



M

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Information

SYSTEMS

FOURTH EDITION

BALTZAN

BUSTED:

The Criminal in
the Cube Next Door

SPAM

IT'S NOT JUST
FOR DINNER

#GOING OFFLINE:

The Anti-Social
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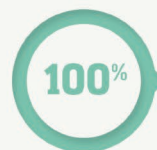
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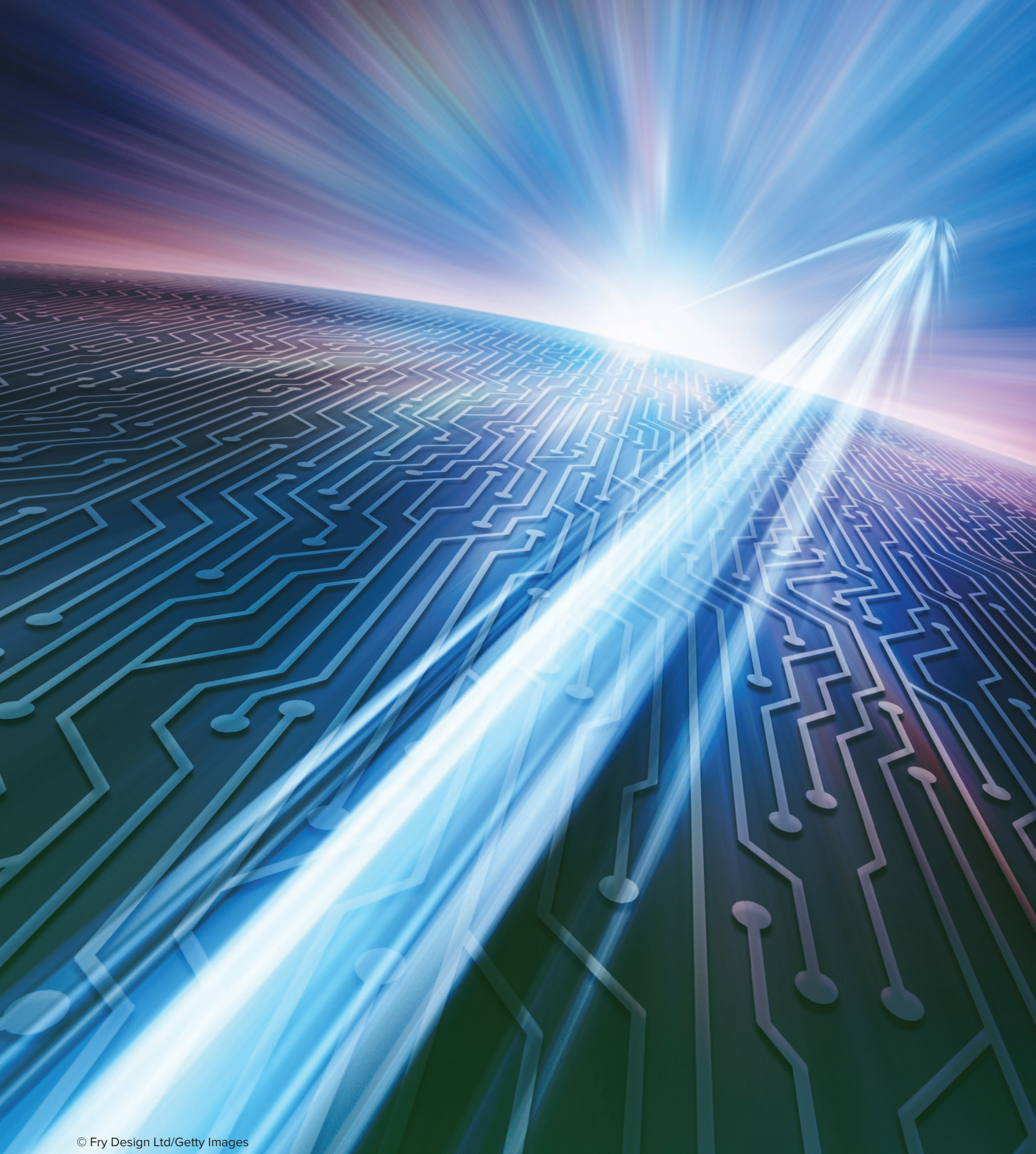
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information
systems 4e



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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

chapter 1: Management Information Systems: Business Driven MIS

chapter 2: Decisions + Processes: Value Driven Business

chapter 3: Ebusiness: Electronic Business Value

chapter 4: Ethics + Information Security: MIS Business Concerns

module two

TECHNICAL FOUNDATIONS OF MIS

module three

ENTERPRISE MIS



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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

continued on p. 6

CHAPTER OUTLINE

SECTION 1.1 >>

Business Driven MIS

- Competing in the Information Age
- The Challenge: Departmental Companies
- The Solution: Systems Thinking and the MIS Solution

SECTION 1.2 >>

Business Strategy

- Identifying Competitive Advantages
- The Five Forces Model—Evaluating Industry Attractiveness
- The Three Generic Strategies—Choosing a Business Focus
- Value Chain Analysis—Executing Business Strategies

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 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 and technology. You must first recognize information’s role in daily 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** Identify the different departments in a company and why they must work together to achieve success.
- LO1.3** 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 four years to create and cost \$450 million.
- Lady Gaga’s real name is Stefani Joanne Angelina Germanotta.
- Customers pay \$2.6 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 startups 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 his or her 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, and it now sells nearly everything.
- Netflix is not a technology company; its primary business focus is to rent videos.
- Zappos is not a technology company; its primary business focus is to sell shoes, bags, clothing, and accessories.

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 videos 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.

Over 20 years ago a few professors at 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. Another term commonly associated with The Internet of Things is **machine-to-machine (M2M)**, which refers to devices that connect directly to other devices. With advanced technologies devices are connecting in ways not previously thought possible and researchers predict that over 50 billion IoT devices will be communicating by 2020. Kevin Ashton, cofounder and executive director of the Auto-ID Center at MIT, first mentioned the Internet of Things in a presentation he made to Procter & Gamble. Here’s Ashton explanation of the Internet of Things:

“Today computers—and, therefore, the Internet—are almost wholly dependent on human beings for information. Nearly all

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

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.

Living the DREAM

Sensors and Bears—A Perfect Match

Two London-based entrepreneurs are building an Internet of huggable things for sick children to make any hospital visit more like a trip to Disneyland. Teddy The Guardian captures heart

rate, temperatures, and blood-oxygen levels when a child grabs it by the paw to give it a cuddle. All measurements are sent wirelessly to nurses and parents, mobile devices. The new cute, cuddly teddy bear is packed full of sensors designed to track children's vital signs and help quickly find out potential issues. Teddy The Guardian takes from 5 to 7 seconds to record measurements and is programmed to run five times per hour. Future versions of Teddy The Guardian will be interactive, using machine learning to find out the child's favorite song or bedtime story and then play the related

content for a more soothing hospital visit. Big pharmaceutical companies in the United States have already placed over \$500,000 in orders and plan to donate the bears to hospitals and clinics.

This is clearly a brilliant idea, and soon we will see Teddy The Guardian in many local hospitals and clinics. Can you identify any additional markets where Teddy The Guardian should focus? Can you think of any ethical issues related to huggable things? Can you think of any security issues related to huggable things?

of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the Internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture or scanning a bar code.

The problem is, people have limited time, attention and accuracy—all of which means they are not very good at capturing data about things in the real world. If we had computers that knew everything there was to know about things—using data they gathered without any help from us—we would be able to track and count everything and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling and whether they were fresh or past their best.”²

IoT is transforming our world into a living information system as we control our intelligent lighting from our smart phone to 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 are 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)

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. **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, click-stream data, or gaming data.

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.

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

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

comprehend massive amounts of data daily, which helps them make more successful business decisions.

A **snapshot** is a view of data at a particular moment in time. Figure 1.2 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 1.2, 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:

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:

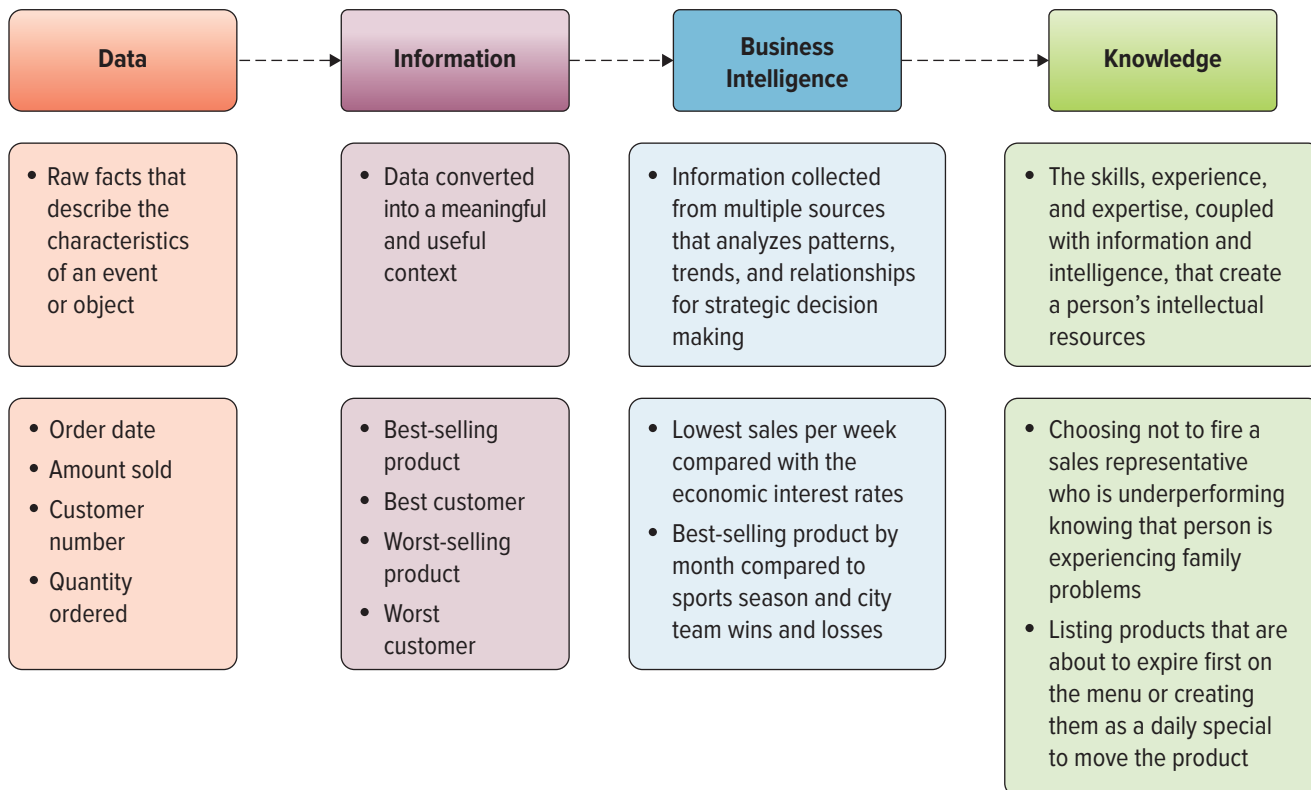
- Machine-generated unstructured data includes satellite images, scientific atmosphere data, and radar data.
- Human-generated unstructured data includes text messages, social media data, and emails.

Big data is a collection of large, complex data sets, including structured and unstructured data, which cannot be analyzed using traditional database methods and tools. Lacking data, managers often found themselves making business decisions about how many products to make, how much material to order, or how many employees to hire based on intuition or gut feelings. In the information age, successful managers compile, analyze, and

- 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*.

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



information Data converted into a meaningful and useful context.

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.

fyi

People in China and India Are Starving for Your Jobs³

“When I was growing up in Minneapolis, my parents always said, ‘Tom, finish your dinner. There are people starving in China and India.’ Today I tell my girls, ‘Finish your homework, because people in China and India are starving for your jobs.’ And in a flat world, they can have them, because there’s no such thing as an American job anymore.” Thomas Friedman.

In his book, *The World Is Flat*, Thomas Friedman describes the unplanned cascade of technological and social shifts that effectively leveled the economic world and “accidentally made Beijing, Bangalore, and Bethesda

next-door neighbors.” The video of Thomas Friedman’s lecture at MIT discussing the flat world is available at <http://mitworld.mit.edu/video/266>. If you want to be prepared to compete in a flat world, you must watch this video and answer the following questions:

- Do you agree or disagree with Friedman’s assessment that the world is flat?
- What are the potential impacts of a flat world for a student performing a job search?

- What can students do to prepare themselves for competing in a flat world?



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FIGURE 1.2 Tony’s Snack Company Data

Order Date	Customer	Sales Representative	Product	Qty	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

Information

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

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.

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 1.3 and 1.4, 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 under-performing 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

▼ **FIGURE 1.3** 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)

analytics The science of fact-based decision making.

predictive analytics Extracts information from data and uses it to predict future trends and identify behavioral patterns.

behavioral analytics Uses data about people’s behaviors to understand intent and predict future actions.

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.

FIGURE 1.4 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

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, 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. A big part of business intelligence is called **predictive analytics**, which extracts information from data and uses it to predict future trends and identify behavioral patterns. Top managers use predictive analytics to define the future of the business, analyzing markets, industries, and economies to determine the strategic direction the company must follow to remain profitable.

Behavioral analytics uses data about people’s behaviors to understand intent and predict future actions. Tony will set the strategic direction for his firm, which might include introducing new flavors of potato chips or sports drinks as new product lines or schools and hospitals as new market segments based on both predictive and behavioral analytics.

Knowledge

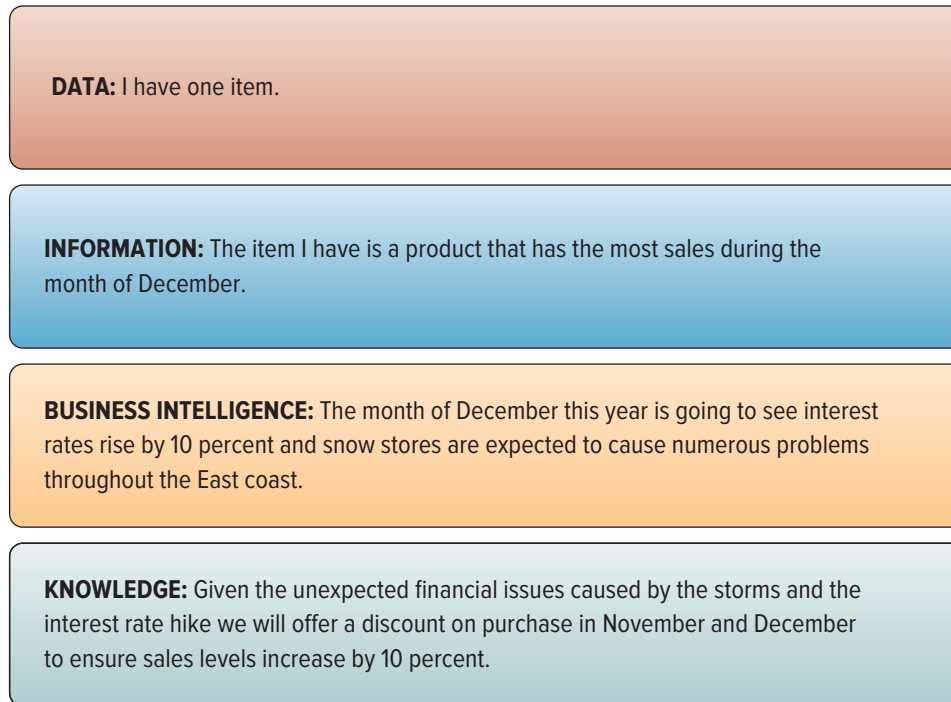
Knowledge includes the skills, experience, and expertise, coupled with information and intelligence, that creates a person’s intellectual resources. **Knowledge workers** are individuals valued for their ability to interpret and analyze information. Today’s workers are commonly referred to as knowledge workers and they

use BI along with personal experience to make decisions based on both information and intuition, a valuable resource for any company.

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 1.5 offers a few different examples of data through knowledge.

▼ **FIGURE 1.5**
Transformation from Data to Knowledge



THE CHALLENGE: DEPARTMENTAL COMPANIES LO1.2

Companies are typically organized by department or functional area 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 resources into goods or services.
- **Sales:** Performs the function of selling goods or services (see Figure 1.6).

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 1.7).

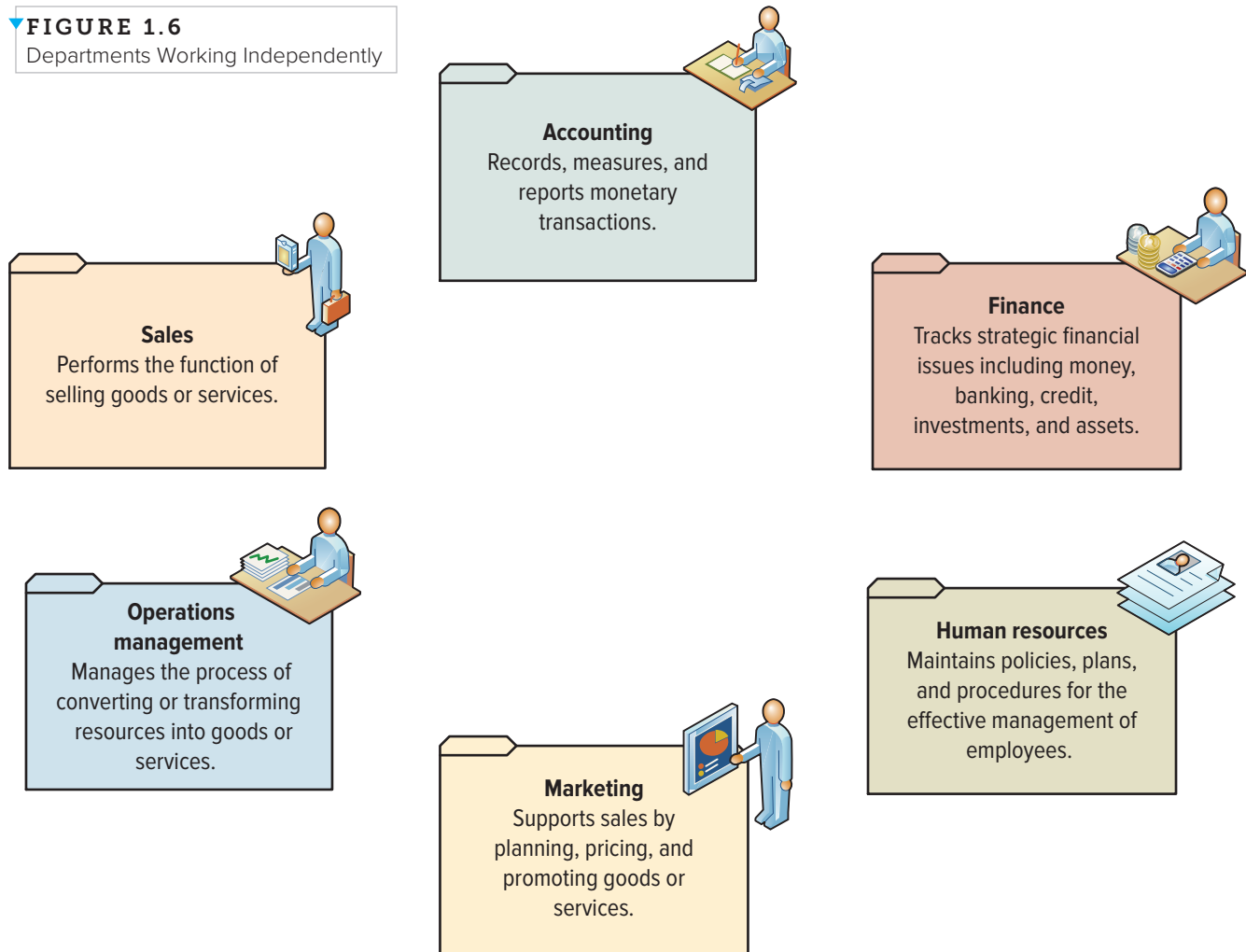
LO1.2 Identify the different departments in a company and why they must work together to achieve success.

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.

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

FIGURE 1.6
Departments Working Independently



SYSTEMS THINKING AND MANAGEMENT INFORMATION SYSTEMS LO1.3

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. 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.

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 1.8).

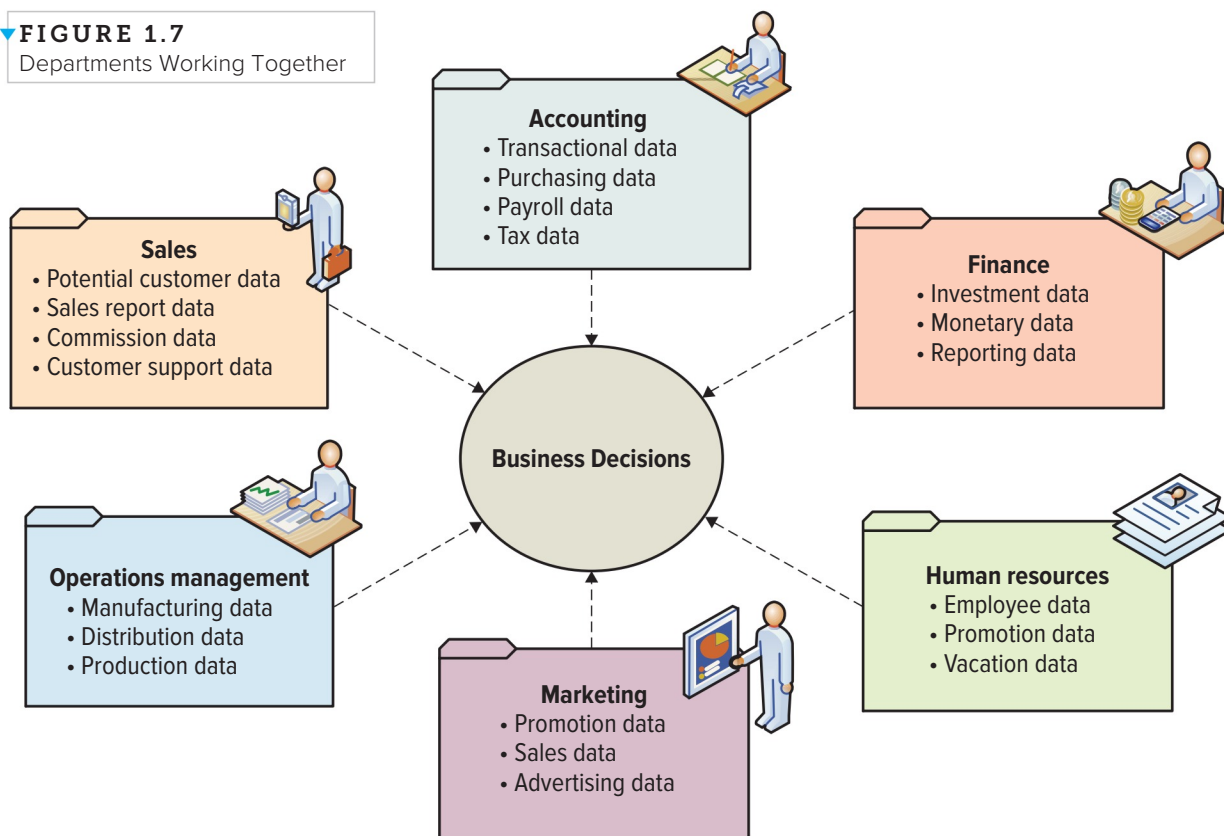
productivity The rate at which goods and services are produced based upon total output given total inputs.

production The process where a business takes raw materials and processes them or converts them into a finished product for its goods or 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 1.9). 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 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 1.7
Departments Working Together



BUSTED

The Interent 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 smart phone to 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 are 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.⁵

In a group, identify a few IoT devices you are using today. These can include 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?

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 1.10). **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

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.

show me the MONEY

Who Really Won the 2014 Winter Olympics?

If you were watching the 2014 Winter Olympics, I bet you were excited to see your country and its amazing athletes compete. As you were following the Olympics day by day, you were probably checking different websites to see how your country ranked. And depending on the website you visited, you could get a very different answer to this seemingly easy question. On the NBC and ESPN networks, the United States ranked second, and on the official Sochi Olympic website, the United States ranked fourth. The simple question of who won the 2014 Winter Olympics changes significantly, depending on whom you asked.⁴

Winter Olympics 2014 Medal Ranking According to NBC News

Rank	Country	Gold	Silver	Bronze	Total
1	Russian Fed.	13	11	9	33
2	United States	9	7	12	28
3	Norway	11	5	10	26
4	Canada	10	10	5	25
5	Netherlands	8	7	9	24

In a group, take a look at the following two charts and brainstorm the reasons each internationally recognized source has a different listing for the top five winners. What measurement is each chart using to determine the winner? Who do you believe is the winner? As a manager, what do you need to understand when reading or listening to business forecasts and reports?



Winter Olympics 2014 Medal Ranking According to Official Sochi Olympic Website

Rank	Country	Gold	Silver	Bronze	Total
1	Russian Fed.	13	11	9	33
2	Norway	11	5	10	26
3	Canada	10	10	5	25
4	United States	9	7	12	28
5	Netherlands	8	7	9	24

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 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 information technology.

the MIS function effectively, almost all companies, 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 1.11.

The **chief information officer (CIO)** is responsible for (1) overseeing all uses of information technology 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, while 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

FIGURE 1.8
Different Types of Goods and Services

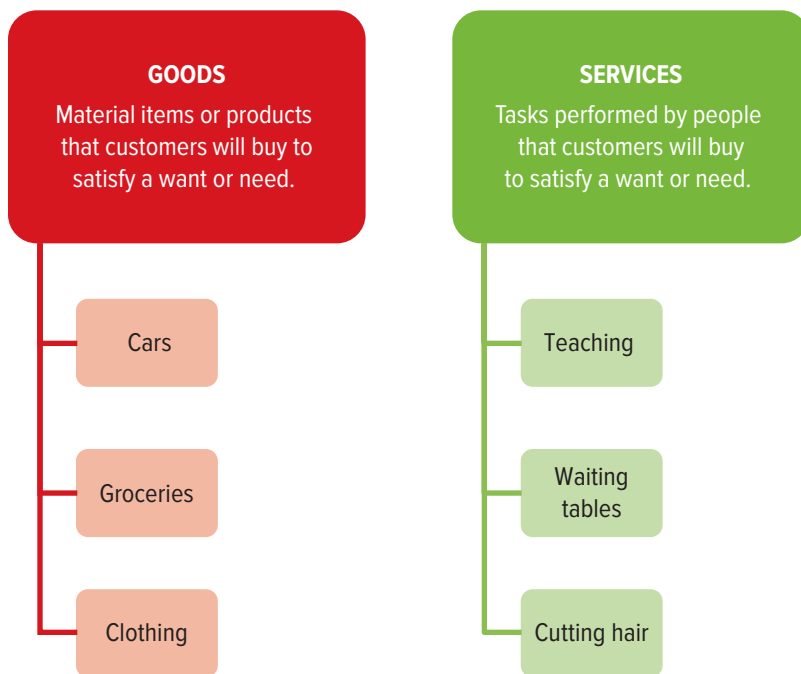


FIGURE 1.9
Input, Process, Output Example

