices or "things" have the ability to collect and share data without human intervention. You might be wearing a smartwatch (IoT device) that is tracking each time your heart beats and every single calorie you burn during your day. Today devices are connecting in ways not previously thought possible, and researchers predict that over 100 billion IoT devices will be communicating by 2025 creating petabytes of data.

Another term commonly associated with the Internet of Things is **machine-to-machine (M2M)**, which refers to devices that connect directly to other devices. Just think of your smartwatch directly connecting with your smartphone. Just imagine the amount of data being sent via Wi-Fi between these devices without any human intervention. This was not even possible a few decades ago as devices didn't have enough capacity to store the massive amounts of data and Wi-Fi networks didn't exist.

IoT is transforming our world into a living information system as we control our intelligent lighting from our smartphone and

Living the DREAM

Data Bits

Have you ever wondered how your computer stores your data? The answer: Bits. A bit, which is short for *binary digit,* is the smallest unit of storage on a computer. Eight bits are equal to 1 byte. A byte is big enough to store a letter, number, space, or symbol. Each time you press a key, the computer translates the keystroke into a numerical code that takes up 1 byte of space. For example, the sentence "Your computer stores your data." uses 31 bytes of storage, with 8 bits per byte.

- One megabyte is equal to 1 million bytes
- One gigabyte is equal to 1 billion bytes
- One terabyte holds a trillion bytes

Original computer hard drives had the capacity to store only 250 megabytes of data. The first Google server had only ten 4-megabyte hard drives. Today, personal computers can save and analyze gigabytes of data. This is one of the key drivers of the technologies radically changing our world and environment. It is estimated that by 2025, every second there will be 1.7 megabytes of new data created for every person in the world. That is an unimaginable amount of data.

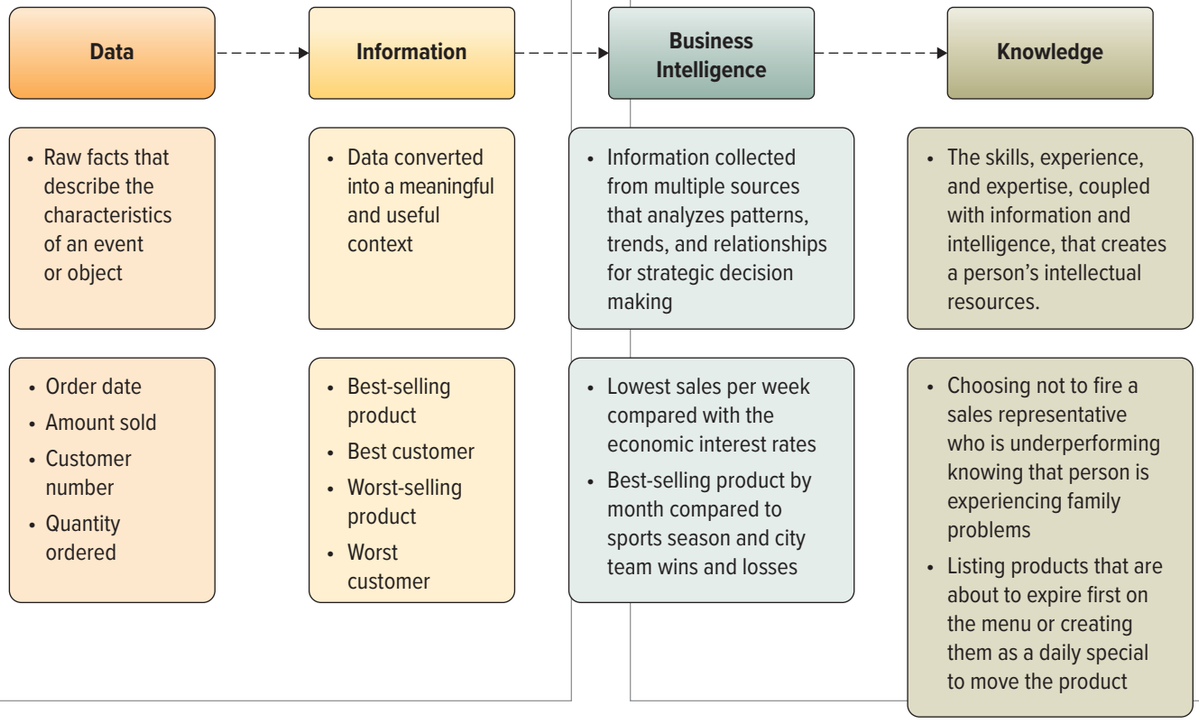
It has been stated that future business leaders must be data literate to survive and thrive in the hyper-competitive business arena. Do you agree or disagree with this statement? If you are a marketing major, how will understanding inventory data help your career? If you are a management major, how will analyzing employee data help your career? If you are a future business leader, how will analyzing competitor data help drive your business strategies? Overall, how will this course help prepare you for your future career?

perform a daily health check from our smart toilet. Of course, with all great technological advances come unexpected risks, and you have to be prepared to encounter various security issues with IoT. Just imagine if your devices were hacked by someone who now has the ability to shut off your water, take control of your car, or unlock the doors of your home from thousands of miles away. We are just beginning to understand the security issues associated with IoT and M2M, and you can be sure that sensitive data leakage from your IoT device is something you will most likely encounter in your life.

Students who understand business along with the power associated with the information age and IoT will create their own opportunities and perhaps even new industries. Realizing the value of obtaining real-time data from connected "things" will allow you to make more informed decisions, identify new opportunities, and analyze customer patterns to predict new behaviors. Our primary goal in this course is to arm you with the knowledge you need to compete in the information age. The core drivers of the information age include:

- Data
- Information
- Business intelligence
- Knowledge (see Figure 1.1)

FIGURE 1.1 The Differences among Data, Information, Business Intelligence, and Knowledge



data Raw facts that describe the characteristics of an event or object.

big data A collection of large, complex data sets, including structured and unstructured data, which cannot be analyzed using traditional database methods and tools.

structured data Data that has a defined length, type, and format and includes numbers, dates, or strings such as Customer Address.

machine-generated data Data created by a machine without human intervention.

human-generated data Data that humans, in interaction with computers, generate.

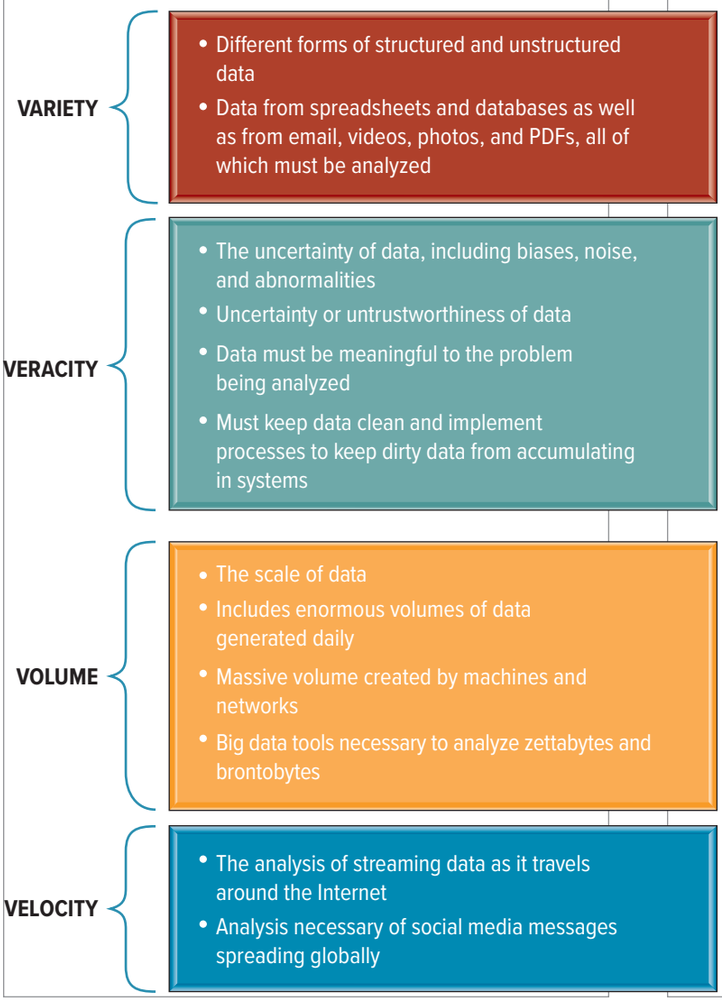
unstructured data Data that is not defined and does not follow a specified format and is typically free-form text such as emails, Twitter tweets, and text messages.

LO1.1 Describe the information age and the differences among data, information, business intelligence, and knowledge.

Data

Data are raw facts that describe the characteristics of an event or object. Before the information age, managers manually collected and analyzed data, a time-consuming and complicated task without which they would have little insight into how to run their business. Today data is your competitive advantage. Data allows you to make evidenced-based decisions to help you run your operations along with analyzing past data to make future predictions. Data-driven decisions enable savvy companies to create business strategies that increase profits, reduce risk, and optimize business processes.

FIGURE 1.2 Four Common Characteristics of Big Data



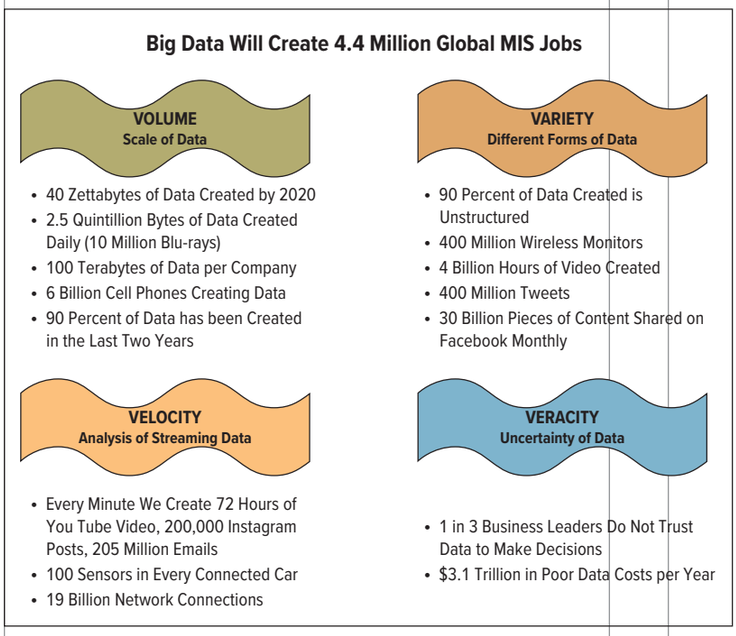
Big data is a collection of large, complex datasets, which cannot be analyzed using traditional database methods and tools. The move to big data combines business with science, research, and government activities and includes petabytes of data, which is equivalent to 20 million four-drawer file cabinets filled with text files or 13 years of HDTV content. The emergence of big data is a result of the last 50 years of technology evolution, and its four common characteristics include large data volumes, with high velocity, wide variety, and veracity. A company can now analyze petabytes of data for patterns, trends, and anomalies, gaining insights into data in new and exciting ways. The four common characteristics of big data are detailed in Figures 1.2 and 1.3.

Big data includes both structured and unstructured data. **Structured data** has a defined length, type, and format and includes numbers, dates, or strings such as Customer Address. Structured data is typically stored in a traditional system such as a relational database or spreadsheet and accounts for about 20 percent of the data that surrounds us. The sources of structured data include:

- **Machine-generated data** is created by a machine without human intervention. Machine-generated structured data includes sensor data, point-of-sale data, and web log data.
- **Human-generated data** is data that humans, in interaction with computers, generate. Human-generated structured data includes input data, clickstream data, or gaming data.

Unstructured data is not defined and does not follow a specified format and is typically free-form text such as emails, Twitter tweets, and text messages. Unstructured data accounts for about 80 percent of the data that surrounds us. The sources of unstructured data include:

FIGURE 1.3 Big Data Will Create 4.4 Million Global MIS Jobs



- **Machine-generated unstructured data**, including satellite images, scientific atmosphere data, and radar data.
- **Human-generated unstructured data**, including text messages, social media data, and emails (see Figure 1.4).

A **snapshot** is a view of data at a particular moment in time. Figure 1.5 shows sales data for Tony's Wholesale Company, a fictitious business that supplies snacks to stores. The data highlight characteristics such as order date, customer, sales representative, product, quantity, and profit. The second line in Figure 1.5, for instance, shows that Roberta Cross sold 90 boxes of Ruffles to Walmart for $1,350, resulting in a profit of $450 (note that Profit = Sales − Costs). These data are useful for understanding individual sales; however, they do not provide us much insight into how Tony's business is performing as a whole. Tony needs to answer questions that will help him manage his day-to-day operations such as:

- Who are my best customers?
- Who are my least-profitable customers?
- What is my best-selling product?
- What is my slowest-selling product?
- Who is my strongest sales representative?
- Who is my weakest sales representative?

What Tony needs, in other words, is not data but *information.*

machine-generated unstructured data Includes satellite images, scientific atmosphere data, and radar data.

human-generated unstructured data Includes text messages, social media data, and emails.

snapshot A view of data at a particular moment in time.

information Data converted into a meaningful and useful context.

FIGURE 1.4 Structured and Unstructured Data Examples

Structured Data	Unstructured Data
Sensor data	Satellite images
Weblog data	Photographic data
Financial data	Video data
Clickstream data	Social media data
Point-of-sale data	Text message
Accounting data	Voice mail data

Information

Information is data converted into a meaningful and useful context. The simple difference between data and information is that

fyi Computers Are Everywhere

A computer is a programmable machine that responds to a specific set of defined instructions. It consists of hardware (the machinery and housing for its electronics) and software (the programs that contain the data used by the computer). The hardware includes a central processing unit (CPU) that controls an operating system, which directs your inputs (keyboard, mouse), outputs (monitor or printer), memory, and storage. The first computers were enormous slow machines designed to solve complicated mathematical questions. Built in 1954, the ENIAC (Electronic Numerical Integrator and Computer) was one of the first digital computers; it weighed 30 tons and was powered by thousands of vacuum tubes, capacitors, relays, and electrical equipment. Former IBM president Tom Watson famously remarked, "I think there is a world market for maybe five computers." Clearly, the world market for computers was far more than five!

Today's computers can do almost anything from controlling the temperature in your house and driving your car, to solving advanced analytical equations, and they can be found everywhere: on our desks, in our laps, in our hands, on our wrists, and even in our eyeglasses. And there is so much more coming, including computers that learn on their own, brain–computer interfacing, and quantum computers that utilize fiber-optic technology.

Think of your life 5 years ago and list three IoT devices you use today that were not invented 5 years ago. What types of IoT devices will be introduced over the next 10 years? What types of data are your IoT devices collecting? As an organization leader, would you prefer structured data or unstructured data for your business analysis? Why?

report A document containing data organized in a table, matrix, or graphical format allowing users to easily comprehend and understand information.

static report A report created once based on data that does not change.

dynamic report A report that changes automatically during creation.

variable A data characteristic that stands for a value that changes or varies over time.

business intelligence (BI) Information collected from multiple sources such as suppliers, customers, competitors, partners, and industries that analyze patterns, trends, and relationships for strategic decision making.

FIGURE 1.5 Tony's Snack Company Data

Order Date	Customer	Sales Representative	Product	Quantity	Unit Price	Total Sales	Unit Cost	Total Cost	Profit
4-Jan	Walmart	PJ Helgoth	Doritos	41	$24	$ 984	$18	$738	$246
4-Jan	Walmart	Roberta Cross	Ruffles	90	$15	$1,350	$10	$900	$450
5-Jan	Safeway	Craig Schultz	Ruffles	27	$15	$ 405	$10	$270	$135
6-Jan	Walmart	Roberta Cross	Ruffles	67	$15	$1,005	$10	$670	$335
7-Jan	7-Eleven	Craig Schultz	Pringles	79	$12	$ 948	$ 6	$474	$474
7-Jan	Walmart	Roberta Cross	Ruffles	52	$15	$ 780	$10	$520	$260
8-Jan	Kroger	Craig Schultz	Ruffles	39	$15	$ 585	$10	$390	$195
9-Jan	Walmart	Craig Schultz	Ruffles	66	$15	$ 990	$10	$660	$330
10-Jan	Target	Craig Schultz	Ruffles	40	$15	$ 600	$10	$400	$200
11-Jan	Walmart	Craig Schultz	Ruffles	71	$15	$1,065	$10	$710	$355

computers or machines need data and humans need information. Data is a raw building block that has not been shaped, processed, or analyzed and frequently appears disorganized and unfriendly. Information gives meaning and context to analyzed data, making it insightful for humans by providing context and structure that is extremely valuable when making informed business decisions.

A **report** is a document containing data organized in a table, matrix, or graphical format allowing users to easily comprehend and understand information. Reports can cover a wide range of subjects or specific subject for a certain time period or event. A **static report** is created once based on data that does not change. Static reports can include a sales report from last year or salary report from five years ago. A **dynamic report** changes automatically during creation. Dynamic reports can include updating daily stock market prices or the calculation of available inventory.

Having the right information at the right moment in time can be worth a fortune. Having the wrong information at the right moment; or the right information at the wrong moment can be disastrous. The truth about information is that its value is only as good as the people who use it. People using the same information can make different decisions depending on how they interpret or analyze the information. Thus information has value only insofar as the people using it do as well.

Tony can analyze his sales data and turn them into information to answer all the above questions and understand how his business is operating. Figures 1.6 and 1.7, for instance, show us that Walmart is Roberta Cross's best customer and that Ruffles is Tony's best product measured in terms of total sales. Armed with this information, Tony can identify and then address such issues as weak products and underperforming sales representatives.

A **variable** is a data characteristic that stands for a value that changes or varies over time. For example, in Tony's data, price and quantity ordered can vary. Changing variables allows managers to create hypothetical scenarios to study future possibilities. Tony may find it valuable to anticipate how sales or cost increases affect profitability. To estimate how a 20 percent increase in prices might improve profits, Tony simply changes the price variable for all orders, which automatically calculates the amount of new profits. To estimate how a 10 percent increase in costs hurts profits, Tony changes the cost variable for all orders, which automatically calculates the amount of lost profits. Manipulating variables is an important tool for any business.

Business Intelligence

Business intelligence (BI) is information collected from multiple sources such as suppliers, customers, competitors, partners, and industries that analyzes patterns, trends, and relationships for strategic decision making. BI manipulates multiple variables and in some cases even hundreds of variables, including such items as interest rates, weather conditions, and even gas prices. Tony could use BI to analyze internal data, such as company sales, along with external data about the environment such as competitors, finances, weather, holidays, and even sporting events. Both internal and external variables affect snack sales, and analyzing these variables will help Tony determine ordering levels and sales forecasts. For instance, BI can predict inventory requirements for Tony's business for the week before the Super Bowl if, say, the home team is playing, the average temperature is above 80 degrees, and the stock market is performing well.

This is BI at its finest, incorporating all types of internal and external variables to anticipate business performance.

Analytics is the science of fact-based decision making. **Business analytics** is the scientific process of transforming data into insight for making better decisions. Analytics is thought of as a broader category than business analytics, encompassing the use of analytical techniques in the sciences and engineering fields as well as business. In this text, we will use the terms *analytics* and *business analytics* as synonymous. Analytics driven companies have the following characteristics:

- Use management information systems to perform rigorous analysis to a wide range of business functions from marketing to human resources.
- Senior executive teams recognize the importance of analytics and make their development and maintenance a primary focus.
- View fact-based decision making as a best practice and part of the company culture.
- Key organizational players have analytical skills.
- Use metrics as a key to monitoring and managing key business processes.
- Collect copious amounts of data from customers and suppliers.

Analytics is used for data-driven or fact-based decision making, helping managers ensure they make successful decisions. A study conducted by MIT's Sloan School of Management and the University of Pennsylvania concluded that firms guided by data-driven decision making have higher productivity and market value along with increased output and profitability. Analytics can range from simple reports to advanced optimization models (models that highlight the best course of actions). A **data scientist** extracts knowledge from data by performing

analytics The science of fact-based decision making.

business analytics The scientific process of transforming data into insight for making better decisions.

data scientist Extracts knowledge from data by performing statistical analysis, data mining, and advanced analytics on big data to identify trends, market changes, and other relevant information.

FIGURE 1.6 Tony's Data Sorted by Customer "Walmart" and Sales Representative "Roberta Cross"

Order Date	Customer	Sales Representative	Product	Quantity	Unit Price	Total Sales	Unit Cost	Total Cost	Profit
26-Apr	Walmart	Roberta Cross	Fritos	86	$ 19	$ 1,634	$ 17	$ 1,462	$ 172
29-Aug	Walmart	Roberta Cross	Fritos	76	$ 19	$ 1,444	$ 17	$ 1,292	$ 152
7-Sep	Walmart	Roberta Cross	Fritos	20	$ 19	$ 380	$ 17	$ 340	$ 40
22-Nov	Walmart	Roberta Cross	Fritos	39	$ 19	$ 741	$ 17	$ 663	$ 78
30-Dec	Walmart	Roberta Cross	Fritos	68	$ 19	$ 1,292	$ 17	$ 1,156	$ 136
7-Jul	Walmart	Roberta Cross	Pringles	79	$ 18	$ 1,422	$ 8	$ 632	$ 790
6-Aug	Walmart	Roberta Cross	Pringles	21	$ 12	$ 252	$ 6	$ 126	$ 126
2-Oct	Walmart	Roberta Cross	Pringles	60	$ 18	$ 1,080	$ 8	$ 480	$ 600
15-Nov	Walmart	Roberta Cross	Pringles	32	$ 12	$ 384	$ 6	$ 192	$ 192
21-Dec	Walmart	Roberta Cross	Pringles	92	$ 12	$ 1,104	$ 6	$ 552	$ 552
28-Feb	Walmart	Roberta Cross	Ruffles	67	$ 15	$ 1,005	$ 10	$ 670	$ 335
6-Mar	Walmart	Roberta Cross	Ruffles	8	$ 15	$ 120	$ 10	$ 80	$ 40
16-Mar	Walmart	Roberta Cross	Ruffles	68	$ 15	$ 1,020	$ 10	$ 680	$ 340
23-Apr	Walmart	Roberta Cross	Ruffles	34	$ 15	$ 510	$ 10	$ 340	$ 170
4-Aug	Walmart	Roberta Cross	Ruffles	40	$ 15	$ 600	$ 10	$ 400	$ 200
18-Aug	Walmart	Roberta Cross	Ruffles	93	$ 15	$ 1,395	$ 10	$ 930	$ 465
5-Sep	Walmart	Roberta Cross	Ruffles	41	$ 15	$ 615	$ 10	$ 410	$ 205
12-Sep	Walmart	Roberta Cross	Ruffles	8	$ 15	$ 120	$ 10	$ 80	$ 40
28-Oct	Walmart	Roberta Cross	Ruffles	50	$ 15	$ 750	$ 10	$ 500	$ 250
21-Nov	Walmart	Roberta Cross	Ruffles	79	$ 15	$ 1,185	$ 10	$ 790	$ 395
29-Jan	Walmart	Roberta Cross	Sun Chips	5	$ 22	$ 110	$ 18	$ 90	$ 20
12-Apr	Walmart	Roberta Cross	Sun Chips	85	$ 22	$ 1,870	$ 18	$ 1,530	$ 340
16-Jun	Walmart	Roberta Cross	Sun Chips	55	$ 22	$ 1,210	$ 18	$ 990	$ 220
				1,206	**$383**	**$20,243**	**$273**	**$14,385**	**$5,858**

Sorting the data reveals the information that Roberta Cross's total sales to Walmart were $20,243, resulting in a profit of $5,858. (Profit $5,858 = Sales $20,243 − Costs $14,385)

descriptive analytics Uses techniques that describe past performance and history.

predictive analytics Uses techniques that extract information from data and use it to predict future trends and identify behavioral patterns.

prescriptive analytics Uses techniques that create models indicating the best decision to make or course of action to take.

algorithms Mathematical formulas placed in software that performs an analysis on a data set.

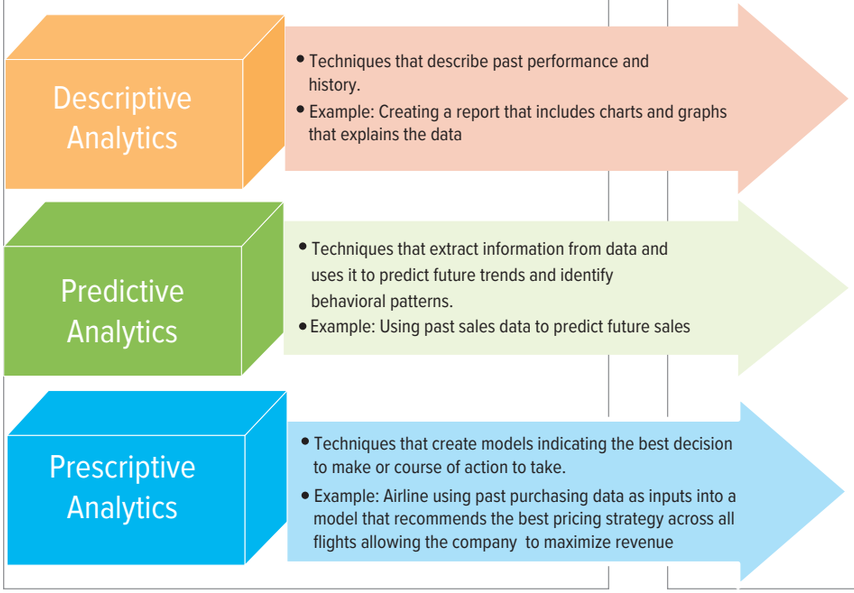
anomaly detection The process of identifying rare or unexpected items or events in a data set that do not conform to other items in the data set.

outlier Data value that is numerically distant from most of the other data points in a set of data.

FIGURE 1.7 Information Gained after Analyzing Tony's Data

Tony's Business Information	Name	Total Profit
Who is Tony's best customer by total sales?	Walmart	$ 560,789
Who is Tony's least-valuable customer by total sales?	Walgreens	$ 45,673
Who is Tony's best customer by profit?	7-Eleven	$ 324,550
Who is Tony's least-valuable customer by profit?	King Soopers	$ 23,908
What is Tony's best-selling product by total sales?	Ruffles	$ 232,500
What is Tony's weakest-selling product by total sales?	Pringles	$ 54,890
What is Tony's best-selling product by profit?	Tostitos	$ 13,050
What is Tony's weakest-selling product by profit?	Pringles	$ 23,000
Who is Tony's best sales representative by profit?	R. Cross	$1,230,980
Who is Tony's weakest sales representative by profit?	Craig Schultz	$ 98,980
What is the best sales representative's best-selling product by total profit?	Ruffles	$ 98,780
Who is the best sales representative's best customer by total profit?	Walmart	$ 345,900
What is the best sales representative's weakest-selling product by total profit?	Sun Chips	$ 45,600
Who is the best sales representative's weakest customer by total profit?	Krogers	$ 56,050

FIGURE 1.8 Three Categories of Analytics



statistical analysis, data mining, and advanced analytics on big data to identify trends, market changes, and other relevant information. The three broad categories of analytics include:

- **Descriptive analytics,** which uses techniques that describe past performance and history.
- **Predictive analytics,** which uses techniques that extract information from data to predict future trends and identify behavioral patterns.
- **Prescriptive analytics,** which uses techniques that create models indicating the best decision to make or course of action to take. Figure 1.8 displays the three broad categories of analytics.

Algorithms are mathematical formulas placed in software that performs an analysis on a dataset. Business analytics uses algorithms to derive meaning from data by finding patterns to make future predictions. **Anomaly detection** is the process of identifying rare or unexpected items or events in a dataset that do not conform to other items in the dataset. If the data you are using to perform your analysis is incorrect, then your analysis will be incorrect. One of the key advantages of performing advanced analytics is to detect anomalies in the data to ensure they are not used in models creating false results. An **outlier** is a data value that is numerically distant from most of the other data points in a dataset. Anomaly detection helps to identify outliers in the data that can cause problems with mathematical modeling. Figure 1.9 displays the techniques a data scientist will use to perform advanced data analytics.

FIGURE 1.9 Advanced Data Analytics

Analytics	Description
Behavioral analysis	Uses data about people's behaviors to understand intent and predict future actions.
Correlation analysis	Determines a statistical relationship between variables, often for the purpose of identifying predictive factors among the variables.
Exploratory data analysis	Identifies patterns in data, including outliers, uncovering the underlying structure to understand relationships between the variables.
Pattern recognition analysis	Classifies or labels an identified pattern in the machine learning process.
Social media analysis	Analyzes text flowing across the Internet, including unstructured text from blogs and messages.
Speech analysis	Analyzes recorded calls to gather information; brings structure to customer interactions and exposes information buried in customer contact center interactions with an enterprise. Speech analysis is heavily used in the customer service department to help improve processes by identifying angry customers and routing them to the appropriate customer service representative.
Text analysis	Analyzes unstructured data to find trends and patterns in words and sentences. Text mining a firm's customer support email might identify which customer service representative is best able to handle the question, allowing the system to forward it to the right person.
Web analysis	Analyzes unstructured data associated with websites to identify consumer behavior and website navigation.

Analyzing **Analytics** Categorizing Analytics

The three techniques for business analytics include descriptive analytics, predictive analytics, and prescriptive analytics. For each of the below examples, determine which analytical technique is being used.

EXAMPLE	DESCRIPTIVE ANALYTICS	PREDICTIVE ANALYTICS	PRESCRIPTIVE ANALYTICS
Which candidate will win the election?			
What price for a product will maximize profit?			
How much money do I need to save each year to have enough money for retirement?			
How many products were sold last year?			
What is the best route for the delivery person to drop off packages to minimize the time needed to deliver all the packages?			
How many Valentine's Day cards should Hallmark print to maximize expected profit?			
How will marketing affect the daily sales of a product?			
How can a company minimize the cost of shipping products from plants to customers?			
What team will win the Super Bowl?			
How can I schedule my workforce to minimize operating costs?			
What was the average purchase price for new customers last year?			
How will the placement of a product in a store determine product sales?			
How many customers do we have and where are they located?			

knowledge Skills, experience, and expertise coupled with information and intelligence that creates a person's intellectual resources.

knowledge worker Individuals valued for their ability to interpret and analyze information.

knowledge assets The human, structural, and recorded resources available to the organization.

knowledge facilitators Help harness the wealth of knowledge in the organization.

business unit A segment of a company (such as accounting, production, marketing) representing a specific business function.

Knowledge

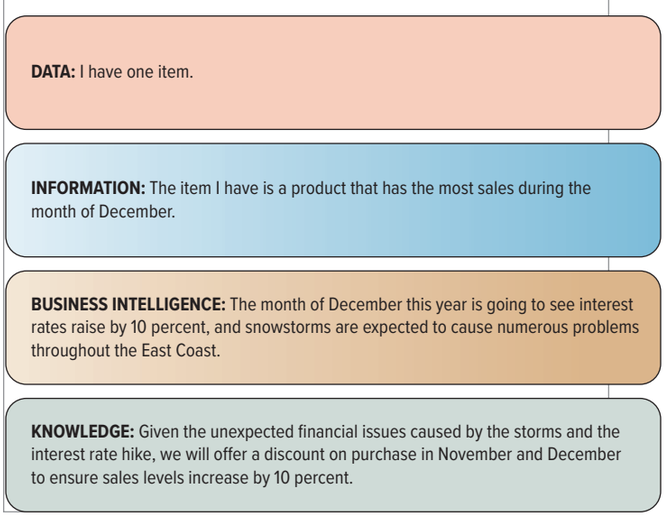
Knowledge includes the skills, experience, and expertise, coupled with information and intelligence, that creates a person's intellectual resources. **Knowledge workers** are individuals valued for their ability to interpret and analyze information. Today's workers are commonly referred to as knowledge workers, and they use BI along with personal experience to make decisions based on both information and intuition, a valuable resource for any company.

Knowledge assets, also called *intellectual capital,* are the human, structural, and recorded resources available to the organization. Knowledge assets reside within the minds of members, customers, and colleagues, and include physical structures and recorded media. **Knowledge facilitators** help harness the wealth of knowledge in the organization. Knowledge facilitators help acquire and catalog the knowledge assets in an organization.

Imagine that Tony analyzes his data and finds his weakest sales representative for this period is Craig Schultz. If Tony considered only this information, he might conclude that firing Craig was a good business decision. However, because Tony has knowledge about how the company operates, he knows Craig has been out on medical leave for several weeks; hence, his sales numbers are low. Without this additional knowledge, Tony might have executed a bad business decision, delivered a negative message to the other employees, and sent his best sales representatives out to look for other jobs.

The key point in this scenario is that it is simply impossible to collect all the information about every situation, and yet without that, it can be easy to misunderstand the problem. Using data, information, business intelligence, *and* knowledge to make decisions and solve problems is the key to finding success in business. These core drivers of the information age are the building blocks of business systems. Figure 1.10 offers a few different examples of data through knowledge.

FIGURE 1.10 Transformation from Data to Knowledge



SYSTEMS THINKING AND MANAGEMENT INFORMATION SYSTEMS LO1.2

A **business unit** is a segment of a company (such as accounting, production, marketing) representing a specific business function. The terms *department, functional area,* and *business unit* are used interchangeably, and corporations are typically organized by business unit such as:

- **Accounting:** Records, measures, and reports monetary transactions.
- **Finance:** Deals with strategic financial issues, including money, banking, credit, investments, and assets.
- **Human resources:** Maintains policies, plans, and procedures for the effective management of employees.
- **Marketing:** Supports sales by planning, pricing, and promoting goods or services.
- **Operations management:** Manages the process of converting or transforming or resources into goods or services.
- **Sales:** Performs the function of selling goods or services (see Figure 1.11).

An **information silo** occurs when one business unit is unable to freely communicate with other business units, making it difficult or impossible for organizations to work cross-functionally. Information silos exist because management does not believe there is enough benefit from sharing information across business units and because information might not be useful to personnel in other business units. Figure 1.11 provides an example of how an organization operates functionally, causing information silos as each department performs its own activities. Sales and marketing focus on moving goods or services into the hands of consumers; they maintain transactional data. Finance and accounting focus on managing the company's resources and maintain monetary data. Operations management focuses on manufacturing and maintains production data, while human resources focuses on hiring and training people and maintains employee data. Although each department has its own focus and data, none can work independently if the company is to operate as a whole.

It is easy to see how a business decision made by one department can affect other departments. Marketing needs to analyze production and sales data to come up with product promotions and advertising strategies. Production needs to understand sales forecasts to determine the company's manufacturing needs. Sales needs to rely on information from operations to understand inventory, place orders, and forecast consumer demand. All departments need to understand the accounting and finance departments' information for budgeting. For the firm to be successful, all departments must work together as a single unit sharing common information and not operate independently or in a silo (see Figure 1.12).

information silo
Occurs when one business unit is unable to freely communicate with other business units, making it difficult or impossible for organizations to work cross-functionally.

The MIS Solution

You probably recall the old story of three blind men attempting to describe an elephant. The first man, feeling the elephant's girth, said the elephant seemed very much like a wall.

FIGURE 1.11 Departments Working Independently

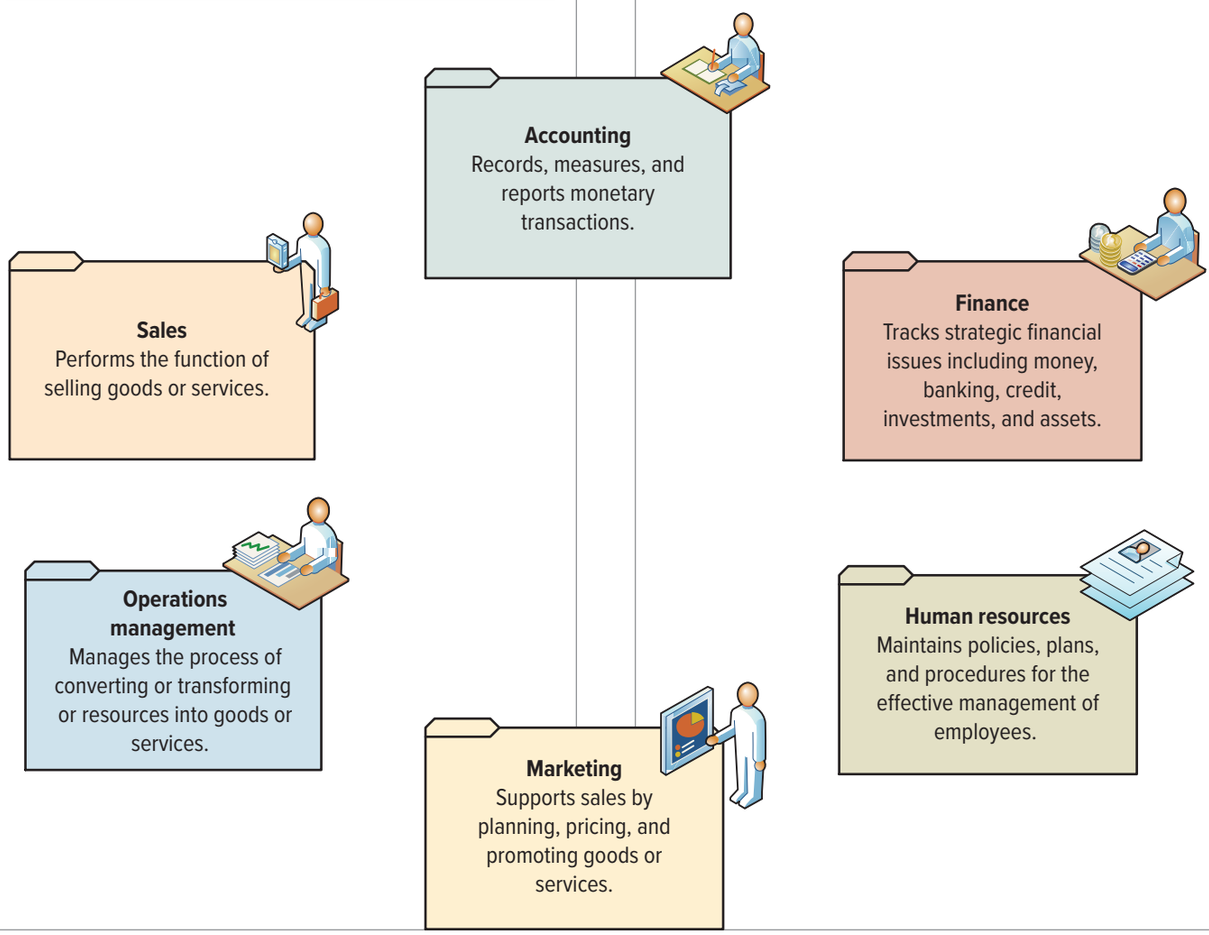
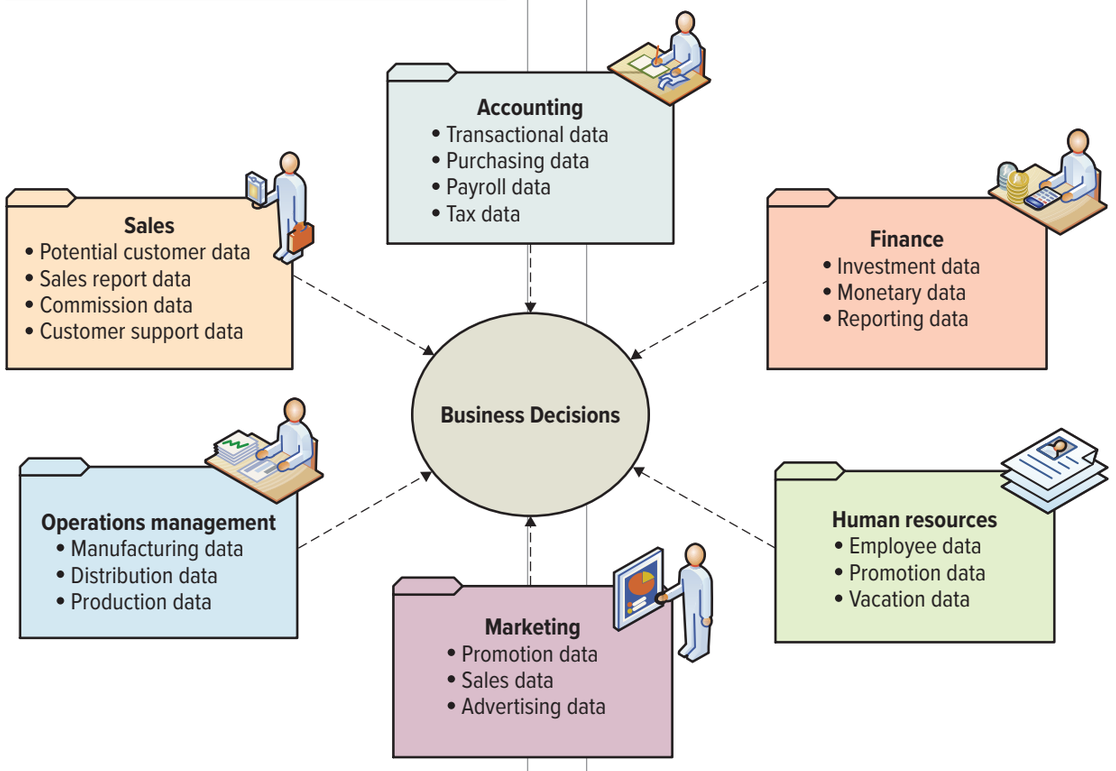


FIGURE 1.12 Departments Working Together



BUSTED

The Internet of Things Is Wide Open—for Everyone!

IoT is transforming our world into a living information system as we control our intelligent lighting from our smartphone and perform a daily health check from our smart toilet. Of course, with all great technological advances come unexpected risks, and you have to be prepared to encounter various security issues with IoT. Just imagine if your devices were hacked by someone who now can shut off your water, take control of your car, or unlock the doors of your home from thousands of miles away. We are just beginning to understand the security issues associated with IoT and M2M, and you can be sure that sensitive data leakage from your IoT device is something you will most likely encounter in your life.[2]

In a group, identify a few IoT devices you are using today. These can include iWatch, fitness trackers that report to your iPhone, sports equipment that provides immediate feedback to an app, or even smart vacuum cleaners. If you are not using any IoT devices today, brainstorm a few you might purchase in the future. How could a criminal or hacker use your IoT to steal your sensitive data? What potential problems or issues could you experience from these types of illegal data thefts? What might be some of the signs that someone had accessed your IoT data illegally? What could you do to protect the data in your device?

The second, feeling the elephant's trunk, declared the elephant was like a snake. The third man felt the elephant's tusks and said the elephant was like a tree or a cane. Companies that operate departmentally are seeing only one part of the elephant, a critical mistake that hinders successful operation.

One of the biggest obstacles to data-driven decision making is not technology or even human skills but gaining access to the data in the first place. Intelligent people find new uses for data analysis every day. Still, despite the explosion of interest in the data collected by just about every area of business—from financial companies and health care firms to management consultancies and the government—many organizations continue to relegate data analysis knowledge to a small number of employees. That is a huge mistake and in the long run can lead to business failure. Think of it this way: A company does not expect every employee to be a professional writer, yet all employees are expected to communicate via writing. So why does a company expect only professional data analysts to understand and analyze data when all employees need data to make data-driven decisions to perform their jobs effectively?

data democratization The ability for data to be collected, analyzed, and accessible to all users (the average end user).

system A collection of parts that link to achieve a common purpose.

goods Material items or products that customers will buy to satisfy a want or need. Clothing, groceries, cell phones, and cars are all examples of goods that people buy to fulfill their needs.

services Tasks that customers will buy to satisfy a want or need.

production The process where a business takes raw materials and processes them or converts them into a finished product for its goods or services.

FIGURE 1.13 Data Democratization Example through an Organization

Business Function	Data Analysis Business Improvement	Example
Customer Service	Identify and classify customers for marketing opportunities to retain customer loyalty	Harrah's, Capital One
Human Resources	Identify the best employee for specific tasks or jobs based on compensation levels	New England Patriots, Oakland A's
Operations Management	Detect quality problems early and address immediately before problems arise	Intel, Boeing
Sales and Marketing	Identify the optimal price for a product or service that maximizes profit	Progressive, Marriott
Supply Chain	Evaluate the supply chain to reduce inventory and cut costs while simultaneously ensuring product availability	Dell, Walmart, Amazon

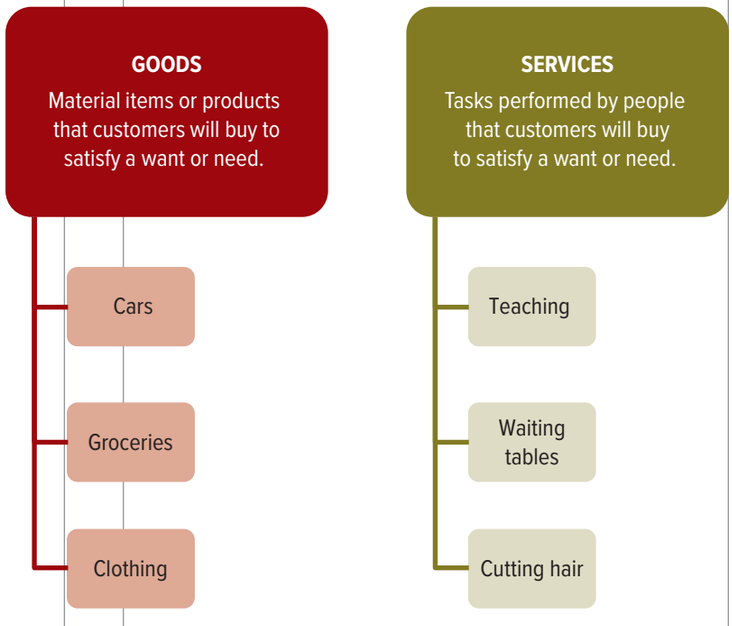
Data democratization is the ability for data to be collected, analyzed, and accessible to all users (the average end user). The goal of data democratization is to allow all employees the ability to collect and analyze data without requiring outside help, for example from a professional data analyst. This allows analytics to become a part of the organization's overall competitive strategy by pushing it down to decision makers at every organizational level. Arming employees with the best facts and evidence for making decisions, big and small, is a huge competitive advantage! Figure 1.13 displays different ways employees are using data to drive fact-based business decisions.

Systems Thinking

Successful companies operate cross-functionally, integrating the operations of all departments. Systems are the primary enabler of cross-functional operations. A **system** is a collection of parts that link to achieve a common purpose. A car is a good example of a system, since removing a part, such as the steering wheel or accelerator, causes the entire system to stop working.

Before jumping into how systems work, it is important to have a solid understanding of the basic production process for goods and services. **Goods** are material items or products that customers will buy to satisfy a want or need. Clothing, groceries, cell phones, and cars are all examples of goods that people buy to fulfill their needs. **Services** are tasks performed by people that customers will buy to satisfy a want or need. Waiting tables, teaching, and cutting hair are all examples of services that people pay for to fulfill their needs (see Figure 1.14).

FIGURE 1.14 Different Types of Goods and Services



Production is the process where a business takes raw materials and processes them or converts them into a finished product for its goods or services. Just think about making a hamburger (see Figure 1.15). First, you must gather all of the *inputs* or raw materials such as the bun, patty, lettuce, tomato, and ketchup. Second, you *process* the raw materials, so in this example, you would need to cook the patty, wash and chop the lettuce and tomato, and place all of the items in the bun. Finally, you would have

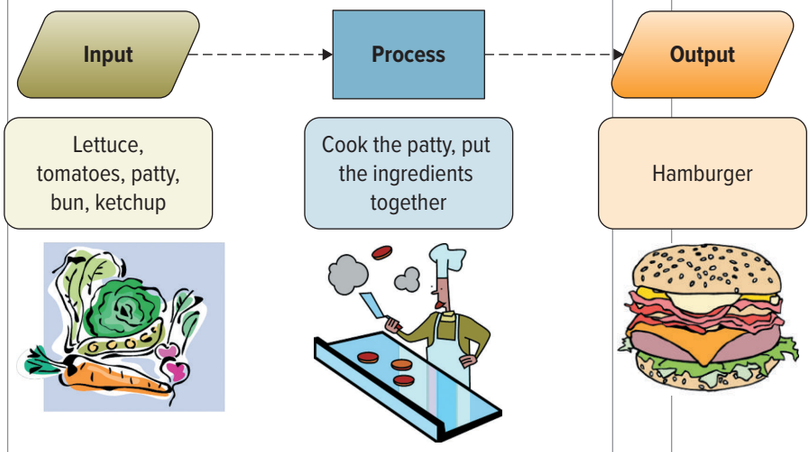
productivity The rate at which goods and services are produced based upon total output given total inputs.

systems thinking A way of monitoring the entire system by viewing multiple inputs being processed or transformed to produce outputs while continuously gathering feedback on each part.

feedback Information that returns to its original transmitter (input, transform, or output) and modifies the transmitter's actions.

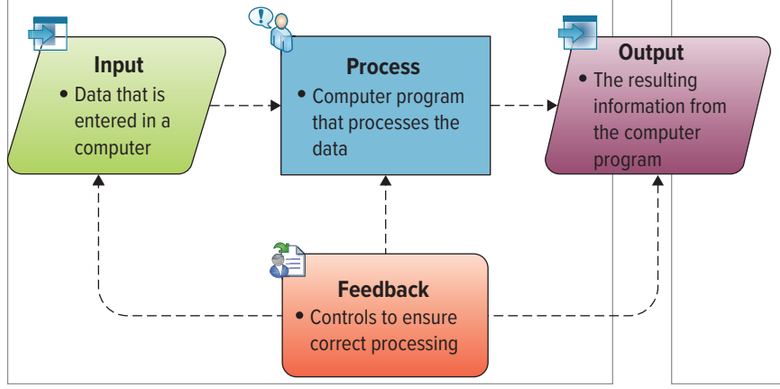
management information systems A business function, like accounting and human resources, which moves information about people, products, and processes across the company to facilitate decision making and problem solving.

FIGURE 1.15 Input, Process, Output Example



your *output* or finished product—your hamburger! **Productivity** is the rate at which goods and services are produced based upon total output given total inputs. Given our previous example, if a business could produce the same hamburger with less expensive inputs or more hamburgers with the same inputs, it would see a rise in productivity and possibly an increase in profits. Ensuring the input, process, and output of goods and services work across all of the departments of a company is where systems add tremendous value to overall business productivity.

FIGURE 1.16 Overview of Systems Thinking



Systems thinking is a way of monitoring the entire system by viewing multiple inputs being processed or transformed to produce outputs while continuously gathering feedback on each part (see Figure 1.16). **Feedback** is information that returns to its original transmitter (input, transform, or output) and modifies the transmitter's actions. Feedback helps the system maintain stability. For example, a car's system continuously monitors the fuel level and turns on a warning light if the gas level is too low. Systems thinking provides an end-to-end view of how operations work together to create a product or service. Business students who understand systems thinking are valuable resources because they can implement solutions that consider the entire process, not just a single component.

Management information systems (MIS) is a business function, like accounting and human resources, which moves information about people, products, and processes across the company to facilitate decision making and problem solving. MIS incorporates systems thinking to help companies operate cross-functionally. For example, to fulfill product orders, an MIS for sales moves a single customer order across all functional areas including sales, order fulfillment, shipping, billing, and finally customer service. Although different functional areas handle different parts of the sale, thanks to MIS, to the customer the sale is one continuous process. If one part of the company is experiencing problems, however, then, like the car without a steering wheel, the entire system fails. If order fulfillment packages the wrong product, it will not matter that shipping, billing, and customer service did their jobs right, since the customer will not be satisfied when he or she opens the package.

MIS can be an important enabler of business success and innovation. This is not to say that MIS *equals* business success and innovation or that MIS *represents* business success and innovation. MIS is a tool that is most valuable when it leverages the talents of people who know how to use and manage it effectively. To perform the MIS function effectively, almost all companies,

chief information officer (CIO) Responsible for (1) overseeing all uses of MIS and (2) ensuring that MIS strategically aligns with business goals and objectives.

chief data officer (CDO) Responsible for determining the types of information the enterprise will capture, retain, analyze, and share.

chief technology officer (CTO) Responsible for ensuring the throughput, speed, accuracy, availability, and reliability of an organization's MIS.

chief security officer (CSO) Responsible for ensuring the security of MIS systems and developing strategies and MIS safeguards against attacks from hackers and viruses.

chief privacy officer (CPO) Responsible for ensuring the ethical and legal use of information within a company.

particularly large and medium-sized ones, have an internal MIS department, often called information technology (IT), information systems (IS), or management information systems (MIS). For the purpose of this text, we will refer to it as MIS.

MIS Department Roles and Responsibilities

Management information systems is a relatively new functional area, having been around formally in most organizations only for about 40 years. Job titles, roles, and responsibilities often differ dramatically from organization to organization. Nonetheless, clear trends are developing toward elevating some MIS positions within an organization to the strategic level.

Most organizations maintain positions such as chief executive officer (CEO), chief financial officer (CFO), and chief operations officer (COO) at the strategic level. Recently there are more MIS-related strategic positions such as chief information officer (CIO), chief data officer (CDO), chief technology officer (CTO), chief security officer (CSO), chief privacy officer (CPO), and chief knowledge officer (CKO). See Figure 1.17.

The **chief information officer (CIO)** is responsible for (1) overseeing all uses of MIS and (2) ensuring the strategic alignment of MIS with business goals and objectives. The CIO often reports directly to the CEO. CIOs must possess a solid and detailed understanding of every aspect of an organization, coupled with tremendous insight into the capability of MIS. Broad functions of a CIO include:

1. *Manager*—ensure the delivery of all MIS projects on time and within budget.
2. *Leader*—ensure the strategic vision of MIS is in line with the strategic vision of the organization.
3. *Communicator*—advocate and communicate the MIS strategy by building and maintaining strong executive relationships.

The **chief data officer (CDO)** is responsible for determining the types of information the enterprise will capture, retain, analyze, and share. The difference between the CIO and CDO is that the CIO is responsible for the *information systems* through which data is stored and processed, whereas the CDO is responsible for the *data,* regardless of the information system.

The **chief technology officer (CTO)** is responsible for ensuring the throughput, speed, accuracy, availability, and reliability of an organization's MIS. CTOs are similar to CIOs, except that CIOs take on the additional responsibility for effectiveness of ensuring that MIS is aligned with the organization's strategic initiatives. CTOs have direct responsibility for ensuring the *efficiency* of MIS systems throughout the organization. Most CTOs possess well-rounded knowledge of all aspects of MIS, including hardware, software, and telecommunications.

The **chief security officer (CSO)** is responsible for ensuring the security of MIS systems and developing strategies and MIS safeguards against attacks from hackers and viruses. The role of a CSO has been elevated in recent years because of the number of attacks from hackers and viruses. Most CSOs possess detailed knowledge of networks and telecommunications because hackers and viruses usually find their way into MIS systems through networked computers.

The **chief privacy officer (CPO)** is responsible for ensuring the ethical and legal use of information within an organization. CPOs are the newest senior executive position in MIS. Recently,

show me *the* MONEY

Is Technology Making Us Dumber or Smarter?

Choose a side and debate the following:

- **Side A** Living in the information age has made us smarter because we have a huge wealth of knowledge at our fingertips whenever or wherever we need it.
- **Side B** Living in the information age has caused people to become lazy and dumber because they are no longer building up their memory banks to solve problems; machines give them the answers they need to solve problems.

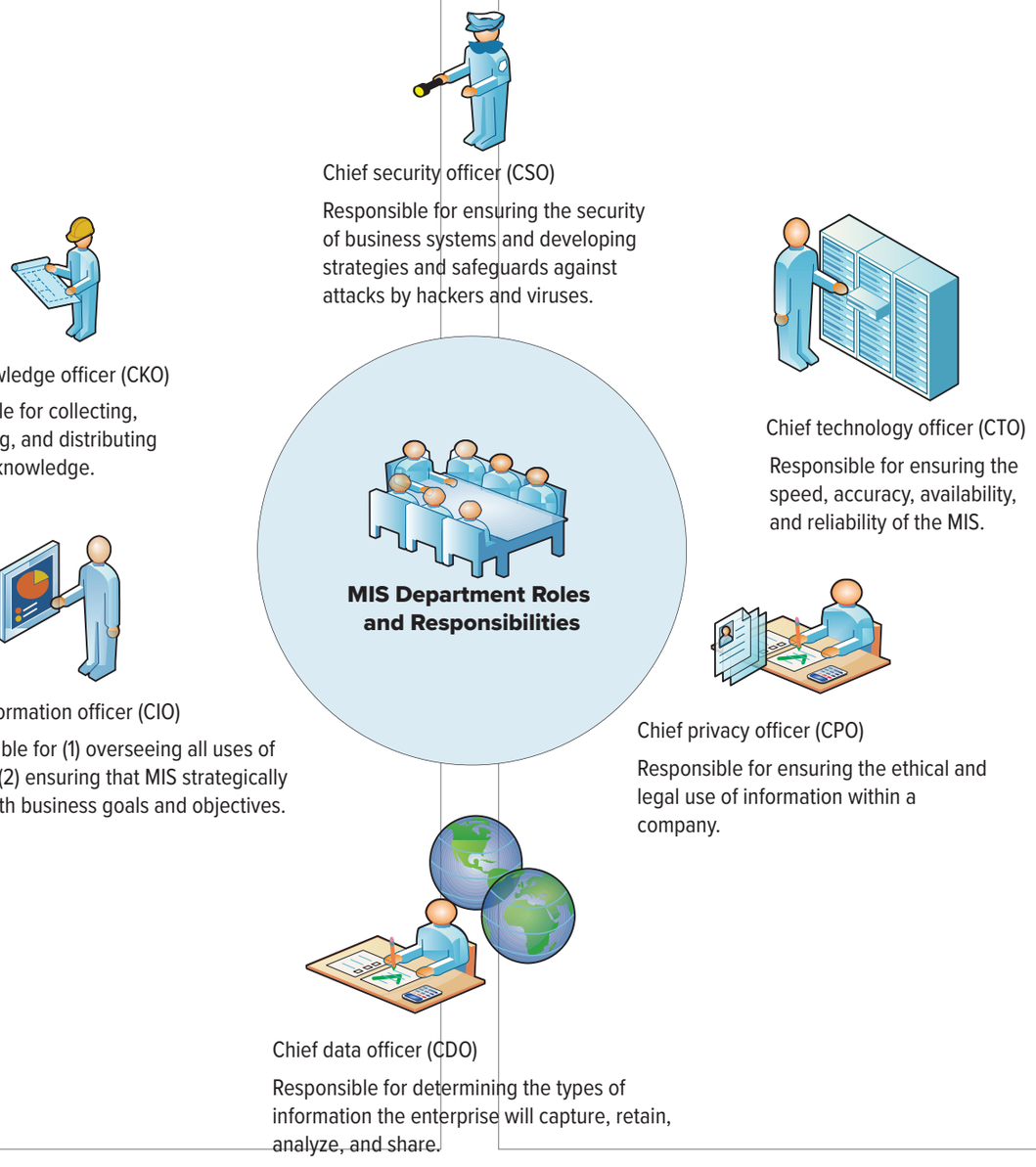
chief knowledge officer (CKO)
Responsible for collecting, maintaining, and distributing company knowledge.

150 of the *Fortune* 500 companies added the CPO position to their list of senior executives. Many CPOs are lawyers by training, enabling them to understand the often complex legal issues surrounding the use of information.

The **chief knowledge officer (CKO)** is responsible for collecting, maintaining, and distributing the organization's knowledge. The CKO designs programs and systems that make it easy for people to reuse knowledge. These systems create repositories of organizational documents, methodologies, tools, and practices, and they establish methods for filtering the information. The CKO must continuously encourage employee contributions to keep the systems up-to-date. The CKO can contribute directly to the organization's bottom line by reducing the learning curve for new employees or employees taking on new roles.

All the above MIS positions and responsibilities are critical to an organization's success. While many organizations may not have a different individual for each of these positions, they must

FIGURE 1.17 The Roles and Responsibilities of MIS



chief automation officer Determines if a person or business process can be replaced by a robot or software.

chief intellectual property officer Manage and defend intellectual property, copyrights, and patents.

chief sustainability officer Oversees the corporation's "environmental" programs such as helping adapt to climate change and reducing carbon emissions.

chief user experience officer Create the optimal relationship between user and technology.

MIS skills gap The difference between existing MIS workplace knowledge and the knowledge required to fulfill the business goals and strategies.

have leaders taking responsibility for all these areas of concern. The individuals responsible for enterprisewide MIS and MIS-related issues must provide guidance and support to the organization's employees. According to *Fast Company* magazine, a few executive levels you might see created over the next decade include:

- **Chief automation officer** will determine if a person or business process can be replaced by a robot or software. As we continue to automate jobs, a member of the core leadership team of the future will be put in charge of identifying opportunities for companies to become more competitive through automation.
- **Chief intellectual property officer** will manage and defend intellectual property, copyrights, and patents. The world of intellectual property law is vast and complicated as new innovations continually enter the market. Companies in the near future will need a core leadership team member who can not only wade through the dizzying sea of intellectual property laws and patents to ensure their company's compliance but also remain vigilant to protect their company against infringement.
- **Chief sustainability officer** will oversee the corporation's "environmental" programs, such as helping adapt to climate change and reducing carbon emissions.
- **Chief user experience officer** will create the optimal relationship between user and technology. User experience used to be an afterthought for hardware and software designers. Now that bulky instruction manuals are largely (and thankfully) a thing of the past, technology companies need to ensure that their products are intuitive from the moment they are activated.

MIS skills gap is the difference between existing MIS workplace knowledge and the knowledge required to fulfill the business goals and strategies. Closing the MIS skills gap by aligning the current workforce with potential future business needs is a complicated proposition. Today, employers often struggle to locate and retain qualified MIS talent, especially individuals with application development, information security, and data analysis skills.

Common approaches to closing an MIS skills gap include social recruiting, off-site training, mentoring services, and partnerships with universities. In many instances, an MIS job will remain unfilled for an extended period of time when an employer needs to hire someone who has a very specific set of skills. In recruiting lingo, such candidates are referred to as purple squirrels. Because squirrels in the real world are not often purple, the implication is that finding the perfect job candidate with exactly the right qualifications, education, and salary expectations can be a daunting—if not impossible—task.

LO1.2 Explain systems thinking and how management information systems enable business communications.

Due Diligence //:
Data Analysis Gone Wrong

Can you imagine receiving an ad from Target informing you that your teenage daughter was pregnant? Yes, this actually happened a few years ago when Target sent an unsuspecting father discount coupons for cribs and baby clothes for his teenage daughter who had not told anyone she was pregnant. This incident set off a flurry of outrage and privacy concerns over Target's data analysis practices.

Andrew Pole, statistician for Target, explained how big data helped analyze customers' purchases to determine pregnancy. Target analyzes its data using a unique ID linked to a customer's credit card, name, and purchases to look for patterns (e.g., a woman buying prenatal vitamins) to then send them special deals and coupons for baby items. When Target's data analysis system analyzed customer purchase data based on 25 products that pregnant women frequently buy, it could assign a pregnancy prediction score to each shopper and estimate her due date so Target could send her relevant coupons for various stages of her pregnancy. After massive customer outrage over privacy concerns, Target began mixing customized coupons by offering a coffee maker with a crib or coupons for baby clothes with wine glasses, so someone reviewing the coupons could not determine anything about the customer.

There is no doubt that some companies' data analysis practices feel more like stalking than strategic business moves. How would you feel if you received coupons indicating someone in your family or household was pregnant or sick? How does a company determine if its data analysis practices are crossing the line of data privacy? Do you agree it was a good idea for Target to mix coupons to help ensure customer privacy?

business strategy A leadership plan that achieves a specific set of goals or objectives such as increasing sales, decreasing costs, entering new markets, or developing new products or services.

stakeholder A person or group that has an interest or concern in an organization.

competitive advantage A feature of a product or service on which customers place a greater value than on similar offerings from competitors.

first-mover advantage An advantage that occurs when a company can significantly increase its market share by being first to market with a competitive advantage.

{SECTION 1.2}
Business Strategy

LEARNING OUTCOMES

LO1.3 Explain why competitive advantages are typically temporary.

LO1.4 Identify the four key areas of a SWOT analysis.

LO1.5 Describe Porter's Five Forces Model and explain each of the five forces.

LO1.6 Compare Porter's three generic strategies.

LO1.7 Demonstrate how a company can add value by using Porter's value chain analysis.

IDENTIFYING COMPETITIVE ADVANTAGES LO1.3

Running a company today is similar to leading an army; the top manager or leader ensures all participants are heading in the right direction and completing their goals and objectives. Companies lacking leadership quickly implode as employees head in different directions attempting to achieve conflicting goals. To combat these challenges, leaders communicate and execute business strategies (from the Greek words *stratus* for army and *ago* for leading).

A **business strategy** is a leadership plan that achieves a specific set of goals or objectives such as increasing sales, decreasing costs, entering new markets, or developing new products or services. A **stakeholder** is a person or group that has an interest or concern in an organization. Stakeholders drive business strategies, and depending on the stakeholder's perspective, the business strategy can change. It is not uncommon to find stakeholders' business strategies have conflicting interests, such as investors looking to increase profits by eliminating jobs. Figure 1.18 displays the different stakeholders found in an organization and their common business interests.

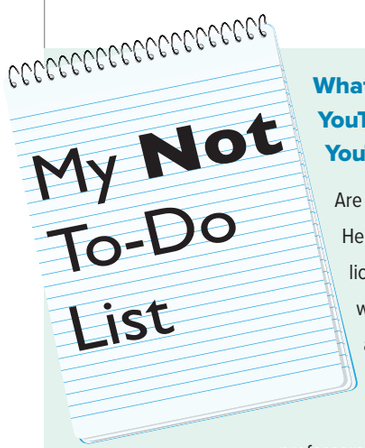
Good leaders also anticipate unexpected misfortunes, from strikes and economic recessions to natural disasters. Their business strategies build in buffers or slack, allowing the company the ability to ride out any storm and defend against competitive or environmental threats. Of course, updating business strategies is a continuous undertaking as internal and external environments rapidly change. Business strategies that match core company competencies to opportunities result in competitive advantages, a key to success!

A **competitive advantage** is a feature of a product or service on which customers place a greater value than they do on similar offerings from competitors. Competitive advantages provide the same product or service either at a lower price or with additional value that can fetch premium prices. Unfortunately, competitive advantages are typically temporary because competitors often quickly seek ways to duplicate them. In turn, organizations must develop a strategy based on a new competitive advantage. Ways that companies duplicate competitive advantages include acquiring the new technology, copying the business operations, and hiring away key employees. The introduction of Apple's iPod and iTunes, a brilliant merger of technology, business, and entertainment, offers an excellent example.

In early 2000, Steve Jobs was fixated on developing video editing software when he suddenly realized that millions of people were using computers to listen to music, a new trend in the industry catapulted by illegal online services such as Napster. Jobs was worried that he was looking in the wrong direction and had missed the opportunity to jump on the online music bandwagon. He moved fast, however, and within 4 months, he had developed the first version of iTunes for the Mac. Jobs' next challenge was to make a portable iTunes player that could hold thousands of songs and be completely transportable. Within 9 months, the iPod was born. With the combination of iTunes and iPod, Apple created a significant competitive advantage in the marketplace. Many firms began following Apple's lead by creating portable music players to compete with the iPod. In addition, Apple continues to create new and exciting products to gain competitive advantages, such as its iPad, a larger version of the iPod that functions more as a computer than a music player.

When a company is the first to market with a competitive advantage, it gains a particular benefit, such as Apple did with its iPod. This **first-mover advantage** occurs when a company can significantly increase its market share by being first with a new competitive advantage. FedEx created a first-mover advantage by developing its customer self-service software, which allows people to request parcel pickups, print mailing slips, and track parcels online. Other parcel delivery companies quickly began creating their own online services. Today, customer self-service on the Internet is a standard feature of the parcel delivery business.

FIGURE 1.18 Stakeholders' Interests



What Happens on YouTube Stays on YouTube—FOREVER[3]

Are you looking for great career advice? Here it is: **Never** post anything on publicly accessible websites that you would not feel comfortable showing a recruiter or hiring manager. This includes inappropriate photos; negative comments about jobs, professors, or people; and evidence of binge drinking at a holiday party. Future employers will google you!

The bad news: You have to continue to keep your cyber profile squeaky clean for the rest of your life. Companies can and will fire you for inappropriate website postings. One interesting story occurred when two employees created a private, password-protected group on Facebook where they would complain about their jobs, post derogatory comments about their managers, and highlight new, top-secret product information. The managers, being computer savvy, obtained the password and immediately fired the two individuals after reviewing the site. Now one of the individuals is suing the former managers for invasion of privacy.

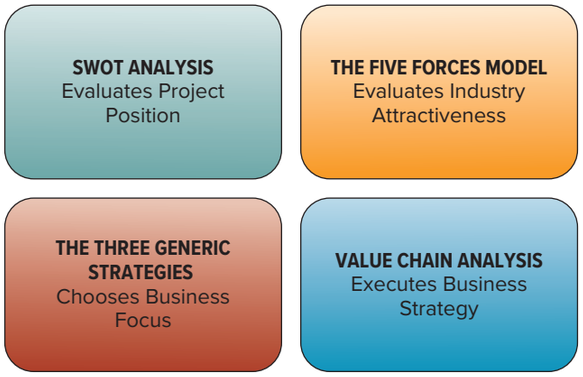
Do you agree that if you post something online it is open for the world to see? What do you consider is inappropriate material that you should never post to the web? What can you do to remove inappropriate material posted to the web by a friend that identifies you? How do efficiency and effectiveness enter into this scenario? What is the potential argument each of these sides might use in order to win the lawsuit?

competitive intelligence The process of gathering information about the competitive environment, including competitors' plans, activities, and products, to improve a company's ability to succeed.

SWOT analysis Evaluates an organization's strengths, weaknesses, opportunities, and threats to identify significant influences that work for or against business strategies.

Competitive intelligence is the process of gathering information about the competitive environment, including competitors' plans, activities, and products, to improve a company's ability to succeed. It means understanding and learning as much as possible as soon as possible about what is occurring outside the company to remain competitive. Frito-Lay, a premier provider of snack foods such as Cracker Jacks and Cheetos, does not send its sales representatives into grocery stores just to stock shelves; they carry handheld computers and record the product offerings, inventory, and even product locations of competitors. Frito-Lay uses this information to gain competitive intelligence on everything from how well competing products are selling to the strategic placement of its own products. Managers use four common tools to analyze competitive intelligence and develop competitive advantages as displayed in Figure 1.19.

FIGURE 1.19 Business Tools for Analyzing Business Strategies



LO1.3 Explain why competitive advantages are temporary.

FOUR KEY AREAS OF A SWOT ANALYSIS LO1.4

A **SWOT analysis** evaluates an organization's strengths, weaknesses, opportunities, and threats to identify significant influences that work for or against business strategies (see Figure 1.20).

FIGURE 1.20 Sample SWOT Analysis

Strengths and weaknesses originate inside an organization, or internally. Opportunities and threats originate outside an organization, or externally, and cannot always be anticipated or controlled.

- **Potential Internal Strengths (Helpful):** Identify all key strengths associated with the competitive advantage, including cost advantages, new and/or innovative services, special expertise and/or experience, proven market leader, and improved marketing campaigns.
- **Potential Internal Weaknesses (Harmful):** Identify all key areas that require improvement. Weaknesses focus on the absence of certain strengths, including absence of an Internet marketing plan, damaged reputation, problem areas for service, and outdated technology.
- **Potential External Opportunities (Helpful):** Identify all significant trends along with how the organization can benefit from each, including new markets, additional customer groups, legal changes, innovative technologies, population changes, and competitor issues.
- **Potential External Threats (Harmful):** Identify all threats or risks detrimental to your organization, including new market entrants, substitute products, employee turnover, differentiating products, shrinking markets, adverse changes in regulations, and economic shifts.

LO1.4 Identify the four key areas of a SWOT analysis.

THE FIVE FORCES MODEL—EVALUATING INDUSTRY ATTRACTIVENESS LO1.5

Michael Porter, a professor at Harvard Business School, identified the following pressures that can hurt potential sales:

- Knowledgeable customers can force down prices by pitting rivals against each other.
- Influential suppliers can drive down profits by charging higher prices for supplies.
- Competition can steal customers.
- New market entrants can steal potential investment capital.
- Substitute products can steal customers.

Formally defined, **Porter's Five Forces Model** analyzes the competitive forces within the environment in which a company operates to assess the potential for profitability in an industry. Its purpose is to combat these competitive forces by identifying opportunities, competitive advantages, and competitive intelligence. If the forces are strong, they increase competition; if the forces are weak, they decrease competition. This section details each of the forces and its associated MIS business strategy (see Figure 1.21).[4]

LO1.5 Describe Porter's Five Forces Model and explain each of the five forces.

Porter's Five Forces Model A model for analyzing the competitive forces within the environment in which a company operates, to assess the potential for profitability in an industry.

Buyer power The ability of buyers to affect the price they must pay for an item.

Buyer Power

Buyer power is the ability of buyers to affect the price they must pay for an item. Factors used to assess buyer power

show me *the* MONEY

SWOT Your Student

What is your dream job? Do you have the right skills and abilities to land the job of your dreams? If not, do you have a plan to acquire those sought-after skills and abilities? Do you have a personal career plan or strategy? Just like a business, you can perform a personal SWOT analysis to ensure your career plan will be successful. You want to know your strengths and recognize career opportunities while mitigating your weaknesses and any threats that can potentially derail your career plans. A key area in which many people struggle is technology, and without the right technical skills, you might find you are not qualified for your dream job. One of the great benefits of this course is its ability to help you prepare for a career in business by understanding the key role technology plays in the different industries and functional areas. Regardless of your major, you will all use business driven information systems to complete the tasks and assignments associated with your career.

Perform a personal SWOT analysis for your career plan based on your current skills, talents, and knowledge. Be sure to focus on your personal career goals, including the functional business area in which you want to work and the potential industry you are targeting, such as health care, telecommunications, retail, or travel.

After completing your personal SWOT analysis, take a look at the table of contents in this text and determine whether this course will eliminate any of your weaknesses or create new strengths. Determine whether you can find new opportunities or mitigate threats based on the material we cover over the next several weeks. For example, Chapter 9 covers project management in detail—a key skill for any business professional who must run a team. Learning how to assign and track work status will be a key tool for any new business professional. Where would you place this great skill in your SWOT analysis? Did it help eliminate any of your weaknesses? When you have finished this exercise, compare your SWOT with those of your peers to see what kind of competition you will encounter when you enter the workforce.

PERSONAL CAREER SWOT ANALYSIS

STRENGTHS	WEAKNESSES
OPPORTUNITES	THREATS

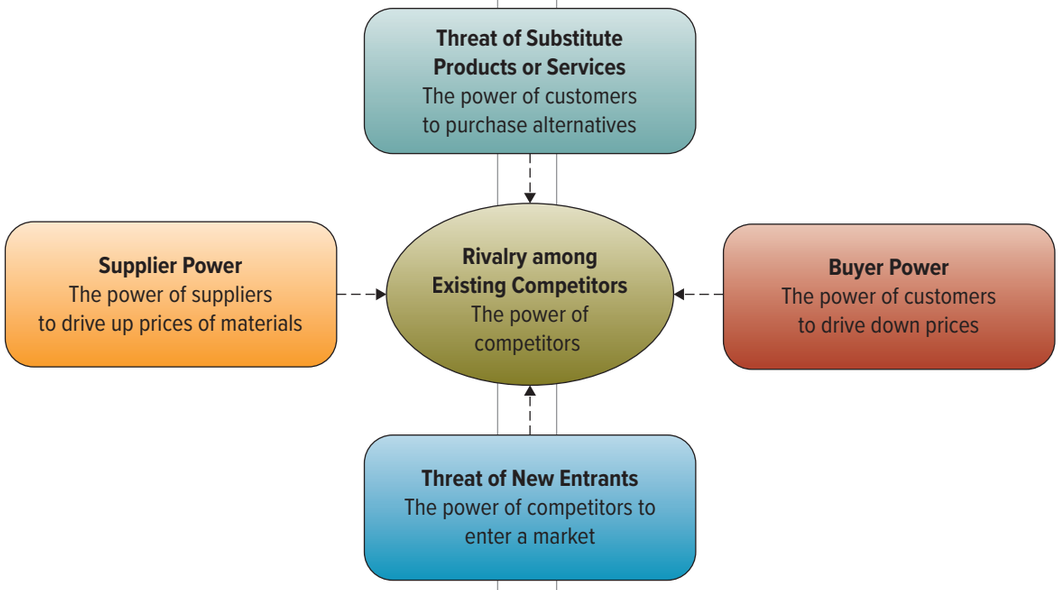
switching costs
Costs that make customers reluctant to switch to another product or service.

loyalty program
A program to reward customers based on spending.

supply chain All parties involved, directly or indirectly, in obtaining raw materials or a product.

supplier power
One of Porter's five forces; measures the suppliers' ability to influence the prices they charge for supplies (including materials, labor, and services).

FIGURE 1.21 Porter's Five Forces Model



include number of customers, their sensitivity to price, size of orders, differences between competitors, and availability of substitute products. If buyer power is high, customers can force a company and its competitors to compete on price, which typically drives prices down.

One way to reduce buyer power is by manipulating **switching costs**, costs that make customers reluctant to switch to another product or service. Switching costs include financial as well as intangible values. The cost of switching doctors, for instance, includes the powerful intangible components of having to build relationships with the new doctor and nurses, as well as transferring all your medical history. With MIS, however, patients can store their medical records on DVDs or thumb drives, allowing easy transferability. The Internet also lets patients review websites for physician referrals, which takes some of the fear out of trying someone new.

Companies can also reduce buyer power with **loyalty programs**, which reward customers based on their spending. The airline industry is famous for its frequent-flyer programs, for instance. Because of the rewards travelers receive (free airline tickets, upgrades, or hotel stays), they are more likely to be loyal to or give most of their business to a single company. Keeping track of the activities and accounts of many thousands or millions of customers covered by loyalty programs is not practical without large-scale business systems, however. Loyalty programs are thus a good example of using MIS to reduce buyer power.

Supplier Power

A **supply chain** consists of all parties involved, directly or indirectly, in obtaining raw materials or a product. In a typical supply chain, a company will be both a supplier (to customers) and a customer (of other suppliers), as illustrated in Figure 1.22. **Supplier power** is the suppliers' ability to influence the prices they charge for supplies (including materials, labor, and services). Factors used to appraise supplier power

FIGURE 1.22 Traditional Supply Chain

threat of substitute products or services One of Porter's five forces, high when there are many alternatives to a product or service and low when there are few alternatives from which to choose.

threat of new entrants One of Porter's five forces, high when it is easy for new competitors to enter a market and low when there are significant entry barriers to joining a market.

entry barrier A feature of a product or service that customers have come to expect and entering competitors must offer the same for survival.

rivalry among existing competitors One of Porter's five forces; high when competition is fierce in a market and low when competitors are more complacent.

product differentiation An advantage that occurs when a company develops unique differences in its products with the intent to influence demand.

include number of suppliers, size of suppliers, uniqueness of services, and availability of substitute products. If supplier power is high, the supplier can influence the industry by:

- Charging higher prices.
- Limiting quality or services.
- Shifting costs to industry participants.

Typically, when a supplier raises prices, the buyers will pass on the increase to their customers by raising prices on the end product. When supplier power is high, buyers lose revenue because they cannot pass on the raw material price increase to their customers. Some powerful suppliers, such as pharmaceutical companies, can exert a threat over an entire industry when substitutes are limited and the product is critical to the buyers. Patients who need to purchase cancer-fighting drugs have no power over price and must pay whatever the drug company asks because there are few available alternatives.

Using MIS to find alternative products is one way of decreasing supplier power. Cancer patients can now use the Internet to research alternative medications and practices, something that was next to impossible just a few decades ago. Buyers can also use MIS to form groups or collaborate with other buyers, increasing the size of the buyer group and reducing supplier power. For a hypothetical example, the collective group of 30,000 students at a university has far more power over price when purchasing laptops than a single student.

Threat of Substitute Products or Services

The **threat of substitute products or services** is high when there are many alternatives to a product or service and low when there are few alternatives from which to choose. For example, travelers have numerous substitutes for airline transportation, including automobiles, trains, and boats. Technology even makes videoconferencing and virtual meetings possible, eliminating the need for some business travel. Ideally, a company would like to be in a market in which there are few substitutes for the products or services it offers.

Polaroid had this unique competitive advantage for many years until it forgot to observe competitive intelligence. Then the firm went bankrupt when people began taking digital pictures with everything from video cameras to cell phones.

A company can reduce the threat of substitutes by offering additional value through wider product distribution. Soft-drink manufacturers distribute their products through vending machines, gas stations, and convenience stores, increasing the availability of soft drinks relative to other beverages. Companies can also offer various add-on services, making the substitute product less of a threat. For example, iPhones include capabilities for games, videos, and music, making a traditional cell phone less of a substitute.

Threat of New Entrants

The **threat of new entrants** is high when it is easy for new competitors to enter a market and low when there are significant entry barriers to joining a market. An **entry barrier** is a feature of a product or service that customers have come to expect and entering competitors must offer the same for survival. For example, a new bank must offer its customers an array of MIS-enabled services, including ATMs, online bill paying, and online account monitoring. These are significant barriers to new firms entering the banking market. At one time, the first bank to offer such services gained a valuable first-mover advantage, but only temporarily, as other banking competitors developed their own MIS services.

Rivalry among Existing Competitors

Rivalry among existing competitors is high when competition is fierce in a market and low when competitors are more complacent. Although competition is always more intense in some industries than in others, the overall trend is toward increased competition in almost every industry. The retail grocery industry is intensively competitive. Kroger, Safeway, and Albertsons in the United States compete in many different ways, essentially trying to beat or match each other on price. Most supermarket chains have implemented loyalty programs to provide customers special discounts while gathering valuable information about their purchasing habits. In the future, expect to see grocery stores using wireless technologies that track customer movements throughout the store to determine purchasing sequences.

Product differentiation occurs when a company develops unique differences in its products or services with the intent to influence demand. Companies can use differentiation to reduce rivalry. For example, while many companies sell books and videos on the Internet, Amazon differentiates itself by using customer profiling. When a customer visits Amazon.com repeatedly,

Amazon begins to offer products tailored to that particular customer based on their profile. In this way, Amazon has reduced its rivals' power by offering its customers a differentiated service.

To review, the Five Forces Model helps managers set business strategy by identifying the competitive structure and economic environment of an industry. If the forces are strong, they increase competition; if the forces are weak, they decrease it (see Figure 1.23).[5]

Analyzing the Airline Industry

Let us bring Porter's five forces together to look at the competitive forces shaping an industry and highlight business strategies to help it remain competitive. Assume a shipping company is deciding whether to enter the commercial airline industry. If performed correctly, an analysis of the five forces should determine that this is a highly risky business strategy because all five forces are strong. It will thus be difficult to generate a profit.

- **Buyer power:** Buyer power is high because customers have many airlines to choose from and typically make purchases based on price, not carrier.
- **Supplier power:** Supplier power is high since there are limited plane and engine manufacturers to choose from, and unionized workforces (suppliers of labor) restrict airline profits.
- **Threat of substitute products or services:** The threat of substitute products is high from many transportation alternatives including automobiles, trains, and boats, and from transportation substitutes such as videoconferencing and virtual meetings.
- **Threat of new entrants:** The threat of new entrants is high because new airlines are continuously entering the market, including companies offering low-cost, on-demand air taxi services.
- **Rivalry among existing competitors:** Rivalry in the airline industry is high, and websites such as Travelocity and Priceline force them to compete on price (see Figure 1.24).[6]

FIGURE 1.23 Strong and Weak Examples of Porter's Five Forces

	Weak Force: Decreases Competition or Few Competitors	Strong Force: Increases Competition or Lots of Competitors
Buyer Power	An international hotel chain purchasing milk	A single consumer purchasing milk
Supplier Power	A company that makes airline engines	A company that makes pencils
Threat of Substitute Products or Services	Cancer drugs from a pharmaceutical company	Coffee from McDonald's
Threat of New Entrants	A professional hockey team	A dog walking business
Rivalry among Existing Competitors	Department of Motor Vehicles	A coffee shop

FIGURE 1.24 Five Forces Model in the Airline Industry

	Strong (High) Force: Increases Competition or Lots of Competitors
Buyer Power	Many airlines for buyers to choose from, forcing competition based on price.
Supplier Power	Limited number of plane and engine manufacturers to choose from along with unionized workers.
Threat of Substitute Products or Services	Many substitutes, including cars, trains, and buses. Even substitutes to travel such as video conferencing and virtual meetings.
Threat of New Entrants	Many new airlines entering the market all the time, including the latest sky taxis.
Rivalry among Existing Competitors	Intense competition—many rivals.

fyi

Sharing Data around the World

In the past few years, data collection rates have skyrocketed, and some estimate we have collected more data in the past 4 years than since the beginning of time. According to International Data Corporation, data collection amounts used to double every 4 years. With the massive growth of smartphones, tablets, and wearable technology devices, it seems as though data is being collected from everything, everywhere, all the time. It is estimated that data collection is doubling every 2 years, and soon it will double every 6 months. That is a lot of data! With the explosion of data collection, CTOs, CIOs, and CSOs are facing extremely difficult times as the threats to steal corporate sensitive data are also growing exponentially. Hackers and criminals have recently stolen sensitive data from retail giant Target and even the Federal Reserve Bank.

To operate, sensitive data has to flow outside an organization to partners, suppliers, community, government, and shareholders. List five types of sensitive data your school collects on students, faculty, and personnel. Review the list of stakeholders working at and with your school; determine which types of sensitive data each has access to and whether you have any concerns about sharing this data. Do you have to worry about theft of your student sensitive data? How can you ensure your school does not have any data leakage problems?

THE THREE GENERIC STRATEGIES—CHOOSING A BUSINESS FOCUS LO1.6

Once top management has determined the relative attractiveness of an industry and decided to enter it, the firm must formulate a strategy for doing so. If our sample company decided to join the airline industry, it could compete as a low-cost, no-frills airline or as a luxury airline providing outstanding service and first-class comfort. Both options offer different ways of achieving competitive advantages in a crowded marketplace. The low-cost operator saves on expenses and passes the savings along to customers in the form of low prices. The luxury airline spends on high-end service and first-class comforts and passes the costs on to the customer in the form of high prices.

Porter's three generic strategies are generic business strategies that are neither organization nor industry specific and can be applied to any business, product, or service. These three generic business strategies for entering a new market are: (1) broad cost leadership, (2) broad differentiation, and (3) focused strategy. Broad strategies reach a large market segment, whereas focused strategies target a niche or unique market with either cost leadership or differentiation. Trying to be all things to all people is a recipe for disaster, since doing so makes it difficult to project a consistent image to the entire marketplace. For this reason, Porter suggests adopting only one of the three generic strategies illustrated in Figure 1.25.

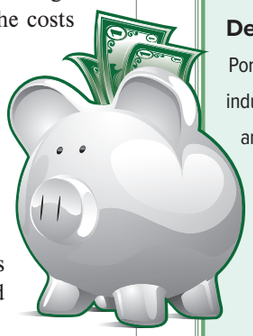
Figure 1.26 applies the three strategies to real companies, demonstrating the relationships among strategies (cost leadership versus differentiation) and market segmentation (broad versus focused).

- **Broad market and low cost:** Walmart competes by offering a broad range of products at low prices. Its business strategy is to be the low-cost provider of goods for the cost-conscious consumer.
- **Broad market and high cost:** Neiman Marcus competes by offering a broad range of differentiated products at high prices. Its business strategy offers a variety of specialty and upscale products to affluent consumers.
- **Narrow market and low cost:** Payless competes by offering a specific product, shoes, at low prices. Its business strategy is to be the low-cost provider of shoes. Payless competes with Walmart, which also sells low-cost shoes, by offering a far bigger selection of sizes and styles.
- **Narrow market and high cost:** Tiffany & Co. competes by offering a differentiated product, jewelry, at high prices. Its business strategy allows it to be a high-cost provider of premier designer jewelry to affluent consumers.

LO1.6 Compare Porter's three generic strategies.

Porter's three generic strategies
Generic business strategies that are neither organization nor industry specific and can be applied to any business, product, or service.

show me the MONEY



Death of a Product

Porter's Five Forces Model is an essential framework for understanding industries and market forces. Choose one of the categories listed here and analyze what happened to the market using Porter's five forces:

- On-demand movies and Blu-ray players.
- Digital camera and Polaroid camera.
- GPS device and a road atlas.
- Digital books and printed books.
- High-definition TV and radio.

FIGURE 1.25 Porter's Three Generic Strategies

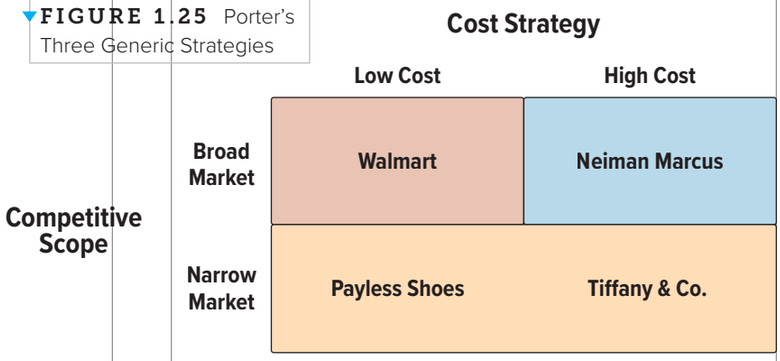
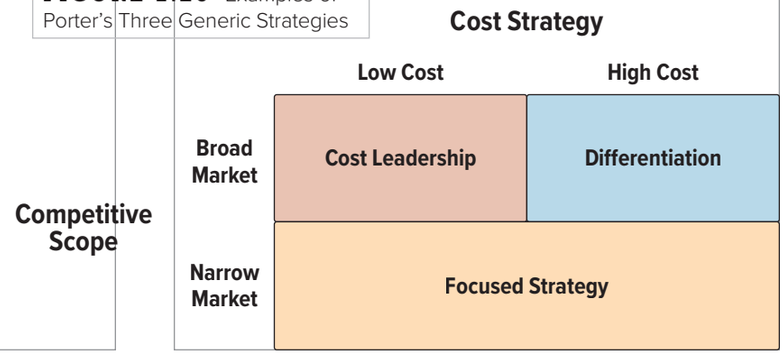


FIGURE 1.26 Examples of Porter's Three Generic Strategies



business process Standardized set of activities that accomplish a specific task.

value chain analysis Views a firm as a series of business processes that each add value to the product or service.

primary value activities Found at the bottom of the value chain, these include business processes that acquire raw materials and manufacture, deliver, market, sell, and provide after-sales services.

support value activities Found along the top of the value chain and includes business processes, such as firm infrastructure, human resource management, technology development, and procurement, that support the primary value activities.

Living the DREAM

One Laptop per Child[7]

Nicholas Negroponte is the founder of the MIT Media Lab and has spent his career pushing the edge of the information revolution as an inventor, thinker, and angel investor. His latest project, One Laptop per Child, plans to build $100 laptops that he hopes to put in the hands of the millions of children in developing countries around the globe. The XO (the "$100 laptop") is a wireless Internet-enabled, pedal-powered computer costing roughly $100. What types of competitive advantages could children gain from Negroponte's $100 laptop? What types of issues could result from the $100 laptop? Which of Porter's three generic strategies is Negroponte following?

Research the Internet to determine the success or failure of Negroponte's foundation. What reasons can you provide for the state of the foundation?

MIGUEL ROJO/Stringer/Getty Images

VALUE CHAIN ANALYSIS—EXECUTING BUSINESS STRATEGIES LO1.7

Firms make profits by taking raw inputs and applying a business process to turn them into a product or service that customers find valuable. A **business process** is a standardized set of activities that accomplish a specific task, such as processing a customer's order. Once a firm identifies the industry it wants to enter and the generic strategy it will focus on, it must then choose the business processes required to create its products or services. Of course, the firm will want to ensure the processes add value and create competitive advantages. To identify these competitive advantages, Michael Porter created **value chain analysis**, which views a firm as a series of business processes that each add value to the product or service.

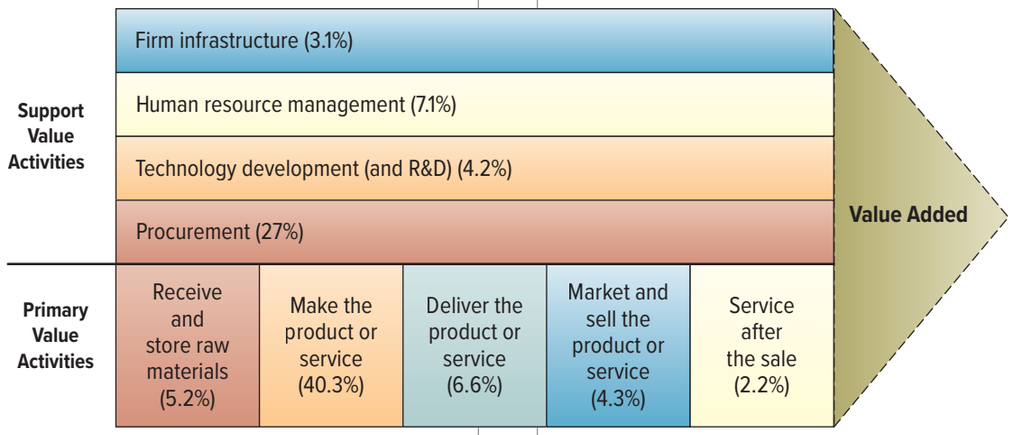
Value chain analysis is a useful tool for determining how to create the greatest possible value for customers (see Figure 1.27). The goal of value chain analysis is to identify processes in which the firm can add value for the customer and create a competitive advantage for itself, with a cost advantage or product differentiation.

The *value chain* groups a firm's activities into two categories, primary value activities, and support value activities. **Primary value activities**, shown at the bottom of the value chain in Figure 1.27, acquire raw materials and manufacture, deliver, market, sell, and provide after-sales services.

1. **Inbound logistics:** acquires raw materials and resources and distributes to manufacturing as required.
2. **Operations:** transforms raw materials or inputs into goods and services.
3. **Outbound logistics:** distributes goods and services to customers.
4. **Marketing and sales:** promotes, prices, and sells products to customers.
5. **Service:** provides customer support after the sale of goods and services.[8]

Support value activities, along the top of the value chain in Figure 1.27, include firm infrastructure, human resource management, technology development, and procurement. Not surprisingly, these support the primary value activities.

FIGURE 1.27 The Value Chain

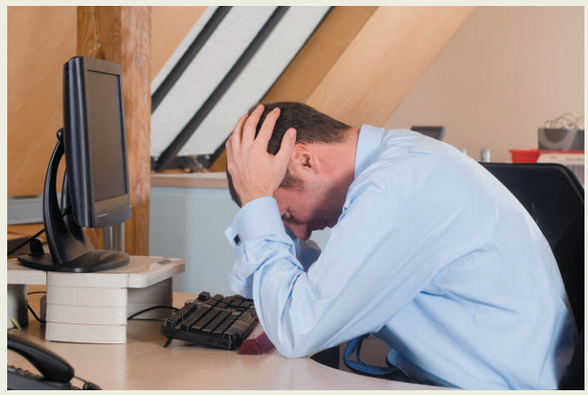


BUSTED

Listen to Spider-Man; He Knows What He's Talking About![7]

Spider-Man's infamous advice—"With great power comes great responsibility"—should be applied to every type of technology you encounter in business. Technology provides countless opportunities for businesses, but it can also lead to countless pitfalls and traps. A great example is how many companies profited from online trading and how many people lost their life savings in online trading scams. For example, Bernard Madoff, the owner of a high-profile New York investment company, was able to forge investment statements and allegedly spent almost $50 billion of his client's money. Craigslist allows anyone to become a provider of goods and services. Unfortunately, Craigslist does not describe exactly what types of goods and services are allowed. Adam Vitale was sentenced to 2 years in prison after he was found running an online prostitution ring through Craigslist.

The IOT is generating massive amounts of data from millions of sensors. Research the Internet and find an example of unethical behavior with IOT data and share the examples with your peers. What can businesses to do to prevent IOT data from being used unethically?



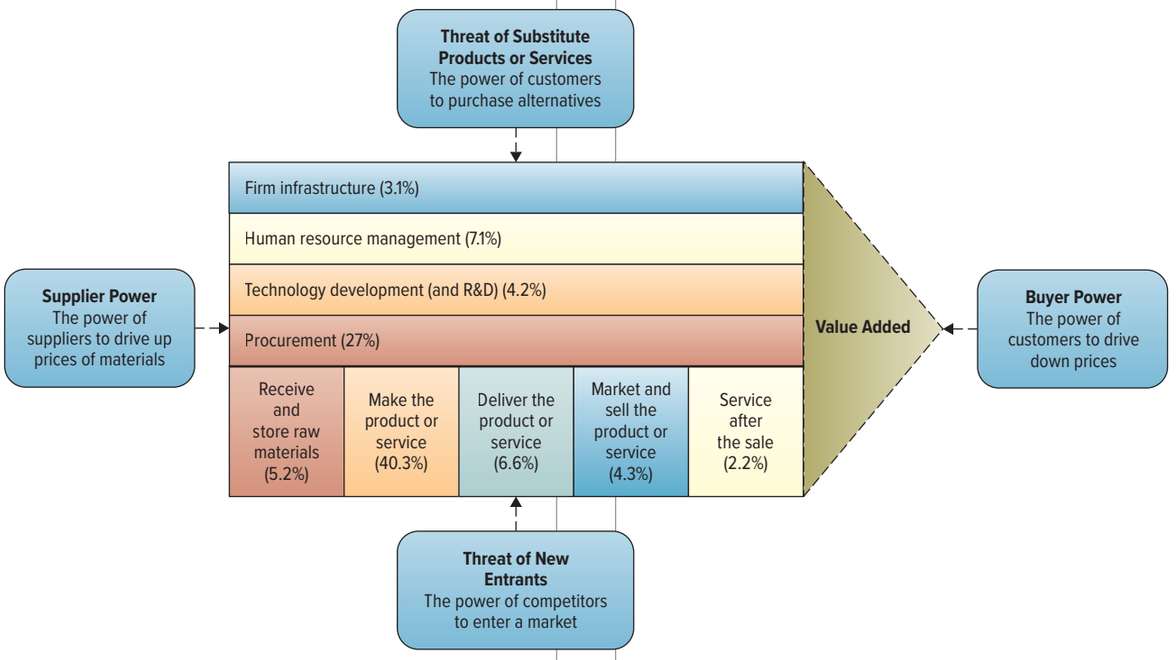
Ingram Publishing/Getty Images

- **Firm infrastructure:** includes the company format or departmental structures, environment, and systems.
- **Human resource management:** provides employee training, hiring, and compensation.
- **Technology development:** applies MIS to processes to add value.
- **Procurement:** purchases inputs such as raw materials, resources, equipment, and supplies.

It is easy to understand how a typical manufacturing firm takes raw materials such as wood pulp and transforms it into paper. Adding value in this example might include using high-quality raw materials or offering next-day free shipping on any order. How, though, might a typical service firm take raw inputs such as time, knowledge, and MIS and transform them into valuable customer service knowledge? A hotel might use MIS to track customer reservations and then inform front-desk employees when a loyal customer is checking in so the employee can call the guest by name and offer additional services, gift baskets, or upgraded rooms. Examining the firm as a value chain allows managers to identify the important business processes that add value for customers and then find MIS solutions that support them.

When performing a value chain analysis, a firm could survey customers about the extent to which they believe each activity adds value to the product or service. This step generates responses the firm can measure, shown as percentages in Figure 1.28, to describe how each activity adds (or reduces) value. Then the competitive advantage decision for the firm is whether to (1) target high value-adding activities to further enhance their value,

FIGURE 1.28 The Value Chain and Porter's Five Forces Model



(2) target low value-adding activities to increase their value, or (3) perform some combination of the two.

MIS adds value to both primary and support value activities. One example of a primary value activity facilitated by MIS is the development of a marketing campaign management system that could target marketing campaigns more efficiently, thereby reducing marketing costs. The system would also help the firm better pinpoint target market needs, thereby increasing sales. One example of a support value activity facilitated by MIS is the development of a human resources system that could more efficiently reward employees based on performance. The system could also identify employees who are at risk of quitting, allowing managers' time to find additional challenges or opportunities that would help retain these employees and thus reduce turnover costs.

Value chain analysis is a highly useful tool that provides hard and fast numbers for evaluating the activities that add value to products and services. Managers can find additional value by analyzing and constructing the value chain in terms of Porter's Five Forces Model (see Figure 1.28). For example, if the goal is to decrease buyer power, a company can construct its value

Up and Running: Smart Carting

It is almost impossible for a company to differentiate itself from competitors based on products alone. Competitors are only a click away and can offer products similar to yours with better quality or cheaper prices. One way to stay ahead of the pack is to use sophisticated analysis to understand every area of how your business performs. With analytics, you discern not only what your customers want but also how much they're willing to pay and what keeps them loyal. Tracking existing inventories and predicting future inventory requirements can offer insights into purchasing patterns along with significant costs savings that can be added to the bottom line.

You have decided to start a business that creates an IoT device that can be attached to a shopping cart or basket and can track store navigation patterns, products placed and removed from carts, and total purchase price. What business strategies can a company such as Target gain from using your IoT device? What types of information can be gleaned by analyzing traffic patterns in the store? What business intelligence can be found by analyzing products placed and removed from carts? Do you think there will be a correlation between time and the amount of the total purchase? How can you use this information to help improve business operations? If you owned a store, would you consider purchasing this great new IoT device?

chain activity of "service after the sale" by offering high levels of customer service. This will increase customers' switching costs and reduce their power. Analyzing and constructing support value activities can help decrease the threat of new entrants. Analyzing and constructing primary value activities can help decrease the threat of substitute products or services.

Revising Porter's three business strategies is critical. Firms must continually adapt to their competitive environments, which can cause business strategy to shift. In the remainder of this text, we discuss how managers can formulate business strategies using MIS to create competitive advantages. Figure 1.29 gives an overview of the remaining chapters, along with the relevant business strategy and associated MIS topics. ■

LO1.7 Demonstrate how a company can add value by using Porter's value chain analysis.

FIGURE 1.29 Overview of Information Systems

MODULE 1: BUSINESS DRIVEN MIS

	Business Strategy	MIS Topics
Chapter 1: Management Information Systems	Understanding Business Driven MIS	Data Information Business Intelligence Knowledge Systems Thinking Porter's Business Strategies
Chapter 2: Decisions and Processes	Creating Value Driven Businesses	Transaction Processing Systems Decision Support Systems Executive Information Systems Artificial Intelligence Business Process Reengineering
Chapter 3: Ebusiness	Finding Electronic Business Value	eBusiness eBusiness Models Social Networking Knowledge Management Collaboration
Chapter 4: Ethics and Information Security	Identifying MIS Business Concerns	Information Security Policies Authentication and Authorization Prevention and Resistance Detection and Response

MODULE 2: TECHNICAL FOUNDATIONS OF MIS

	Business Strategy	MIS Topics
Chapter 5: Infrastructures	Deploying Organizational MIS	Grid Computing Cloud Computing Virtualization Sustainable MIS Infrastructures
Chapter 6: Data	Uncovering Business Intelligence	Database Data Management Systems Data Warehousing Data Mining
Chapter 7: Networks	Supporting Mobile Business	Business Networks Web 1.0, Web 2.0, Web 3.0 Mobile MIS Wireless MIS GPS, GIS, and LBS

MODULE 3: ENTERPRISE MIS

	Business Strategy	MIS Topics
Chapter 8: Enterprise Applications	Enhancing Business Communications	Customer Relationship Management Supply Chain Management Enterprise Resource Planning
Chapter 9: Systems Development and Project Management	Leading MIS Projects	MIS Development Methodologies Project Management Outsourcing

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chapter two

decisions + processes: value driven business

what's in IT for me?

Working faster and smarter has become a necessity for companies. A firm's value chain is directly affected by how well it designs and coordinates its business processes. Business processes offer competitive advantages if they enable a firm to lower operating costs, differentiate, or compete in a niche market. They can also be huge burdens if they are outdated, which impedes operations, efficiency, and effectiveness. Thus, the ability of management information systems to improve business processes is a key advantage.

The goal of Chapter 2 is to provide an overview of specific MIS tools managers can use to support the strategies discussed in Chapter 1. After reading this

continued on p.34

CHAPTER OUTLINE

continued from p.33

chapter, you, the business student, should have detailed knowledge of the types of information systems that exist to support decision making and business process reengineering, which in turn can improve organization efficiency and effectiveness and help an organization create and maintain competitive advantages. ■

{SECTION 2.1}
Decision Support Systems

LEARNING OUTCOMES

LO2.1 Explain the importance of decision making for managers at each of the three primary organization levels along with the associated decision characteristics.

LO2.2 Define critical success factors (CSFs) and key performance indicators (KPIs), and explain how managers use them to measure the success of MIS projects.

LO2.3 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.

LO2.4 Describe artificial intelligence, and identify its main types.

MAKING BUSINESS DECISIONS LO2.1

Porter's strategies outlined in Chapter 1 suggest entering markets with a competitive advantage in either overall cost leadership, differentiation, or focus. To achieve these results, managers must be able to make decisions and forecast future business needs and requirements. The most important and most challenging question confronting managers today is how to lay the foundation for tomorrow's success while competing to win in today's business environment. A company will not have a future if it is not cultivating strategies for tomorrow. The goal of this section is to expand on Porter's Five Forces Model, three generic strategies, and value chain analysis to demonstrate how managers can learn the concepts and practices of business decision making to add value. It will also highlight how companies today are taking advantage of advanced MIS capable of generating significant competitive advantages across the value chain.

As we discussed in Chapter 1, decision making is one of the most important and challenging aspects of management. Decisions range from routine choices, such as how many items to order or how many people to hire, to unexpected ones, such as what to do if a key employee suddenly quits or needed materials do not arrive. Today, with massive volumes of information available, managers are challenged to make highly complex decisions—some involving far more information than the human brain can comprehend—in increasingly shorter time frames. Figure 2.1 displays the three primary challenges managers face when making decisions.

show me *the* MONEY

What Level Are My Decisions?

For each of the following decisions, determine if it is operational, managerial, or strategic.

Decision	Operational Decision	Managerial Decision	Strategic Decision
How many employees are out sick?			
What are the sales forecasts for next month?			
What was the impact of last month's marketing campaign discount on the primary product?			
How will an increase in the interest rate over the next year affect sales?			
How will changes in health insurance laws impact the company over the next 5 years?			
How many paychecks were incorrect during the last payroll run?			
What was the difference between forecast sales and actual sales last month?			
How will new tax laws impact business?			
What are next week's production schedules?			

operational level Employees develop, control, and maintain core business activities required to run the day-to-day operations.

operational decisions Affect how the firm is run from day to day; they are the domain of operations managers, who are the closest to the customer.

structured decision Involves situations where established processes offer potential solutions.

managerial level Employees are continuously evaluating company operations to hone the firm's abilities to identify, adapt to, and leverage change.

managerial decisions Concern how the organization should achieve the goals and objectives set by its strategy, and they are usually the responsibility of mid-level management.

LO2.1 Explain the importance of decision making for managers at each of the three primary organization levels along with the associated decision characteristics.

The Decision-Making Process

The process of making decisions plays a crucial role in communication and leadership for operational, managerial, and strategic projects. Analytics is the science of fact-based decision making. There are numerous academic decision-making models; Figure 2.2 presents just one example.[1]

Decision-Making Essentials

A few key concepts about organizational structure will help our discussion of MIS decision-making tools. The structure of a typical organization is similar to a pyramid, and the different levels require different types of information to assist in decision making, problem solving, and opportunity capturing (see Figure 2.3).

Operational At the **operational level**, employees develop, control, and maintain core business activities required to run the day-to-day operations. **Operational decisions** affect how the firm is run from day to day; they are the domain of operations managers, who are the closest to the customer. Operational decisions are considered **structured decisions**, which arise in situations where established processes offer potential solutions. Structured decisions are made frequently and are almost repetitive in nature; they affect short-term business strategies. Reordering inventory and creating the employee staffing and weekly production schedules are examples of routine structured decisions. Figure 2.4 highlights the essential elements required for operational decision making. All the elements in the figure should be familiar, except metrics, which are discussed in detail below.

Managerial At the **managerial level**, employees are continuously evaluating company operations to hone the firm's abilities to identify, adapt to, and leverage change. A company that has a competitive advantage needs to constantly adjust and revise its strategy 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. **Managerial decisions** concern how the organization

FIGURE 2.1 Managerial Decision-Making Challenges

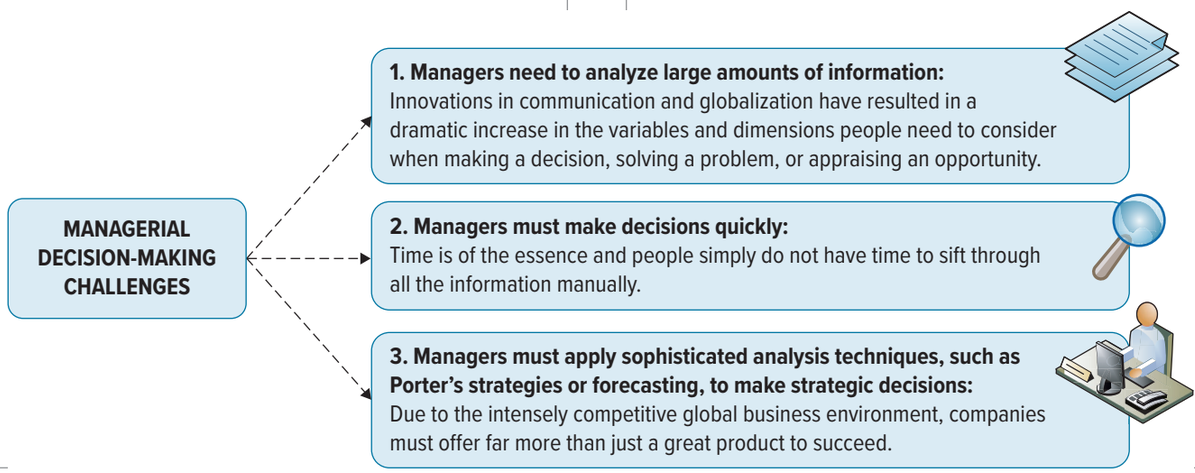
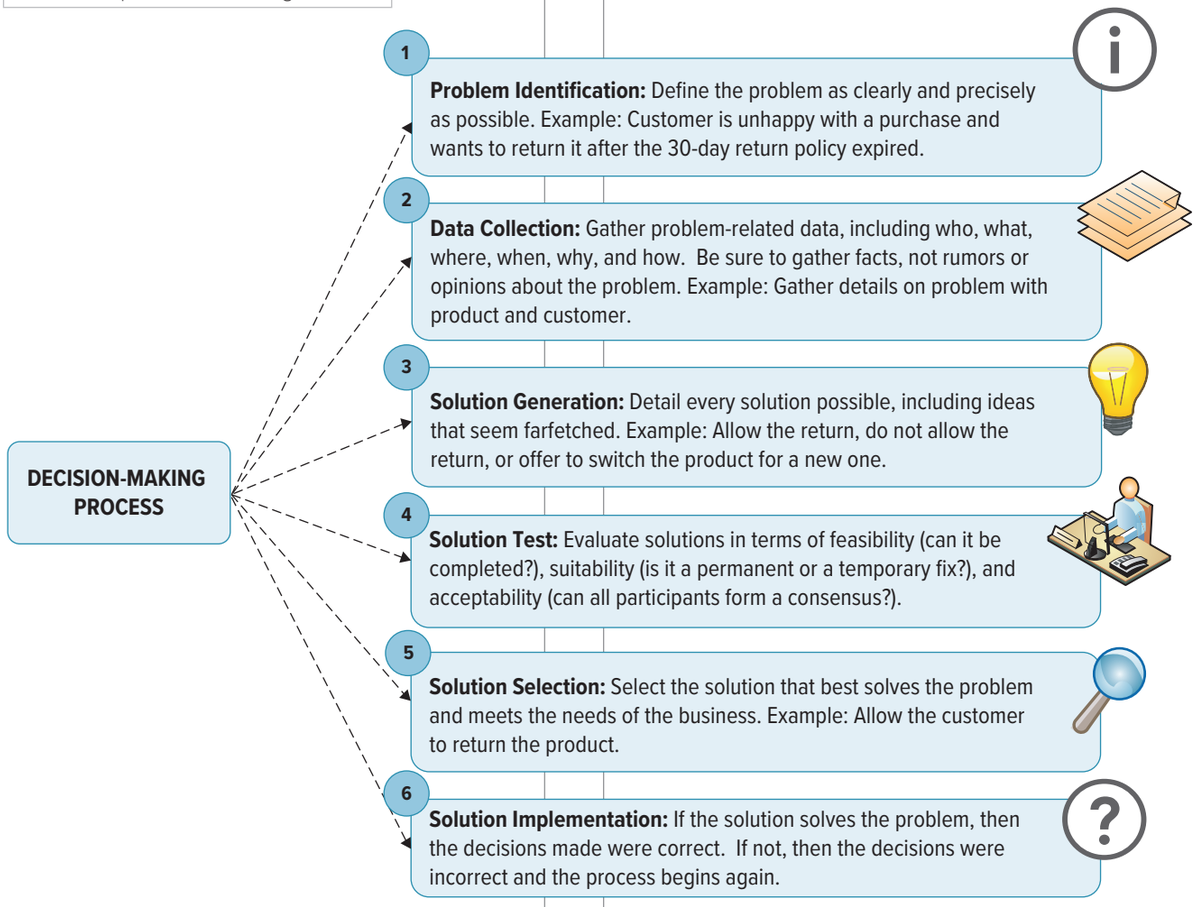


FIGURE 2.2
The Six-Step Decision-Making Process



should achieve the goals and objectives set by its strategy, and they are usually the responsibility of mid-level management. Managerial 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 2.4 highlights the essential elements required for managerial decision making.

FIGURE 2.3 Common Company Structure

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

semistructured decision Occurs in situations in which a few established processes help to evaluate potential solutions, but not enough to lead to a definite recommended decision.

strategic level Managers develop overall business strategies, goals, and objectives as part of the company's strategic plan.

strategic decisions Involve higher-level issues concerned with the overall direction of the organization; these decisions define the organization's overall goals and aspirations for the future.

unstructured decision Occurs in situations in which no procedures or rules exist to guide decision makers toward the correct choice.

project Temporary activity a company undertakes to create a unique product, service, or result.

metrics Measurements that evaluate results to determine whether a project is meeting its goals.

FIGURE 2.4 Overview of Decision Making

	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?

business environment. **Strategic decisions** involve higher-level issues concerned with the overall direction of the organization; these decisions define the organization's overall goals and aspirations for the future. 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 3 years. In these types of decisions, managers rely on many sources of information, along with personal knowledge, to find solutions. Figure 2.4 highlights the essential elements required for strategic decision making.

MEASURING BUSINESS DECISIONS LO2.2

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

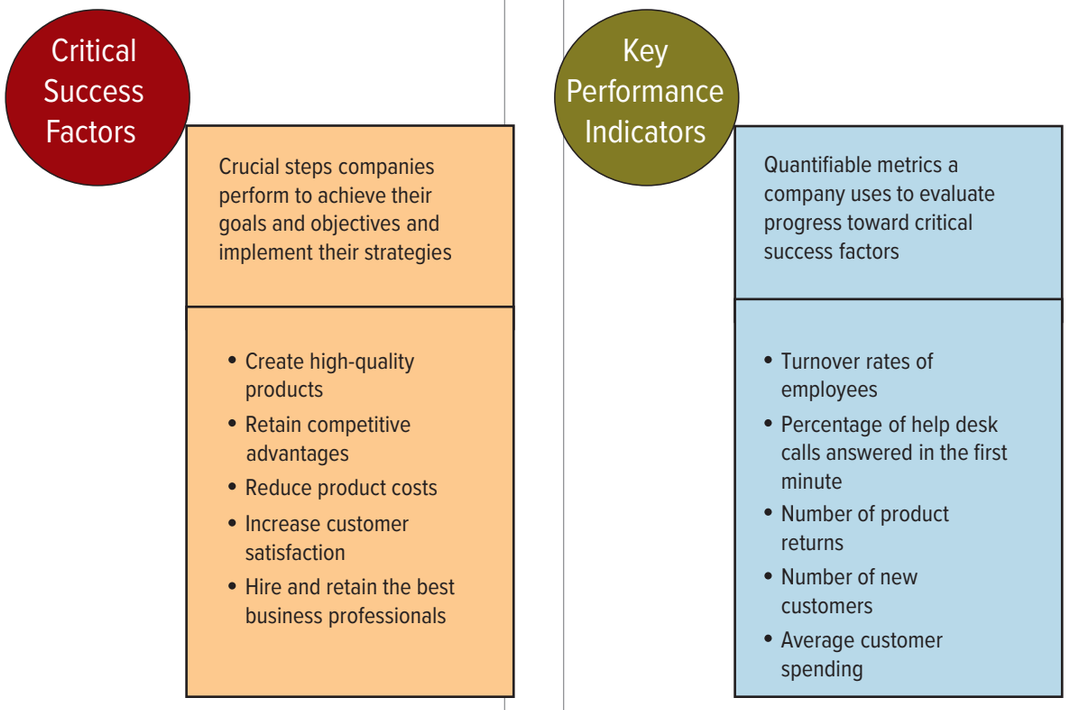
critical success factors (CSFs) Crucial steps companies perform to achieve their goals and objectives and implement their strategies.

key performance indicators (KPIs) Quantifiable metrics a company uses to evaluate progress toward critical success factors.

market share The proportion of the market that a firm captures.

return on investment (ROI) Indicates the earning power of a project.

FIGURE 2.5 CSF and KPI Metrics



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 2.5). **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:

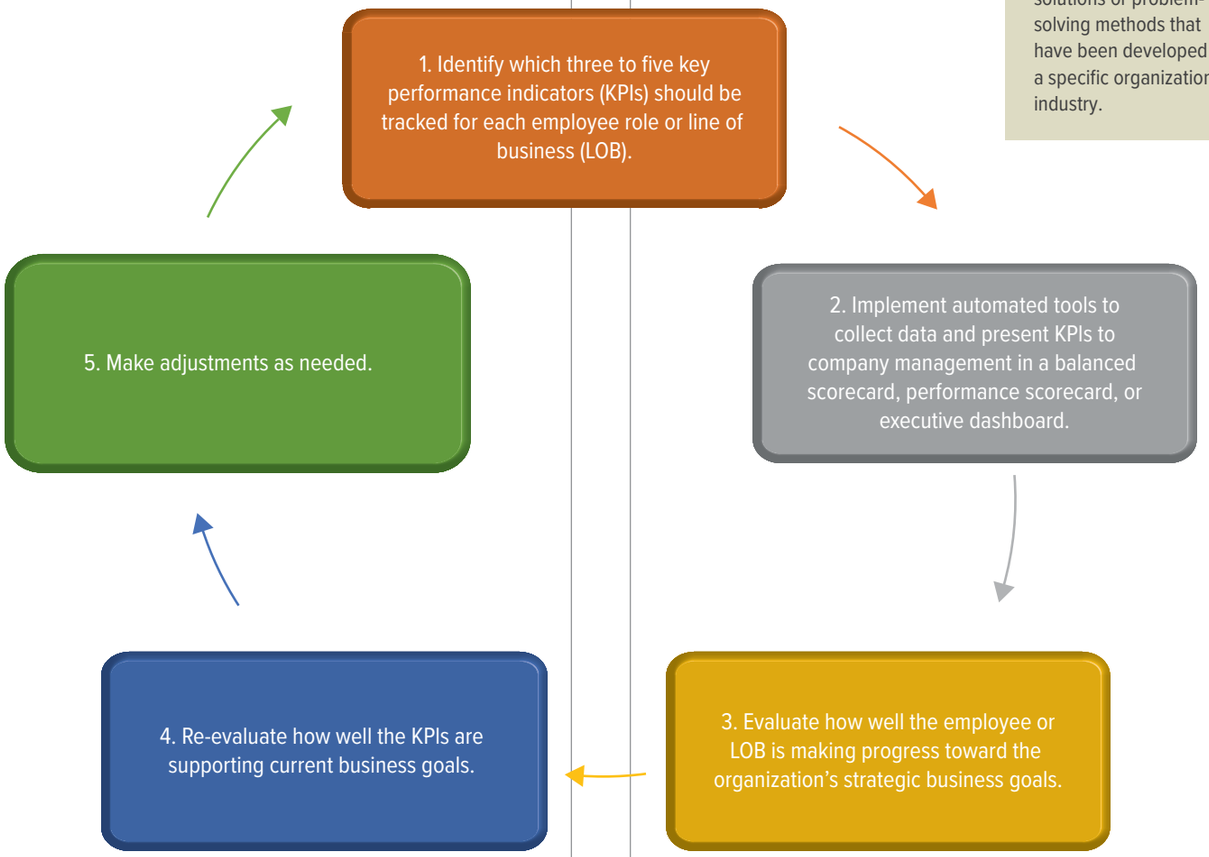
- Average grades by course and gender.
- Student dropout rates by gender and major.
- Average graduation rate by gender and major.
- Time spent in tutoring by gender and major.

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

best practices
The most successful solutions or problem-solving methods that have been developed by a specific organization or industry.

FIGURE 2.6 Method for Defining KPIs



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.

Although monitoring KPIs can help management identify deficiencies within an organization, it is up to management to decide how to correct them. Having too many KPIs can be problematic. It not only dilutes employee attention, it also makes it difficult for managers to prioritize indicators and make sure the key indicators get the attention they deserve.

To that end, many successful companies limit KPI scope to small sets of indicators that evaluate the success of individuals in the organization. Figure 2.6 displays a common approach is to defining KPIs.

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.

LO2.2 Define critical success factors (CSFs) and key performance indicators (KPIs), and explain how managers use them to measure the success of MIS projects.

efficiency MIS metrics Measure the performance of MIS itself such as throughput, transaction speed, and system availability.

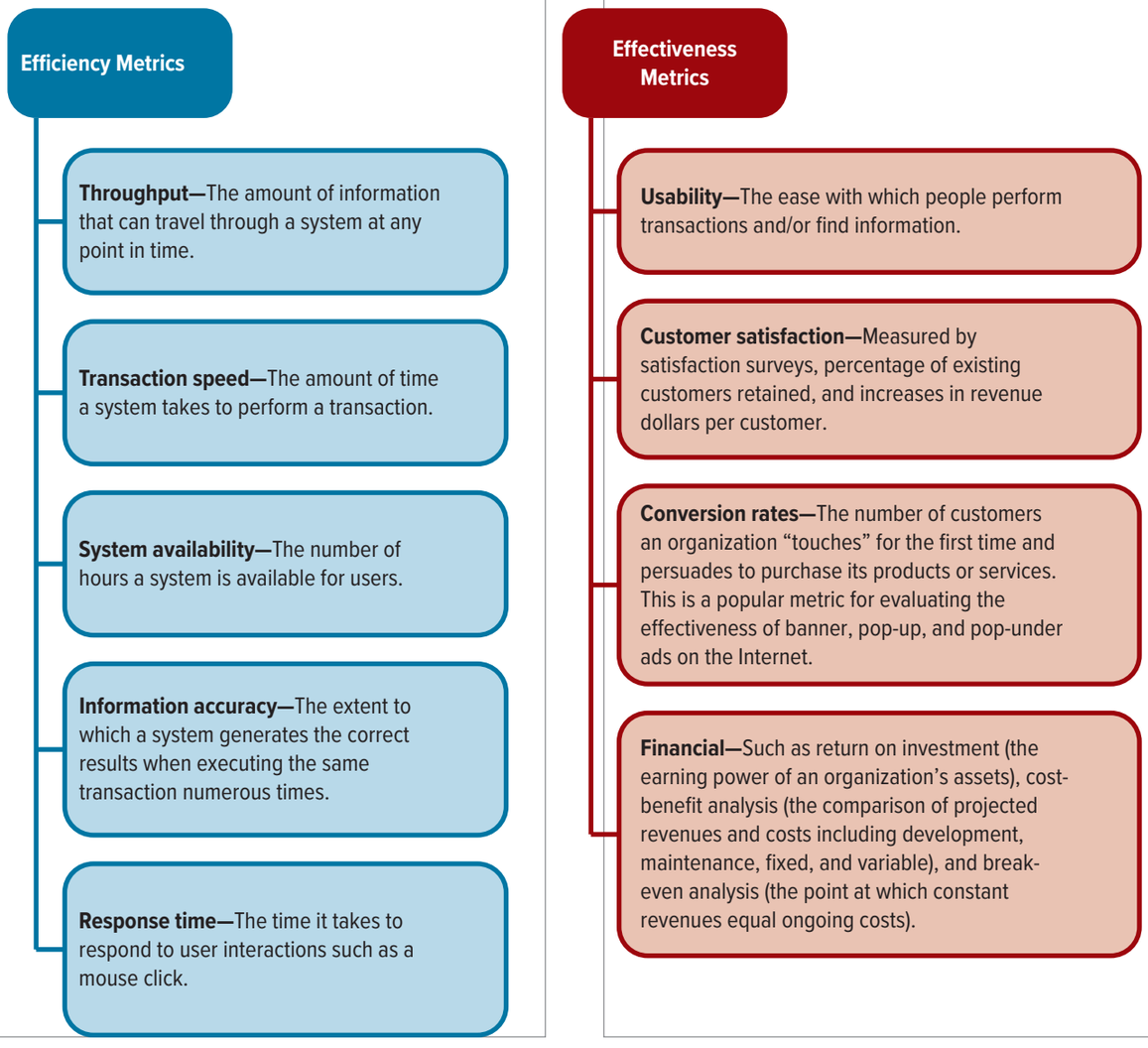
effectiveness MIS metrics Measure the impact MIS has on business processes and activities including customer satisfaction and customer conversion rates.

Efficiency 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.[2]

Large increases in productivity typically result from increases in effectiveness, which focus on CSFs. Efficiency MIS metrics

FIGURE 2.7 Common Types of Efficiency and Effectiveness 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 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 taking the added viewpoint offered by effectiveness MIS metrics to analyze all benefits associated with an MIS project.

The Interrelationship of Efficiency and Effectiveness MIS Metrics

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. While 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 (e.g., Walmart), as well as KPIs, such as increasing new customers by 10 percent or reducing new-product development cycle times to 6 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.

benchmarks
Baseline values the system seeks to attain

benchmarking
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.

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

show me *the* MONEY

Is It Effective or Is It Efficient?

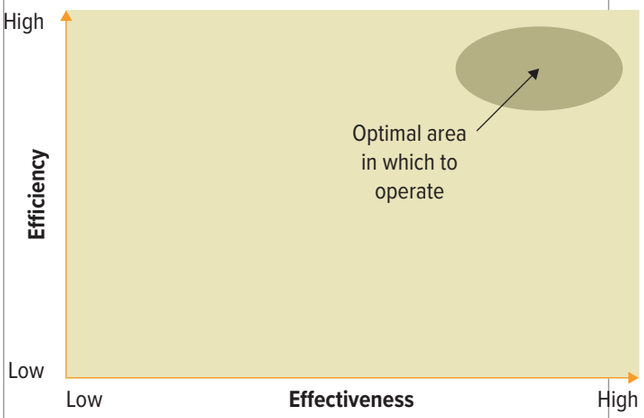
Making business decisions is a key skill for all managers. Review the following list and, in a group, determine whether the question is focusing on efficiency, effectiveness, or both.

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?		

model A simplified representation or abstraction of reality.

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 or structured decisions.

FIGURE 2.8 The Interrelationships between Efficiency and Effectiveness



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 LO2.3

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 mathematically express relationships among variables. For example, a spreadsheet program, such as Microsoft Office Excel, might contain models that calculate market share or ROI. MIS have 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.

LO2.3 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.

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 an ATM. Managers use transactional information when making structured decisions at the operational level, such as when

Due Diligence //: Get the Cow Out of the Ditch

Fortune magazine asked Anne Mulcahy, former chairperson 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. A cow falls in a ditch. 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.[3]

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?

online transaction processing (OLTP) 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.

transaction processing system (TPS) The basic business system that serves the operational level (analysts) and assists in making structured decisions.

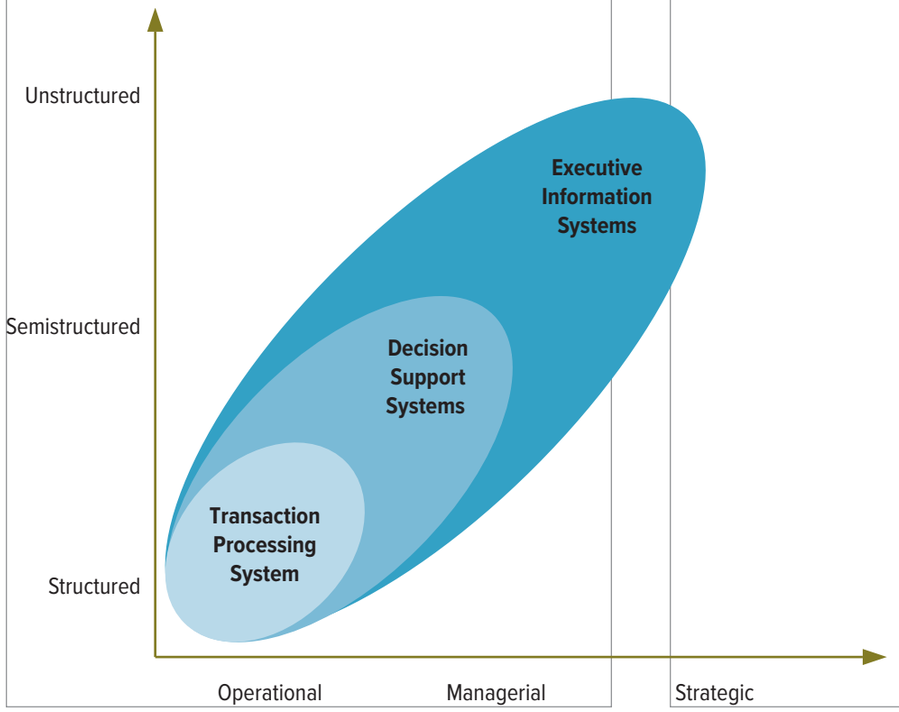
source document Describes the original transaction record along with details such as its date, purpose, and amount spent and includes cash receipts, canceled checks, invoices, customer refunds, employee time sheet, etc.

Analyzing **Analytics** Will They Stay or Will They Go?

Workplace turnover is a huge issue for business today. Each time an employee walks out the door, the business loses large amounts of capital, including training investments, business process knowledge, and organizational performance history. Anything a business can do to keep employees satisfied and motivated will help the company succeed. Human resource analytics software can analyze employee data to help determine which employees are at risk of leaving the company. The following variables describe the types of data being analyzed to forecast potential employee turnover. Review each variable, and explain how it is helping to predict employee turnover. Do you agree this is the best way to determine employee turnover? What other variables would you recommend a business collect to determine employee turnover?

- Time required for next promotion.
- Yearly bonus.
- Time since last raise.
- Employee performance.
- Manager performance.
- Attrition under employee's manager.
- Time off taken.
- Time off not taken.
- Stock grants over time.
- Location of employee.
- Location of employee's team.
- Location of employee's manager.

FIGURE 2.9 Primary Types of MIS Systems for Decision Making



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**, which describes the original transaction record along with details such as its date, purpose,