

The Importance of MIS

“Fired?” You’re firing me?”

“Well, *fired* is a harsh word, but ... well, Falcon Security has no further need for your services.”

“But, Joni, I don’t get it. I really don’t. I worked hard, and I did everything you told me to do.”

“Jennifer, that’s just it. You did everything I told you to do.”

“I put in so many hours. How could you fire me?”

“Your job was to find ways to reduce our fleet costs using 3D printing.”

“Right! And I did that.”

“No, you didn’t. You followed up on ideas *that I gave you*. But we don’t need someone who can follow up on my plans. We need someone who can figure out what we need to do, create her own plans, and bring them back to me.... and others.”

“How could you expect me to do that? I’ve only been here 6 months!”



"It's called teamwork. Sure, you're just learning our business, but I made sure all of our senior staff would be available to you ..."

"I didn't want to bother them."

"Well, you succeeded. I asked Cam what she thought of the plans you're working on. Who's Jennifer?' she asked."

"But doesn't she work down at the hangar?"

"Right. She's the operations manager ... and it would seem to be worth talking to her."

"I'll go do that!"

"Jennifer, do you see what just happened? I gave you an idea, and you said you'd do it. That's not what I need. I need you to find solutions on your own."

"I worked really hard. I put in a lot of hours. I've got all these reports written."

"Has anyone seen them?"

"I talked to you about some of them. But I was waiting until I was satisfied with them."

"Right. That's not how we do things here. We develop ideas and then kick them around with each other. Nobody has all the smarts. Our plans get better when we comment and rework them... I think I told you that."

"Maybe you did. But I'm just not comfortable with that."

"Well, it's a key skill here."

"I know I can do this job."

"Jennifer, you've been here almost 6 months; you have a degree in business. Several weeks ago, I asked you for your first idea for a process that would identify potential drones, or drone parts, that could be 3D-printed. Do you remember what you said?"

"Yes, I wasn't sure how to proceed. I didn't want to just throw something out that might not work."

"But how would you find out if it would work?"

"I don't want to waste money ..."

"No, you don't. So, when you didn't get very far with that task, I backed up and asked you to send me a list of parts that could be printed based on our existing drones, a list of replacement repair parts we buy on a regular basis, the specifications for future drones that we might buy, and a description of how existing 3D-printed drones are made. Not details, just an overview."

"Yes, I sent you those part lists and specifications."

"Jennifer, they made no sense. Your lists included parts that can't be 3D-printed, and your list of potential future drones included models that can't even carry cameras."



"But today, they're not enough."

Image source: rommma/Fotolia

Study QUESTIONS

- Q1-1** Why is Introduction to MIS the most important class in the business school?
- Q1-2** How will MIS affect me?
- Q1-3** What is MIS?
- Q1-4** How can you use the five-component model?
- Q1-5** What is information?
- Q1-6** What are necessary data characteristics?
- Q1-7** 2027?

"I know which parts can be printed, I just wasn't sure which ones to include. But I'll try again!"

"Well, I appreciate that attitude, but we're a small company, really still a startup in many ways. Everyone needs to pull more than their own weight here. Maybe if we were a bigger company, I'd be able to find a spot for you, see if we could bring you along. But we can't afford to do that now."

"What about my references?"

"I'll be happy to tell anyone that you're reliable, that you work 40 to 45 hours a week, and that you're honest and have integrity."

"Those are important!"

"Yes, they are. But today, they're not enough."

Chapter PREVIEW

"But today, they're not enough."

Do you find that statement sobering? And if hard work isn't enough, what is? We'll begin this book by discussing the key skills that Jennifer (and you) need and explaining why this course is the single best course in the business school for teaching you those key skills.

You may find that last statement surprising. If you are like most students, you have no clear idea of what your MIS class will be about. If someone were to ask you, "What do you study in that class?" you might respond that the class has something to do with computers and maybe computer programming. Beyond that, you might be hard-pressed to say more. You might add, "Well, it has something to do with computers in business," or maybe, "We are going to learn to solve business problems with computers using spreadsheets and other programs." So, how could this course be the most important one in the business school?

We begin with that question. After you understand how important this class will be to your career, we will discuss fundamental concepts. We'll wrap up with some practice on one of the key skills you need to learn.

Q1-1

Why Is Introduction to MIS the Most Important Class in the Business School?

Introduction to MIS is the most important class in the business school. This wasn't always the case. A couple decades ago, majoring in "computers" was considered a nerdy thing to do. But things have changed—a lot. Now the hottest jobs are found in tech companies. People brag about working for tech startups. Apple Inc. is the largest corporation in the world with a market cap of \$590B. The largest IPO offering in history (\$25B) came from the online e-commerce giant Alibaba (Alibaba Holdings Group) in 2014.

But why? Why has information technology changed from a minor corporate support function to a primary driver of corporate profitability? Why are tech jobs some of the highest paid? Why is working for a tech company considered über cool?

The answer has to do with the way technology is fundamentally changing business.

The Digital Revolution

You've probably heard that we live in the **Information Age**, or a period in history where the production, distribution, and control of information is the primary driver of the economy. The Information Age started in the 1970s with the **Digital Revolution**, or the conversion from mechanical

and analog devices to digital devices. This shift to digital devices meant monumental changes for companies, individuals, and our society as a whole.

The problem was, people couldn't really understand how, or even why, this shift was going to affect them. Much like people today, they based their future projections on past events. They knew factories, bureaucracies, mass production, and operational efficiency. But this knowledge didn't prepare them for the changes that were coming.

The Digital Revolution didn't just mean that new "digital" equipment was replacing old mechanical, or analog, equipment. These new digital devices could now be connected to other digital devices and share data among themselves. They could also work faster as processor speed increased. This was groundbreaking. In 1972, computer scientist Gordon Bell recognized that these digital devices would change the world as they evolved and became widely used. He formulated **Bell's Law**, which states that "a new computer class forms roughly each decade establishing a new industry."¹ In other words, digital devices will evolve so quickly that they will enable new platforms, programming environments, industries, networks, and information systems every 10 years.

And it has happened just as Bell predicted. About every 10 years since 1970, entirely new classes of digital devices have emerged. They have created entirely new industries, companies, and platforms. In the 1980s, we saw the rise of the personal computer (PC) and small local networks. In the 1990s, we saw the rise of the Internet and widespread adoption of cellular phones. In the 2000s, we saw a push toward making all "things" network-enabled. Social networking and cloud-based services really took off, creating a flurry of new companies. In the 2010s, so far, we've seen huge advances in 3D printing, drones, and digital reality devices (e.g., Microsoft HoloLens).

The evolution of digital technology has fundamentally altered businesses and become a primary driver of corporate profitability. And it will probably continue to do so for at least the next few decades. The key to understanding how businesses will be affected by this digital evolution is understanding the forces pushing the evolution of these new digital devices.

Evolving Capabilities

To understand the fundamental forces pushing the evolution of digital devices, let's imagine your body is evolving at the same rate as digital devices. Suppose you can run 8 miles per hour today. That's about average. Now suppose, hypothetically, that your body is changing so quickly that you can run twice as fast every 18 months. In 18 months, you'd be able to run 16 mph. In another 18 months, you'd be at 32 mph. Then 64, 128, 256, and 512. Then, after 10 1/2 years of growth, you'd be running 1,024 mph—on foot! How would this change your life?

Well, you'd certainly give up your car. It would be much too slow. Air travel would also probably be a thing of the past. You could start a very profitable package delivery business and quickly corner the market. You could live outside of the city because your commute would be shorter. You'd also need new clothes and some really tough shoes! And this is the key point—not only would *you* change, but *what* you do and *how* you do it would also change. This is Bell's Law. This same thing is happening to digital devices.

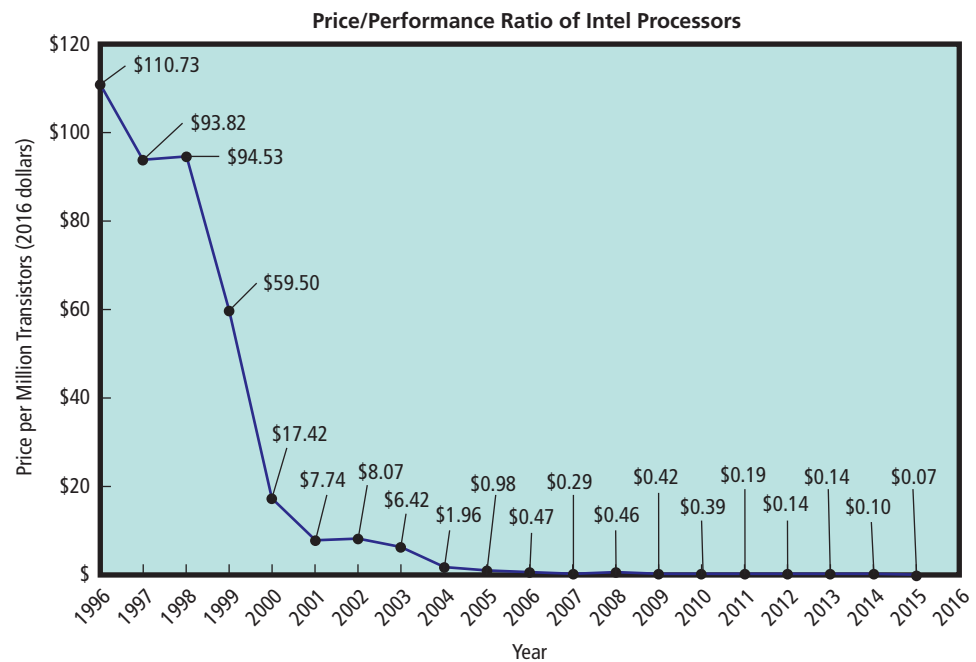
This example may seem silly at first, but it helps you understand how exponential change is affecting digital devices. Processing power, interconnectivity of devices, storage capacity, and bandwidth are all increasing extremely rapidly—so rapidly that it's changing how these devices are used. Let's explore some of these forces by looking at the laws that describe them.

Moore's Law

In 1965, Gordon Moore, cofounder of Intel Corporation, stated that because of technology improvements in electronic chip design and manufacturing, "The number of transistors per square inch on an integrated chip doubles every 18 months." This became known as **Moore's Law**. His statement has been commonly misunderstood to be "The speed of a computer doubles every 18 months," which is incorrect but captures the sense of his principle.

FIGURE 1-1
Computer Price/Performance
Ratio Decreases

Source: © Based on data from Internet Transit Prices- Historical and Projected, DrPeering International. <http://drpeering.net/white-papers/Internet-Transit-Pricing-Historical-And-Projected.php>



Because of Moore's Law, the ratio of price to performance of computer processors has fallen dramatically. In 1996, when the Internet was really starting to take off, a standard CPU cost about \$110 per million transistors. By 2015 that price had fallen to \$0.07 per million transistors.² See Figure 1-1. Increasing processing power has had a greater impact on the global economy in the past 30 years than any other single factor. It has enabled new devices, applications, companies, and platforms. In fact, most tech companies would not exist today if processing power hadn't increased exponentially.

As a future business professional, however, you needn't care how fast of a computer your company can buy for \$1,000. That's not the point. The point is, because of Moore's Law, the cost of data processing is approaching zero. Current applications like new drug development, artificial intelligence, and molecular modeling require massive amounts of processing power. Innovations in these areas are being held back because the cost of buying sufficient processing power is so high. But the good news is that the cost of processing is dropping—rapidly.

Metcalfe's Law

Another fundamental force that is changing digital devices is Metcalfe's Law, named after Robert Metcalfe, the inventor of Ethernet. **Metcalfe's Law** states that the value of a network is equal to the square of the number of users connected to it. In other words, as more digital devices are connected together, the value of that network will increase.³ See Figure 1-2. Metcalfe's Law can be clearly seen in the dramatic rise of the Internet in the 1990s. As more users gained access to the Internet, it became more valuable. The dot-com boom ushered in tech giants like Google, Amazon, and eBay. None of these companies would have existed without large numbers of users connected to the Internet.

Metcalfe's Law isn't lost on tech companies, either. Google's Project Loon is a major effort to bring Internet access to everyone on the planet using a network of inflated balloons floating around the world. One of the primary metrics for social media companies is the number of monthly active users (MAU) using their social network. The more people they can get in their network, the more their company will be worth. And look at the network effects of using products like Microsoft Word. Why do you pay for Microsoft Word when you could use a free word processor like LibreOffice Writer? You pay for Microsoft Word because everyone else uses it.

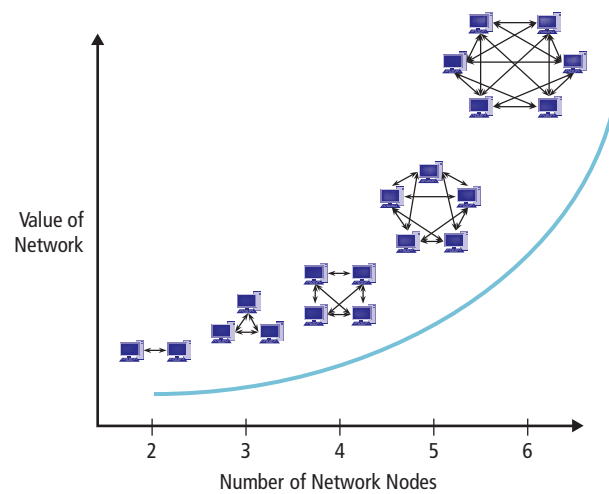


FIGURE 1-2
Increasing Value of Networks

Other Forces Pushing Digital Change

And it’s not just the number of users on the network that’s changing the way we use digital devices—it’s the *speed* of the network. **Nielsen’s Law**, named after Jakob Nielsen, says that network connection speeds for high-end users will increase by 50 percent per year. As networks become faster, new companies, new products, and new platforms will emerge.

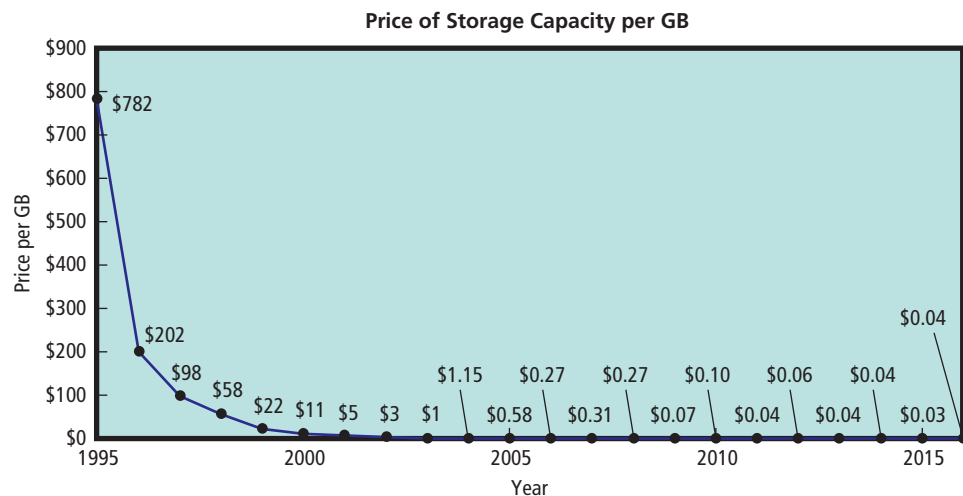
YouTube, for example, started in February 2005 when there wasn’t a lot of video shared over the Internet. But average Internet speeds were increasing to the point where a typical Internet connection could handle a stream of YouTube videos. By November 2006, the company was bought by Google for \$1.65B. If you’re counting, that’s less than 2 years to create a billion-dollar company. Network speed matters. The question is why didn’t Google, Microsoft, IBM, or Apple think of video sharing before the YouTube founders?

There are other forces changing digital devices beyond Nielsen’s Law, Metcalfe’s Law, and Moore’s Law. See Figure 1-3. **Kryder’s Law**, named after Mark Kryder, the former chief technology officer of Seagate Corp., says that the storage density on magnetic disks is increasing at an exponential rate. See Figure 1-4. Digital storage is so important that it’s typically the first question you ask when you buy a new computer, smartphone, or tablet. There’s also power consumption, image resolution, and interconnectivity between devices, all of which are changing, too. And this isn’t a complete list.

Law	Meaning	Implications
Moore’s Law	The number of transistors per square inch on an integrated chip doubles every 18 months.	Computers are getting exponentially faster. The cost of data processing is approaching zero.
Metcalfe’s Law	The value of a network is equal to the square of the number of users connected to it.	More digital devices are connected together. The value of digital and social networks is increasing exponentially.
Nielsen’s Law	Network connection speeds for high-end users will increase by 50 percent per year.	Network speed is increasing. Higher speeds enable new products, platforms, and companies.
Kryder’s Law	The storage density on magnetic disks is increasing at an exponential rate.	Storage capacity is increasing exponentially. The cost of storing data is approaching zero.

FIGURE 1-3
Fundamental Forces
Changing Technology

FIGURE 1-4
Price of Storage Capacity
per GB



This Is the Most Important Class in the School of Business

This takes us back to our original statement that Introduction to MIS is the most important class you will take in the school of business. Why? Because this class will show you how technology is fundamentally changing businesses. You'll learn why executives are constantly trying to find ways to use new technology to create a sustainable competitive advantage. This leads us to the first reason Introduction to MIS is the most important course in the business school today:

Future business professionals need to be able to assess, evaluate, and apply emerging information technology to business.

You need the knowledge of this course to attain that skill.

Q1-2 How Will MIS Affect Me?

Technological change is accelerating. So what? How is this going to affect you? You may think that the evolution of technology is just great. You can hardly wait for the next iGadget to come out.

But pause for a second and imagine you graduated from college in 2004 and went to work for one of the largest and most successful home entertainment companies in the United States—Blockbuster LLC. In 2004, Blockbuster had 60,000 employees and 9,000-plus stores with \$5.9B in annual revenues. Everything looked peachy. Fast-forward 6 years to 2010 and Blockbuster was bankrupt! Why? Because streaming a video over the Internet is easier than driving to a store. High-speed Internet connections made it all possible.

The point is that after graduation you too may choose to go to work for a large, successful, well-branded company. And 6 years down the road, it could be bankrupt because technology changed and it didn't.

How Can I Attain Job Security?

Many years ago, I had a wise and experienced mentor. One day I asked him about job security, and he told me that the only job security that exists is “a marketable skill and the courage to use it.” He continued, “There is no security in our company, there is no security in any government program, there is no security in your investments, and there is no security in Social Security.” Alas, how right he turned out to be.

So, what is a marketable skill? It used to be that one could name particular skills, such as computer programming, tax accounting, or marketing. But today, because of Moore’s Law, Metcalfe’s Law, and Kryder’s Law, the cost of data processing, storage, and communications is essentially zero. Any routine skill can and will be outsourced to the lowest bidder. And if you live in the United States, Canada, Australia, Europe, or another advanced economy, the lowest bidder is unlikely to be you.

Numerous organizations and experts have studied the question of what skills will be marketable during your career. Consider two of them. First, the RAND Corporation, a think tank located in Santa Monica, California, has published innovative and groundbreaking ideas for more than 60 years, including the initial design for the Internet. In 2004, RAND published a description of the skills that workers in the 21st century will need:

Rapid technological change and increased international competition place the spotlight on the skills and preparation of the workforce, particularly the ability to adapt to changing technology and shifting demand. Shifts in the nature of organizations ... favor strong nonroutine cognitive skills.⁴

Whether you’re majoring in accounting, marketing, finance, or information systems, you need to develop strong nonroutine cognitive skills.

What are such skills? Robert Reich, former Secretary of Labor, enumerates four:⁵

- Abstract reasoning
- Systems thinking
- Collaboration
- Ability to experiment

Figure 1-5 shows an example of each. Reread the Falcon Security case that started this chapter, and you’ll see that Jennifer lost her job because of her inability to practice these key skills. Even though Reich’s book was written in the early 1990s, the cognitive skills he mentions are still relevant today because humans, unlike technology, aren’t changing that rapidly.⁶

How Can Intro to MIS Help You Learn Nonroutine Skills?

Introduction to MIS is the best course in the business school for learning Reich’s four key skills because every topic requires you to apply and practice them. Here’s how.

Abstract Reasoning

Abstract reasoning is the ability to make and manipulate models. You will work with one or more models in every course topic and book chapter. For example, later in this chapter you will learn about a *model* of the five components of an information system. This chapter will describe

Skill	Example	Jennifer's Problem at Falcon Security
Abstract Reasoning	Construct a model or representation.	Hesitancy and uncertainty when conceptualizing a method for identifying 3D-printable drone parts.
Systems Thinking	Model system components and show how components' inputs and outputs relate to one another.	Inability to model Falcon Security's operational needs.
Collaboration	Develop ideas and plans with others. Provide and receive critical feedback.	Unwilling to work with others on work-in-progress.
Ability to Experiment	Create and test promising new alternatives, consistent with available resources.	Fear of failure prohibited discussion of new ideas.

FIGURE 1-5
Examples of Critical Skills
for Nonroutine Cognition

how to use this model to assess the scope of any new information system project; other chapters will build upon this model.

In this course, you will not just manipulate models that we have developed, you will also be asked to construct models of your own. In Chapter 5, for example, you'll learn how to create data models, and in Chapter 12 you'll learn to make process models.

Systems Thinking

Can you go to a grocery store, look at a can of green beans, and connect that can to U.S. immigration policy? Can you watch tractors dig up a forest of pulpwood trees and connect that woody trash to Moore's Law? Do you know why Cisco Systems is one of the major beneficiaries of YouTube? Answers to all of these questions require systems thinking. **Systems thinking** is the ability to model the components of the system to connect the inputs and outputs among those components into a sensible whole that reflects the structure and dynamics of the phenomenon observed.

As you are about to learn, this class is about information *systems*. We will discuss and illustrate systems; you will be asked to critique systems; you will be asked to compare alternative systems; you will be asked to apply different systems to different situations. All of those tasks will prepare you for systems thinking as a professional.

Collaboration

Collaboration is the activity of two or more people working together to achieve a common goal, result, or work product. Chapter 2 will teach you collaboration skills and illustrate several sample collaboration information systems. Every chapter of this book includes collaboration exercises that you may be assigned in class or as homework.

Here's a fact that surprises many students: Effective collaboration isn't about being nice. In fact, surveys indicate the single most important skill for effective collaboration is to give and receive critical feedback. Advance a proposal in business that challenges the cherished program of the VP of marketing, and you'll quickly learn that effective collaboration skills differ from party manners at the neighborhood barbeque. So, how do you advance your idea in the face of the VP's resistance? And without losing your job? In this course, you can learn both skills and information systems for such collaboration. Even better, you will have many opportunities to practice them.

Ability to Experiment

"I've never done this before."

"I don't know how to do it."

"But will it work?"

"Is it too weird for the market?"

Fear of failure: the fear that paralyzes so many good people and so many good ideas. In the days when business was stable, when new ideas were just different verses of the same song, professionals could allow themselves to be limited by fear of failure.

Let's look at an example of the application of social networking to the oil change business. Is there a legitimate application of social networking there? If so, has anyone ever done it? Is there anyone in the world who can tell you what to do? How to proceed? No. As Reich says, professionals in the 21st century need to be able to experiment.

Successful experimentation is not throwing buckets of money at every crazy idea that enters your head. Instead, **experimentation** is making a reasoned analysis of an opportunity, envisioning potential solutions, evaluating those possibilities, and developing the most promising ones, consistent with the resources you have.

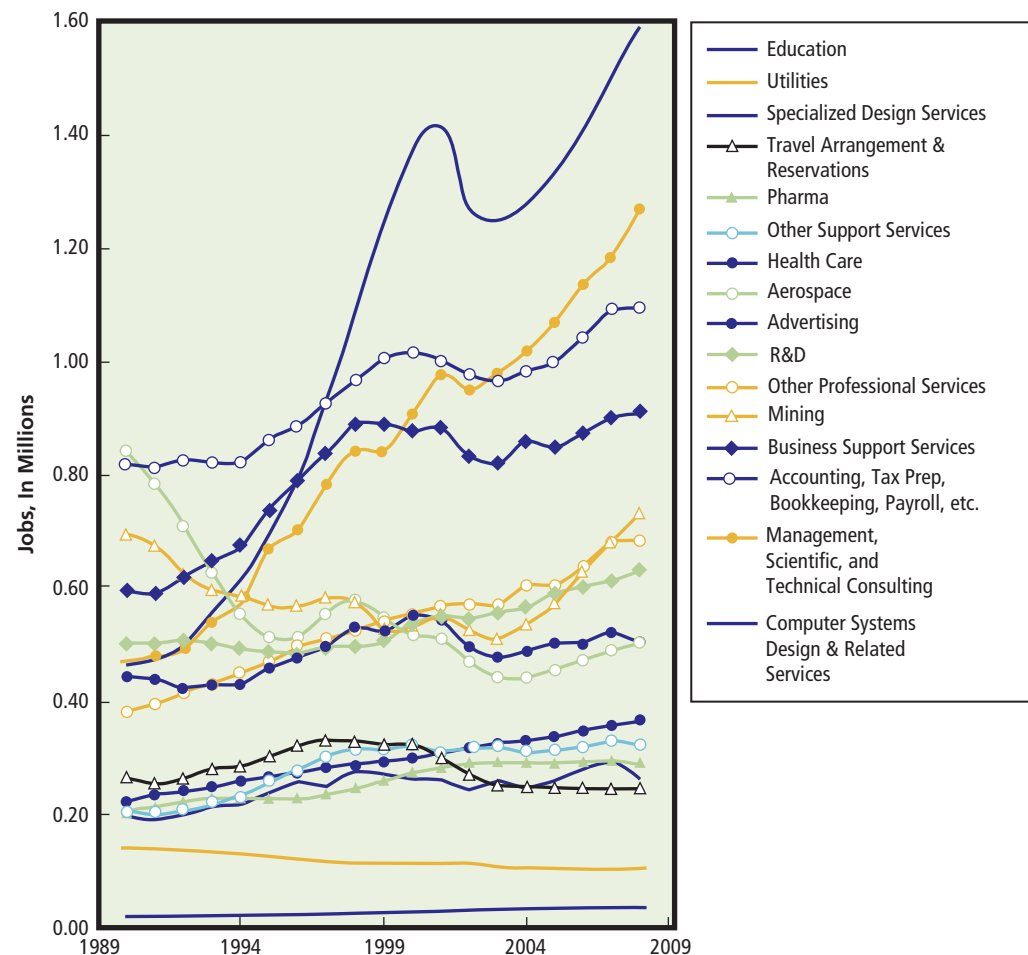
In this course, you will be asked to use products with which you have no familiarity. Those products might be Microsoft Excel or Access, or they might be features and functions of Blackboard that you have not used. Or you may be asked to collaborate using OneDrive or SharePoint or Google

Drive. Will your instructor explain and show every feature of those products that you'll need? You should hope not. You should hope your instructor will leave it up to you to experiment, to envision new possibilities on your own, and to experiment with those possibilities, consistent with the time you have available.

Jobs

Employment is another factor that makes the Introduction to MIS course vitally important to you. Accenture, a technology consulting and outsourcing company, conducted a survey of college graduates in 2015. It found that 67 percent of students about to graduate expected to be employed full-time, but only 52 percent of the prior year's graduates actually found full-time employment. Further, 49 percent of recent graduates were working in jobs that did not require their degree or were otherwise underemployed.⁷ But this is not the case in job categories related to information systems.

Spence and Hlatshwayo studied employment in the United States from 1990 to 2008.⁸ They defined a *tradable job* as one that was not dependent on a particular location; this distinction is important because such jobs can be outsourced overseas. As shown in Figure 1-6, computer systems design and related services had the strongest growth of any job type in that category. The number of jobs dipped substantially after the dot-com bust in 2000; since 2003, however, job growth has not only recovered but accelerated dramatically. While this category includes technical positions such as computer programmer and database administrator, it includes nontechnical positions such as computer programmer and database administrator, it includes nontechnical



sales, support, and business management jobs as well. By the way, because Figure 1-6 shows tradable jobs, it puts an end to the myth that all the good computer jobs have gone overseas. According to their data analysis, sourced from the U.S. Bureau of Labor Statistics, that simply has not happened.

The data in Figure 1-6 stops at 2009 and, unfortunately, Spence and Hlatshwayo have not updated their study. However, Figure 1-7 shows the U.S. Bureau of Labor Statistics salary growth from 2012 to 2014 for business managers, computer and information technology, and other business occupations. It also shows job growth projections for the years 2014 to 2024.⁹ Growth rates of all information systems–related jobs are above the 7 percent average for all occupations.

Information systems and computer technology provide job and wage benefits beyond just IS professionals. Acemoglu and Autor published an impressive empirical study of jobs and wages in the United States and parts of Europe from the 1960s to 2010. They found that early in this period, education and industry were the strongest determinants of employment and salary. However, since 1990, the most significant determinant of employment and salary is the nature of work performed. In short, as the price of computer technology plummets, the value of jobs that benefit from it increases dramatically.¹⁰ For example, plentiful, high-paying jobs are available to business professionals who know how to use information systems to improve business process quality, or those who know how to interpret data mining results for improved marketing, or those who know how to use emerging technology like 3D printing to create new products and address new markets. See the Career Guide on pages 28–29 for more thoughts on why you might consider an IS-related job.

FIGURE 1-7
Bureau of Labor Statistics
Occupational Outlook
2014–2024
Source: Based on Bureau of Labor Statistics, “Computer Systems Analysts,” Occupational Outlook Handbook, accessed April 16, 2016, www.bls.gov/ooh.

	2012 Median Pay	2014 Median Pay	Job Growth (%) 2014–24	Job Growth (N) 2014–24
Business Managers				
Marketing Managers	\$ 115,750	\$ 123,450	9%	19,700
Information Systems Managers	\$ 120,950	\$ 127,640	15%	53,700
Financial Managers	\$ 109,740	\$ 115,320	7%	37,700
Human Resources Managers	\$ 99,720	\$ 102,780	9%	10,800
Sales Managers	\$ 105,260	\$ 110,660	5%	19,000
Computer and Information Technology				
Computer Network Architects	\$ 91,000	\$ 98,430	9%	12,700
Computer Systems Analysts	\$ 79,680	\$ 82,710	21%	118,600
Database Administrators	\$ 118,700	\$ 80,280	11%	13,400
Information Security Analysts	\$ 87,170	\$ 88,890	18%	14,800
Network and Systems Admin.	\$ 72,560	\$ 75,790	8%	30,200
Software Developers	\$ 93,350	\$ 97,990	17%	186,600
Web Developers	\$ 62,500	\$ 63,490	27%	39,500
Business Occupations				
Accountants and Auditors	\$ 63,550	\$ 65,940	11%	142,400
Financial Analysts	\$ 76,950	\$ 78,620	12%	32,300
Management Analysts	\$ 78,600	\$ 80,880	14%	103,400
Market Research Analysts	\$ 60,300	\$ 61,290	19%	92,300
Logisticians	\$ 72,780	\$ 73,870	2%	2,500
Human Resources Specialists	\$ 55,640	\$ 57,420	5%	22,000

What Is the Bottom Line?

The bottom line? This course is the most important course in the business school because:

1. It will give you the background you need to assess, evaluate, and apply emerging information systems technology to business.
2. It can give you the ultimate in job security—marketable skills—by helping you learn abstraction, systems thinking, collaboration, and experimentation.
3. Many well-paid MIS-related jobs are in high demand.

Q1-3 What Is MIS?

We've used the term *MIS* several times, and you may be wondering exactly what it is. **MIS** stands for **management information systems**, which we define as *the management and use of information systems that help organizations achieve their strategies*. MIS is often confused with the closely related terms *information technology* and *information systems*. An **information system (IS)** is an assembly of hardware, software, data, procedures, and people that produces information. In contrast, **information technology (IT)** refers to the products, methods, inventions, and standards used for the purpose of producing information.

How are MIS, IS, and IT different? You cannot buy an IS. But you can buy IT; you can buy or lease hardware, you can license programs and databases, and you can even obtain predesigned procedures. Ultimately, however, it is *your* people who will assemble the IT you purchase and execute those procedures to employ that new IT. Information technology drives the development of new information systems.

For any new system, you will always have training tasks (and costs), you will always have the need to overcome employees' resistance to change, and you will always need to manage the employees as they use the new system. Hence, you can buy IT, but you cannot buy IS. Once your new information system is up and running, it must be managed and used effectively in order to achieve the organization's overall strategy. This is MIS.

Consider a simple example. Suppose your organization decides to develop a Facebook page. Facebook provides the IT. It provides the hardware and programs, the database structures, and standard procedures. You, however, must create the IS. You have to provide the data to fill your portion of its database, and you must extend its standard procedures with your own procedures for keeping that data current. Those procedures need to provide, for example, a means to review your page's content regularly and a means to remove content that is judged inappropriate. Furthermore, you need to train employees on how to follow those procedures and manage those employees to ensure that they do. MIS is the management of your Facebook page to achieve your overall organization's strategy. Managing your own Facebook page is as simple an IS as exists. Larger, more comprehensive IS that involve many, even dozens, of departments and thousands of employees require considerable work.

The definition of MIS has three key elements: *management and use, information systems, and strategies*. Let's consider each, starting first with information systems and their components.

Components of an Information System

A **system** is a group of components that interact to achieve some purpose. As you might guess, an *information system (IS)* is a group of components that interacts to produce information. That sentence, although true, raises another question: What are these components that interact to produce information?

Figure 1-8 shows the **five-component framework**—a model of the components of an information system: **computer hardware, software, data, procedures, and people**. These five components are present in every information system, from the simplest to the most complex. For example, when you use a computer to write a class report, you are using hardware (the computer, storage disk, keyboard, and monitor), software (Word, WordPerfect, or some other word-processing program), data (the words, sentences, and paragraphs in your report), procedures (the methods you use to start the program, enter your report, print it, and save and back up your file), and people (you).

Consider a more complex example, say, an airline reservation system. It, too, consists of these five components, even though each one is far more complicated. The hardware consists of thousands of computers linked together by data communications hardware. Hundreds of different programs coordinate communications among the computers, and still other programs perform the reservations and related services. Additionally, the system must store millions upon millions of characters of data about flights, customers, reservations, and other facts. Hundreds of different procedures are followed by airline personnel, travel agents, and customers. Finally, the information system includes people, not only the users of the system but also those who operate and service the computers, those who maintain the data, and those who support the networks of computers.

The important point here is that the five components in Figure 1-8 are common to all information systems, from the smallest to the largest. As you think about any information system, including a new one like social networking, learn to look for these five components. Realize, too, that an information system is not just a computer and a program, but rather an assembly of computers, programs, data, procedures, and people.

As we will discuss later in this chapter, these five components also mean that many different skills are required besides those of hardware technicians or computer programmers when building or using an information system. See the Career Guide starting on page 28 for more.

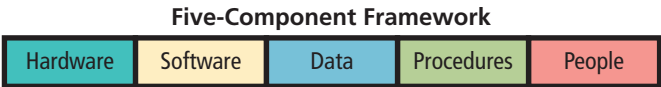
Before we move forward, note that we have defined an information system to include a computer. Some people would say that such a system is a **computer-based information system**. They would note that there are information systems that do not include computers, such as a calendar hanging on the wall outside of a conference room that is used to schedule the room’s use. Such systems have been used by businesses for centuries. Although this point is true, in this book we focus on computer-based information systems. To simplify and shorten the book, we will use the term *information system* as a synonym for *computer-based information system*.

Management and Use of Information Systems

The next element in our definition of MIS is the *management and use* of information systems. Here we define management to mean develop, maintain, and adapt. Information systems do not pop up like mushrooms after a hard rain; they must be developed. They must also be maintained, and, because business is dynamic, they must be adapted to new requirements.

You may be saying, “Wait a minute, I’m a finance (or accounting or management) major, not an information systems major. I don’t need to know how to manage information systems.” If you are saying that, you are like a lamb headed for shearing. Throughout your career, in whatever field you choose, information systems will be built for your use and sometimes under your direction. To create an information system that meets your needs, you need to take an *active role* in that system’s development. Even if you are not a programmer or a database designer or some other IS professional, you must take an active role in specifying the system’s requirements and in managing the system’s development project. You will also have an important role in testing the new system. Without active involvement on your part, it will only be good luck that causes the new system to meet your needs.

FIGURE 1-8
Five Components of an
Information System



Security is critically important when using information systems today. You'll learn much more about it in Chapter 10. But you need to know about strong passwords and their use now, before you get to that chapter. Read and follow the Security Guide on pages 26–27.

As a business professional, you are the person who understands business needs and requirements. If you want to apply social networking to your products, you are the one who knows how best to obtain customer responses. The technical people who build networks, the database designers who create the database, the IT people who configure the computers—none of these people know what is needed and whether the system you have is sufficient or whether it needs to be adapted to new requirements. You do!

In addition to management tasks, you will also have important roles to play in the *use* of information systems. Of course, you will need to learn how to employ the system to accomplish your job tasks. But you will also have important ancillary functions as well. For example, when using an information system, you will have responsibilities for protecting the security of the system and its data. You may also have tasks for backing up data. When the system fails (all do, at some point), you will have tasks to perform while the system is down as well as tasks to accomplish to help recover the system correctly and quickly.

Achieving Strategies

The last part of the definition of MIS is that information systems exist to help organizations *achieve their strategies*. First, realize that this statement hides an important fact: Organizations themselves do not “do” anything. An organization is not alive, and it cannot act. It is the people within a business who sell, buy, design, produce, finance, market, account, and manage. So, information systems exist to help people who work in an organization to achieve the strategies of that business.

Information systems are not created for the sheer joy of exploring technology. They are not created so the company can be “modern” or so the company can show it has a social networking presence on the Web. They are not created because the information systems department thinks it needs to be created or because the company is “falling behind the technology curve.”

This point may seem so obvious that you might wonder why we mention it. Every day, however, some business somewhere is developing an information system for the wrong reasons. Right now, somewhere in the world, a company is deciding to create a Facebook presence for the sole reason that “every other business has one.” This company is not asking questions such as:

- “What is the purpose of our Facebook page?”
- “What is it going to do for us?”
- “What is our policy for employees’ contributions?”
- “What should we do about critical customer reviews?”
- “Are the costs of maintaining the page sufficiently offset by the benefits?”

But that company should ask those questions! Chapter 3 addresses the relationship between information systems and strategy in more depth. Chapter 8 addresses social media and strategy specifically.

Again, MIS is the development and use of information systems that help businesses achieve their strategies. You should already be realizing that there is much more to this class than buying a computer, working with a spreadsheet, or creating a Web page.

For more information on how an understanding of MIS can broaden your career options, see the Career Guide on pages 28–29.

Q1-4 How Can You Use the Five-Component Model?

The five-component model in Figure 1-8 can help guide your learning and thinking about IS, both now and in the future. To understand this framework better, first note in Figure 1-9 that these five components are symmetric. The outermost components, hardware and people, are both actors; they can take actions. The software and procedure components are both sets of instructions: Software is instructions for hardware, and procedures are instructions for people. Finally, data is the bridge between the computer side on the left and the human side on the right.

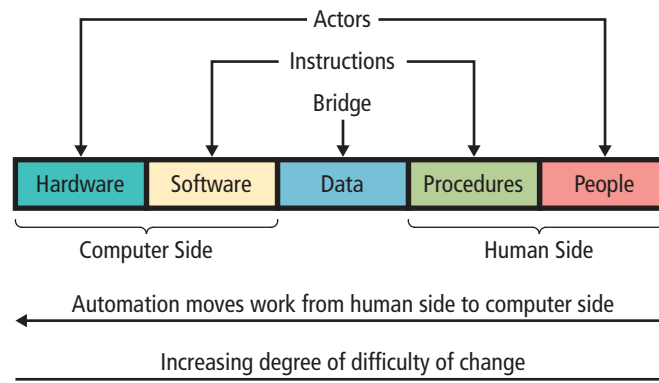


FIGURE 1-9
Characteristics of the Five
Components

Now, when we automate a business task, we take work that people are doing by following procedures and move it so that computers will do that work, following instructions in software. Thus, the process of automation is a process of moving work from the right side of Figure 1-9 to the left.

The Most Important Component—You

You are part of every information system that you use. When you consider the five components of an information system, the last component, people, includes you. Your mind and your thinking are not merely a component of the information systems you use; they are the most important component.

As you will learn later in this chapter, computer hardware and programs manipulate data, but no matter how much data they manipulate, it is still just data. It is only humans that produce information. When you take a set of data, say, a list of customer responses to a marketing campaign, that list, no matter if it was produced using 10,000 servers and Hadoop (Chapter 9), is still just data. It does not become information until you or some other human take it into your mind and are informed by it.

Even if you have the largest computer farm in the world and even if you are processing that data with the most sophisticated programs, if you do not know what to do with the data those programs produce, you are wasting your time and money. The quality of your thinking is what determines the quality of the information that is produced.

Substantial cognitive research has shown that although you cannot increase your basic IQ, you can dramatically increase the quality of your thinking. That is one reason we have emphasized the need for you to use and develop your abstract reasoning. The effectiveness of an IS depends on the abstract reasoning of the people who use it.

All Components Must Work

Information systems often encounter problems—despite our best efforts, they don't work right. And in these situations, blame is frequently placed on the wrong component. You will often hear people complain that the computer doesn't work, and certainly hardware or software is sometimes at fault. But with the five-component model, you can be more specific, and you have more suspects to consider. Sometimes the data is not in the right format or, worse, is incorrect. Sometimes, the procedures are not clear and the people using the system are not properly trained. By using the five-component model, you can better locate the cause of a problem and create effective solutions.

High-Tech Versus Low-Tech Information Systems

Information systems differ in the amount of work moved from the human side (people and procedures) to the computer side (hardware and programs). For example, consider two different versions of a customer support information system: A system that consists only of a file of email addresses

SO WHAT?

A IS FOR ALPHABET

We are living in an era referred to as the Information Age, a period in human history characterized by the shift from an economy based on industrial production to one based on information and computerization.¹¹ This shift has changed virtually every aspect of our lives, from the way we communicate with friends, coworkers, and loved ones to the way we purchase goods and carry out various financial transactions. What advancement made this shift possible? You guessed it—the Internet!

As with most technological innovations, the Internet started out as a project sponsored by both research and governmental entities. It took several decades to lay the groundwork for the Internet as we know it today, and the tipping point for widespread Internet use was the introduction of Netscape Navigator, the Web browser of choice in the mid-1990s. The adoption and use of Netscape was critical because it allowed fledgling Internet users to access information posted by other users around the world. At that time, the content available on the Internet was minimal and only tech-savvy users could create and manage content. Over time, the amount of information available became so great that new tools were needed to search the Internet. Enter Google.

Google Searches for a Better Future in Alphabet

Today, Google is the dominant Internet search engine and is one of the largest publicly traded companies in the world. What you may not realize is that Google's core search engine service (Google Search) is only one of many successful products in a larger portfolio. Google has turned Google Maps, YouTube, Chrome, and Android into successful standalone offerings. The success and diversity of Google's many projects led the company to announce that, as of August 10, 2015, it was a subsidiary of an overarching company named Alphabet Inc.¹²

Google founders Larry Page and Sergey Brin decided that it was time to reduce their involvement in the daily management of Google projects. To facilitate this change, each project was transitioned into a standalone company with its own CEO, and each standalone company is a subsidiary of Alphabet Inc. In this way, Page and Brin can manage the overall strategic objectives of the subsidiaries without having to immerse themselves in the daily operations of each company.



Why did they choose the name Alphabet? In a blog post about the new direction of the company, Page revealed that there are a number of meanings associated with this new name. First, an alphabet represents the collection of letters used to define a language, which Page classifies as one of humanity's most profound creations. Second, alphabets serve as the basis for Google searches around the world. Finally, in the world of finance, alpha represents an investment return above the benchmark, which according to Page, is something the company is continuously striving to achieve.¹³

While Page's rationale about the restructuring makes sense, outsiders have identified this strategy as a direct response to Google's struggles to retain top talent in a highly competitive industry. Before restructuring, Google housed a wide variety of projects and research initiatives under one roof; this led to an increasingly bureaucratic climate and inherent limitations on the career trajectories of industry superstars.¹⁴ Alphabet was born to create a new corporate environment in which top talent can thrive. In the Alphabet hierarchy, individual companies are much more nimble and better able to provide the autonomy and efficiency that smaller companies offer.

When future generations look back at the Information Age, it is likely Alphabet will be seen as playing a prominent role. With all of the projects the company is pursuing—everything from drones and robots to medical research and artificial intelligence—it is intriguing to think about the role Alphabet will play in shaping the next era of humanity.

Questions

1. The feature identifies the Internet as a catalyst for the Information Age. What other innovations have contributed to this era of unprecedented access to information via computers?
2. Think about your daily use of phones, tablets, and traditional desktop/laptop computers. How many searches do you perform each day? What types of things do you search for on the Internet? Do you use Google for these searches? If not, what search engine do you use? Why do you use that search engine?
3. Conduct an Internet search to find a project or product offered by Alphabet that you had not heard about before reading this feature. Are you surprised at the diversity of the company and its projects and research initiatives?
4. What technological innovation do you think will drive the next great era in humanity? What do you think the defining elements of that era will be?

and an email program is a very low-tech system. Only a small amount of work has been moved from the human side to the computer side. Considerable human work is required to determine when to send which emails to which customers.

In contrast, a customer support system that keeps track of the equipment that customers have and the maintenance schedules for that equipment and then automatically generates email reminders to customers is a higher-tech system. This simply means that more work has been moved from the human side to the computer side. The computer is providing more services on behalf of the humans.

Often, when considering different information systems alternatives, it will be helpful to consider the low-tech versus high-tech alternatives in light of the amount of work being moved from people to computers.

The Ethics Guide in each chapter of this book considers the ethics of information systems use. These guides challenge you to think deeply about ethical standards, and they provide for some interesting discussions with classmates. The Ethics Guide on pages 23–24 considers the ethics of presenting data that deceives the viewer.

Understanding the Scope of New Information Systems

The five-component framework can also be used when assessing the scope of new systems. When in the future some vendor pitches the need for a new technology to you, use the five components to assess how big of an investment that new technology represents. What new hardware will you need? What programs will you need to license? What databases and other data must you create? What procedures will need to be developed for both use and administration of the information system? And, finally, what will be the impact of the new technology on people? Which jobs will change? Who will need training? How will the new technology affect morale? Will you need to hire new people? Will you need to reorganize?

Components Ordered by Difficulty and Disruption

Finally, as you consider the five components, keep in mind that Figure 1-9 shows them in order of ease of change and the amount of organizational disruption. It is a simple matter to order additional hardware. Obtaining or developing new programs is more difficult. Creating new databases or changing the structure of existing databases is still more difficult. Changing procedures, requiring people to work in new ways, is even more difficult. Finally, changing personnel responsibilities and reporting relationships and hiring and terminating employees are all very difficult and very disruptive to the organization.

Q1-5 What Is Information?

Based on our earlier discussions, we can now define an information system as an assembly of hardware, software, data, procedures, and people that interact to produce information. The only term left undefined in that definition is *information*, and we turn to it next.

Definitions Vary

Information is one of those fundamental terms that we use every day but that turns out to be surprisingly difficult to define. Defining information is like defining words such as *alive* and *truth*. We know what those words mean, we use them with each other without confusion, but nonetheless, they are difficult to define.

In this text, we will avoid the technical issues of defining information and will use common, intuitive definitions instead. Probably the most common definition is that **information** is knowledge derived from data, whereas *data* is defined as recorded facts or figures. Thus, the facts that employee James Smith earns \$70.00 per hour and that Mary Jones earns \$50.00 per hour are *data*. The statement that the average hourly wage of all the graphic designers is \$60.00 per hour is *information*. Average wage is knowledge derived from the data of individual wages.

Another common definition is that *information is data presented in a meaningful context*. The fact that Jeff Parks earns \$30.00 per hour is data.¹⁵ The statement that Jeff Parks earns less than half the average hourly wage of the company’s graphic designers, however, is information. It is data presented in a meaningful context.

Another definition of information that you will hear is that *information is processed data* or, sometimes, *information is data processed by summing, ordering, averaging, grouping, comparing, or other similar operations*. The fundamental idea of this definition is that we do something to data to produce information.

There is yet a fourth definition of information, which was set out by the great research psychologist Gregory Bateson. He defined information as *a difference that makes a difference*.

For the purposes of this text, any of these definitions of information will do. Choose the definition of information that makes sense to you. The important point is that you discriminate between data and information. You also may find that different definitions work better in different situations.

Where Is Information?

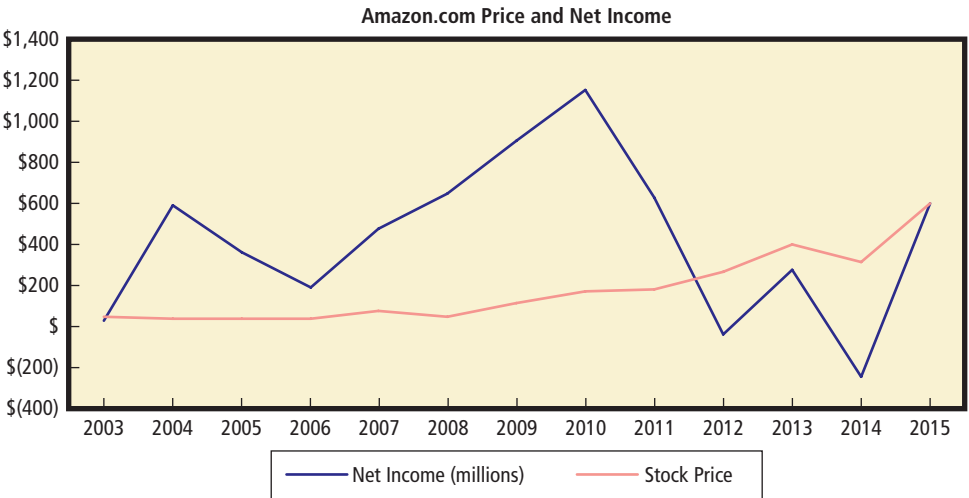
Suppose you create a graph of Amazon.com’s stock price and net income over its history, like that shown in Figure 1-10. Does that graph contain information? Well, if it shows a difference that makes a difference or if it presents data in a meaningful context, then it fits two of the definitions of information, and it’s tempting to say that the graph contains information.

However, show that graph to your family dog. Does your dog find information in that graph? Well, nothing about Amazon.com, anyway. The dog might learn what you had for lunch, but it won’t obtain any information about Amazon.com’s stock price over time.

Reflect on this experiment and you will realize that the graph is not, itself, information. The graph is data that you and other humans *perceive*, and from that perception you *conceive*

FIGURE 1-10 Amazon.com Stock Price and Net Income

Source: © Based on data from Wikinvest, [http://www.wikinvest.com/stock/Amazon.com_\(AMZN\)/Data/Net_Income/2015](http://www.wikinvest.com/stock/Amazon.com_(AMZN)/Data/Net_Income/2015)



information. In short, if it's on a piece of paper or on a digital screen, it's data. If it's in the mind of a human, it's information.

Why, you're asking yourself, do I care? Well, for one, it further explains why you, as a human, are the most important part of any information system you use. The quality of your thinking, of your ability to conceive information from data, is determined by your cognitive skills. *The data is just the data; the information you conceive from it is the value that you add to the information system.*

Furthermore, people have different perceptions and points of view. Not surprisingly, then, they will conceive different information from the same data. You cannot say to someone, "Look, it's right there in front of you, in the data" because it's not right there in the data. Rather, it's in your head and in their heads, and your job is to explain what you have conceived so that others can understand it.

Finally, once you understand this, you'll understand that all kinds of common sentences make no sense. "I sent you that information" cannot be true. "I sent you the data, from which you conceived the information" is the most we can say. During your business career, this observation will save you untold frustration if you remember to apply it.

Q1-6

What Are Necessary Data Characteristics?

You have just learned that humans conceive information from data. As stated, the quality of the information that you can create depends, in part, on your thinking skills. It also depends, however, on the quality of the data you are given. Figure 1-11 summarizes critical data characteristics.

Accurate

First, good information is conceived from accurate, correct, and complete data that has been processed correctly as expected. Accuracy is crucial; business professionals must be able to rely on the results of their information systems. The IS function can develop a bad reputation in the organization if a system is known to produce inaccurate data. In such a case, the information system becomes a waste of time and money as users develop work-arounds to avoid the inaccurate data.

A corollary to this discussion is that you, a future user of information systems, ought not to rely on data just because it appears in the context of a Web page, a well-formatted report, or a fancy query. It is sometimes hard to be skeptical of data delivered with beautiful, active graphics. Do not be misled. When you begin to use a new information system, be skeptical. Cross-check the data you are receiving. After weeks or months of using a system, you may relax. Begin, however, with skepticism. Again, you cannot conceive accurate information from inaccurate data.

Timely

Good information requires that data be timely—available in time for its intended use. A monthly report that arrives 6 weeks late is most likely useless. The data arrives long after the decisions have been made that needed your information. An information system that sends you a poor customer credit report after you have shipped the goods is unhelpful and frustrating. Notice that timeliness can be measured against a calendar (6 weeks late) or against events (before we ship).

FIGURE 1-11
Data Characteristics Required
for Good Information

- **Accurate**
- **Timely**
- **Relevant**
 - To context
 - To subject
- **Just sufficient**
- **Worth its cost**

When you participate in the development of an IS, timeliness will be part of the requirements you specify. You need to give appropriate and realistic timeliness needs. In some cases, developing systems that provide data in near real time is much more difficult and expensive than producing data a few hours later. If you can get by with data that is a few hours old, say so during the requirements specification phase.

Consider an example. Suppose you work in marketing and you need to be able to assess the effectiveness of new online ad programs. You want an information system that not only will deliver ads over the Web but that also will enable you to determine how frequently customers click on those ads. Determining click ratios in near real time will be very expensive; saving the data in a batch and processing it some hours later will be much easier and cheaper. If you can live with data that is a day or two old, the system will be easier and cheaper to implement.

Relevant

Data should be relevant both to the context and to the subject. Considering context, you, the CEO, need data that is summarized to an appropriate level for your job. A list of the hourly wage of every employee in the company is unlikely to be useful. More likely, you need average wage information by department or division. A list of all employee wages is irrelevant in your context.

Data should also be relevant to the subject at hand. If you want data about short-term interest rates for a possible line of credit, then a report that shows 15-year mortgage interest rates is irrelevant. Similarly, a report that buries the data you need in pages and pages of results is also irrelevant to your purposes.

Just Barely Sufficient

Data needs to be sufficient for the purpose for which it is generated, but just barely so. We are inundated with data; one of the critical decisions that each of us has to make each day is what data to ignore. The higher you rise into management, the more data you will be given, and because there is only so much time, the more data you will need to ignore. So, data should be sufficient, but just barely.

Worth Its Cost

Data is not free. There are costs for developing an information system, costs of operating and maintaining that system, and costs of your time and salary for reading and processing the data the system produces. For data to be worth its cost, an appropriate relationship must exist between the cost of data and its value.

Consider an example. What is the value of a daily report of the names of the occupants of a full graveyard? Zero, unless grave robbery is a problem for the cemetery. The report is not worth the time required to read it. It is easy to see the importance of economics for this silly example. It will be more difficult, however, when someone proposes new technology to you. You need to be ready to ask, “What’s the value of the information I can conceive from this data?” “What is the cost?” “Is there an appropriate relationship between value and cost?” Information systems should be subject to the same financial analyses to which other assets are subjected.

Q1-7 2027?



At the start of this chapter you read about how technology is changing exponentially. Processing power, connectivity of devices, network speed, and data storage are increasing so rapidly that they fundamentally change the way we use technology every 10 years (Bell’s Law). Businesspeople need to be able to assess, evaluate, and apply emerging technology. They need to know how these changes affect businesses.

ETHICS GUIDE

ETHICS AND PROFESSIONAL RESPONSIBILITY

Suppose you're a young marketing professional who has just taken a new promotional campaign to market. The executive committee asks you to present a summary of the sales effect of the campaign, and you produce the graph shown in Figure 1. As shown, your campaign was just in the nick of time; sales were starting to fall the moment your campaign kicked in. After that, sales boomed.

But note the vertical axis has no quantitative labels. If you add quantities, as shown in Figure 2, the performance is less impressive. It appears that the substantial growth amounts to less than 20 units. Still the curve of the graph is impressive, and if no one does the arithmetic, your campaign will appear successful.

This impressive shape is only possible, however, because Figure 2 is not drawn to scale. If you draw it to scale, as shown in Figure 3, your campaign's success is, well, problematic, at least for you.

Which of these graphs do you present to the committee? Each chapter of this text includes an Ethics Guide that explores ethical and responsible behavior in a variety of MIS-related contexts. In this chapter, we'll examine the ethics of data and information.

Centuries of philosophical thought have addressed the question "What is right behavior?" and we can't begin to discuss all of it here. You will learn much of it, however, in your business ethics class. For our purposes, we'll use two of the major pillars in the philosophy of ethics. We introduce the first one here and the second in Chapter 2.

The German philosopher Immanuel Kant defined the *categorical imperative* as the principle that *one should behave only in a way that one would want the behavior to be a universal law*. Stealing is not such behavior because if everyone steals, nothing can be owned. Stealing cannot be a universal law. Similarly, lying cannot be consistent with the categorical imperative because if everyone lies, words are useless.

When you ask whether a behavior is consistent with this principle, a good litmus test is "Are you willing to publish your behavior to the world? Are you willing to put it on your Facebook page? Are you willing to say what you've done to all the players involved?" If not, your behavior is not ethical, at least not in the sense of Kant's categorical imperative.

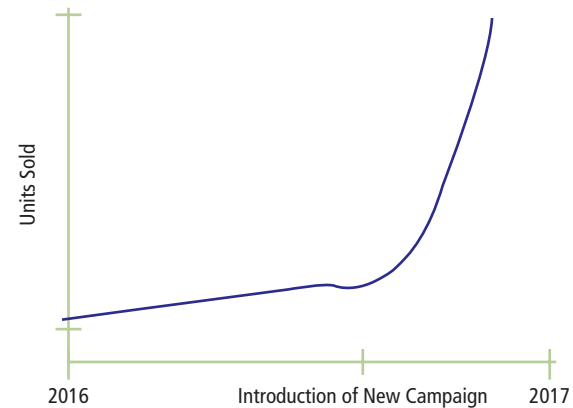


FIGURE 1

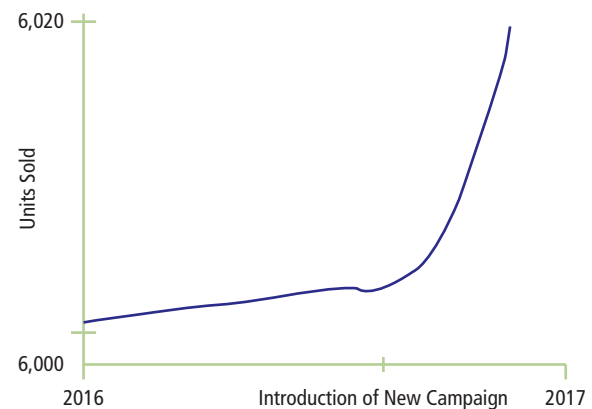


FIGURE 2

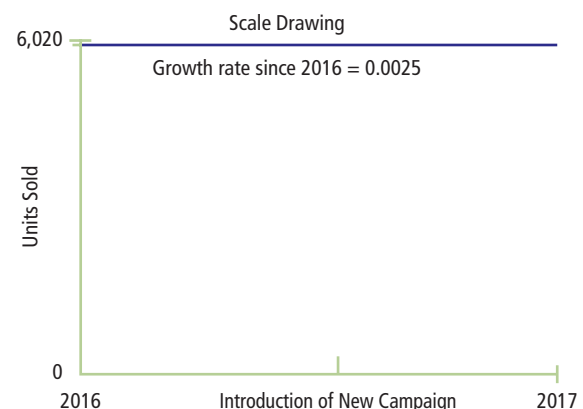


FIGURE 3

Kant defined *duty* as the necessity to act in accordance with the categorical imperative. *Perfect duty* is behavior that must always be met. Not lying is a perfect duty. *Imperfect duty* is action that is praiseworthy but not required according to the categorical imperative. Giving to charity is an example of an imperfect duty.

Kant used the example of cultivating one's own talent as an imperfect duty, and we can use that example as a way of defining professional responsibility. Business professionals have an imperfect duty to obtain the skills necessary to accomplish their jobs. We also have an imperfect duty to continue to develop our business skills and abilities throughout our careers.

We will apply these principles in the chapters that follow. For now, use them to assess your beliefs about Figures 1 through 3 by answering the following questions.



Source: Pressmaster/Fotolia



DISCUSSION QUESTIONS

1. Restate Kant's categorical imperative using your own words. Explain why cheating on exams is not consistent with the categorical imperative.
2. While there is some difference of opinion, most scholars believe that the Golden Rule ("Do unto others as you would have them do unto you.") is not equivalent to Kant's categorical imperative. Justify this belief.
3. Using the Bateson definition (discussed in Q1-5) that information is a difference that makes a difference:
 - a. Explain how the features of the graph in Figure 1 influence the viewer to create information.
 - b. Explain how the features of the graph in Figure 3 influence the viewer to create information.
 - c. Which of these graphs is consistent with Kant's categorical imperative?
4. Suppose you created Figure 1 using Microsoft Excel. To do so, you keyed the data into Excel and clicked the Make Graph button (there is one, though it's not called that). Voilà, Excel created Figure 1 without any labels and drawn out of scale as shown. Without further consideration, you put the result into your presentation.
 - a. Is your behavior consistent with Kant's categorical imperative? Why or why not?
 - b. If Excel automatically produces graphs like Figure 1, is Microsoft's behavior consistent with Kant's categorical imperative? Why or why not?
5. Change roles. Assume now you are a member of the executive committee. A junior marketing professional presents Figure 1 to the committee, and you object to the lack of labels and the scale. In response, the junior marketing professional says, "Sorry, I didn't know. I just put the data into Excel and copied the resulting graph." What conclusions do you, as an executive, make about the junior marketing professional in response to this statement?
6. Is the junior marketing person's response in question 5 a violation of a perfect duty? Of an imperfect duty? Of any duty? Explain your response.
7. If you were the junior marketing professional, which graph would you present to the committee?
8. According to Kant, lying is not consistent with the categorical imperative. Suppose you are invited to a seasonal barbeque at the department chair's house. You are served a steak that is tough, overcooked, and so barely edible that you secretly feed it to the department chair's dog (who appears to enjoy it). The chairperson asks you, "How is your steak?" and you respond, "Excellent, thank you."
 - a. Is your behavior consistent with Kant's categorical imperative?
 - b. The steak seemed to be excellent to the dog. Does that fact change your answer to part a?
 - c. What conclusions do you draw from this example?

Let's take a guess at technology in the year 2027. Of course, we won't have perfect insight, and, in fact, these guesses will probably seem ludicrous to the person who finds this book for sale for a dollar at a Goodwill store in 2027. But let's exercise our minds in that direction.

Would you use your smartphone differently if it had a gigabyte network connection, an exabyte of data storage, and a battery that lasted a month on a single charge? What if it could connect to every device in your home, car, and office—and control them remotely? With this new device you could store every book, song, and movie ever created. You could capture, store, and stream 8K of UHD video with no delay at all.

On the other hand, maybe smartphones will fade away. Large tech companies are investing tremendous resources into mixed-reality devices like HoloLens, Meta, and Magic Leap that can create virtual objects within the real world (see Chapter 4). It's possible that changes in technology will make these devices commonplace. People didn't always carry a phone around with them. But now they're in nearly every pocket.

How would these new devices change your everyday life? Well, you wouldn't have to fight over the TV remote control any more. Everyone wearing a Microsoft HoloLens could sit on the couch and watch a *different* show at the same time. In fact, you might not have a two-dimensional TV hanging on the wall at all. 3D Holographic entertainment would take place in the *center* of the room, not on the walls.¹⁶

Your mixed-reality devices would also have gesture and voice control. That means you could turn your smart lightbulbs on or off by simply pointing to them. You could even see inside your smart refrigerator without leaving the couch! Nice. Also, thanks to increases in connectivity, all of your new smart devices could talk to each other. Imagine waking up in the morning and your smart home turning the lights on automatically. Your smart home then starts reading off your daily schedule (from your Internet-based calendar), starts your coffee pot, and tells your self-driving car to check for traffic delays.

Advances in technology will undoubtedly have a profound impact on your personal life. But what about the impact of these advances on business? How will they change the way you work? What new types of jobs will be created? What new companies will form to support these advances?

In 2013, Yahoo! CEO Marissa Mayer required her employees to come to work and earned the disdain of many. She said important work gets done in informal meetings around the coffee pot. But what if you could virtually remote into work using a holographic interface and stay at home physically? You could still interact with your boss face-to-face and chat with coworkers at the coffee pot.¹⁷ But you could live anywhere, skip the commute, and work for multiple companies at the same time.

These changes may improve the way you work, but they'll also change the *type* of work you do. People with the ability to effectively experiment will be able to adapt to changes in technology required by their employer. Companies that adapt more quickly will gain a competitive advantage, at least temporarily. For example, an innovative automaker may switch from using desktop computers and traditional CAD design software to using mixed reality devices and 3D printing to shorten design time.

Systems thinking will also be important because of the need to predict changes caused by interconnected smart devices. For example, medical data (i.e., calories burned, heart rate, etc.) from your smart pacemaker and smartwatch could be integrated into other systems. It could be sent to your doctor, athletic trainer, and insurance company. Your doctor could know you're having a heart attack, call an ambulance, and forward your insurance information to the hospital before you even realize what's happening.

Advances in technology have a downside too. By 2027, privacy may be increasingly difficult to maintain. Your data will be collected by new kinds of apps, flowing through the cloud, and be packaged for sale by companies providing “free” services. Social relationships may suffer as well. We may become less connected to *people* as we become more connected to *systems*. Just look around at your family staring into their tiny phone screens at holiday parties. What will happen when they can watch a high-definition 3D holographic football game without anyone knowing?

We'll take a 2027 look at the end of each chapter. For now, just realize one certainty: Knowledge of information systems and their use in business will be more important, not less.

SECURITY GUIDE

PASSWORDS AND PASSWORD ETIQUETTE

Many forms of computer security use passwords to control access to systems and data. Most likely, you have a university account that you access with a username and password. When you set up that account, you were probably advised to use a “**strong password**.” That’s good advice, but what is a strong password? Probably not “sesame,” but what then?

Microsoft, a company that has many reasons to promote effective security, provides the following guidelines for creating a strong password. A strong password should:

- Have at least 12 characters; 14 is even better
- Not contain your username, real name, or company name
- Not contain a complete dictionary word in any language
- Be different from previous passwords you have used
- Contain both upper- and lowercase letters, numbers, and special characters (such as ~ ! @; # \$ % ^ & * () _ +; =; { } | \ : “; ’ < > ; , . /)

Examples of good passwords are:

- Qw37^T1bb?at
- 3B47qq<3>5!7b

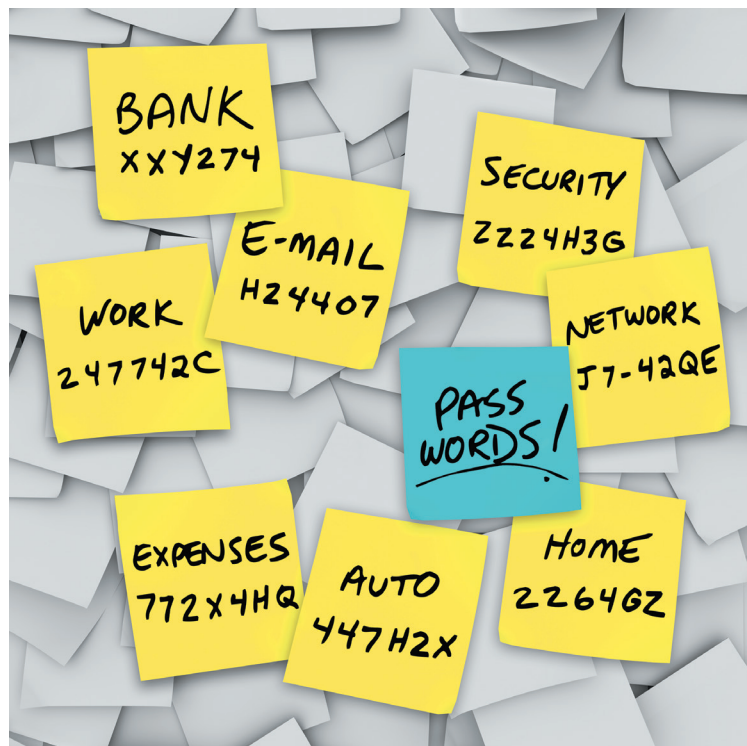
The problem with such passwords is that they are nearly impossible to remember. And the last thing you want to do is write your password on a piece of paper and keep it near the device where you use it. Never do that!

One technique for creating memorable, strong passwords is to base them on the first letter of the words in a phrase. The phrase could be the title of a song or the first line of a poem or one based on some fact about your life. For example, you might take the phrase “I was born in Rome, New York, before 2000.” Using the first letters from that phrase and substituting the character < for the word *before*, you create the password IwbiR,NY<2000. That’s an acceptable password, but it would be better if all of the numbers were not placed on the end. So, you might try the phrase, “I was born at 3:00 AM in Rome, New York.” That phrase yields the password

Iwba3:00AMiR,NY which is a strong password that is easily remembered.

Once you have a strong password you want to avoid *reusing* the same password at every site you visit. Not all sites provide the same level of protection for your data. In fact, sometimes they lose your password to hackers. Then hackers can use those passwords to access other sites that you regularly use. Password variety is your friend. Never use the same password for less important sites (e.g., social networking) that you’d use to access more important sites (e.g., online banking).

You also need to protect your password with proper behavior. Never write down your password, do not share it with others, and never ask others for their passwords. Occasionally, an attacker will pretend to be an administrator and ask users for their passwords. You’ll never have to give your



Source: iQConcept/Fotolia

password to a real administrator. He or she doesn't need it and won't ask for it. He or she already has full access to all corporate computers and systems.

But what if you need someone else's password? Suppose, for example, you ask someone to help you with a problem on your computer. You sign on to an information system, and for some reason, you need to enter that other person's password. In this case, say to the other person, "We need your password," and then get out of your chair, offer your keyboard to the other person, and look away while she enters

the password. Among professionals working in organizations that take security seriously, this little "do-si-do" move—one person getting out of the way so another person can enter her password—is common and accepted.

If someone asks for your password, do not give it out. Instead, get up, go over to that person's machine, and enter your own password yourself. Stay present while your password is in use, and ensure that your account is logged out at the end of the activity. No one should mind or be offended in any way when you do this. It is the mark of a professional.



DISCUSSION QUESTIONS

1. Here is a line from Shakespeare's *Macbeth*: "Tomorrow and tomorrow and tomorrow, creeps in its petty pace." Explain how to use these lines to create a password. How could you add numbers and special characters to the password in a way that you will be able to remember?
2. List two different phrases that you can use to create a strong password. Show the password created by each.
3. One of the problems of life in the cyberworld is that we all are required to have multiple passwords—one for work or school, one for bank accounts, another for eBay or other auction sites, and so forth. Of course, it is better to use different passwords for each. But in that case you have to remember three or four different passwords. Think of different phrases you can use to create a memorable, strong password for each of these different accounts. Relate the phrase to the purpose of the account. Show the passwords for each.
4. Explain proper behavior when you are using your computer and you need to enter, for some valid reason, another person's password.
5. Explain proper behavior when someone else is using her computer and that person needs to enter, for some valid reason, your password.

CAREER GUIDE

FIVE-COMPONENT CAREERS

Some years, even some decades, students can wait until their last semester to think seriously about jobs. They can pick a major, take the required classes, and prepare to graduate, all the while assuming that job recruiters will be on campus, loaded with good jobs, sometime during their senior year. *Alas, today is not one of those periods.*

In the current employment situation, you need to be proactive and aggressive in your job search. Think about it: You will be spending one-third of your waking life in your job. One of the best things you can do for yourself is to begin to think seriously about your career prospects now. You don't want to find yourself working as a barista after 4 years of business school, unless, of course, you're planning on starting the next Starbucks.

So, start here. Are you interested in a career in MIS? At this point, you don't know enough to know, but Figure 1-6 and Figure 1-7 should catch your attention. With job growth like that, in a category of jobs that is net of outsourcing, you should at least ponder whether there is a career for you in IS and related services.

But what does that mean? If you go to the U.S. Bureau of Labor Statistics, you can find that there are more than a million computer programmers in the United States today and more than 600,000 systems analysts. You probably have some notion of what a programmer does, but you don't yet know what a systems analyst is. Examine the five components in Figure 1-8, however, and you can glean some idea. Programmers work primarily with the software component, while systems analysts work with the entire system, with all five

components. So, as a systems analyst, you work with system users to determine what the organizational requirements are and then with technical people (and others) to help develop that system. You work as a cultural broker: translating the culture of technology into the culture of business, and the reverse.

Fortunately for you, many interesting jobs are not captured by the bureau's data. Why fortunate? Because you can use what you're learning in this course to identify and obtain jobs that other students may not think about or even know about. If so, you've gained a competitive advantage.

The chart on the next page provides a framework for thinking about careers in an unconventional way. As you can see, there are technical jobs in MIS but fascinating, challenging, high-paying, nontechnical ones as well. Consider, for example, professional sales. Suppose you have the job of



Source: Tyler Olson/Fotolia

selling enterprise-class software to the Mayo Clinic. You will sell to intelligent, highly motivated professionals with tens of millions of dollars to spend. Or suppose you work for the Mayo Clinic on the receiving end of that sales pitch. How will you spend your tens of millions? You will need knowledge of

your business, and you will need to understand enough technology to ask intelligent questions and interpret the responses.

Give this some thought by answering the questions that follow, even if they aren't assigned for a grade!

	Hardware	Software	Data	Procedures	People
Sales & Marketing	Vendors (IBM, Cisco, etc.)	Vendors (Microsoft, Oracle, etc.)	Vendors (Acxiom, Google, etc.)	Vendors (SAP, Infor, Oracle)	Recruiters (Robert Half, Lucas Group)
Support	Vendors Internal MIS	Vendors Internal MIS	Database administration Security	Vendors and internal customer support	Customer support Training
Development	Computer engineering Internal MIS	Application programmer Quality test Engineer	Data modeler Database design	Business process management Process reengineering	Training Internal MIS recruiting
Management	Internal MIS	Internal MIS	Data administration	Project management	Technical management
Consulting	Project management, development, pre- and postsale support				



DISCUSSION QUESTIONS

1. What does the phrase *in a category of jobs that is net of outsourcing* mean? Reread the discussion of Figure 1-6 if you're not certain. Why is this important to you?
2. Examine the five-component careers chart and choose the row that seems most relevant to your interests and abilities. Describe a job in each component column of that row. If you are uncertain, Google the terms in the cells of that row.
3. For each job in your answer to question 2, describe what you think are the three most important skills and abilities for that job.
4. For each job in your answer to question 2, describe one innovative action that you can take this year to increase your employment prospects.

ACTIVE REVIEW

Use this Active Review to verify that you understand the ideas and concepts that answer the chapter's study questions.

Q1-1 Why is Introduction to MIS the most important class in the business school?

Define *Bell's Law* and explain why its consequences are important to business professionals today. Describe how *Moore's Law*, *Metcalfe's Law*, *Nielsen's Law*, and *Kryder's Law* are changing how digital devices are used. State how business professionals should relate to emerging information technology.

Q1-2 How will MIS affect me?

Give the text's definition of *job security* and use Reich's list to explain how this course will help you attain that security. Summarize IS-related job opportunities. According to the Bureau of Labor Statistics, how does the growth rate of IS-related jobs compare with the average growth rate of all jobs nationally?

Q1-3 What is MIS?

Explain why you can buy IT, but you can never buy IS. What does that mean to you as a potential future business manager? Identify the three important phrases in the definition of *MIS*. Name the five components of an information system. Using the five-component model, explain the difference between IT and IS. Explain why end users need to be involved in the management of information systems. Explain why it is a misconception to say that organizations do something.

Q1-4 How can you use the five-component model?

Name and define each of the five components. Explain the symmetry in the five-component model. Show how automation moves work from one side of the five-component structure to the other. Name the most important component and state why it

is the most important. Use the five-component model to describe the differences between high-tech and low-tech information systems. Explain how the components are ordered according to difficulty of change and disruption.

Q1-5 What is information?

State four different definitions of information. Identify the one that is your favorite and explain why. State the difference between data and information. Explain why information can never be written on a piece of paper or shown on a display device.

Q1-6 What are necessary data characteristics?

Create a mnemonic device for remembering the characteristics of good data. Explain how these data characteristics relate to information quality.

Q1-7 2027?

What trends do you expect to see in 2027? How might you use your smartphone differently in 2027? What everyday devices might be able to connect to the Internet in 2027? How might mixed-reality devices change your daily life? How could these devices change the way you work? Why would the ability to experiment and systems thinking be important in adapting to technological change? Summarize how answering these questions contributes to your skill as a non-routine thinker.

Using Your Knowledge with Falcon Security

Reread the Falcon Security vignette at the start of this chapter. Using the knowledge you've gained from this chapter, especially that in Q1-2, identify five mistakes that Jennifer made. For each, explain what you would do differently. Be specific.

KEY TERMS AND CONCEPTS

Abstract reasoning	10	Five-component framework	15	Moore's Law	6
Bell's Law	6	Information	20	Nielsen's Law	8
Collaboration	11	Information Age	5	People	15
Computer hardware	15	Information system (IS)	14	Procedures	15
Computer-based information system	15	Information technology (IT)	14	Software	15
Data	15	Kryder's Law	8	Strong password	26
Digital Revolution	5	Management information systems (MIS)	14	System	14
Experimentation	11	Metcalfe's Law	7	Systems thinking	11

MyMISLab™

To complete the problems with the [MyMISLab](#), go to EOC Discussion Questions in the MyLab.

USING YOUR KNOWLEDGE

1-1. [MyMISLab](#) One of life's greatest gifts is to be employed doing work that you love. Reflect for a moment on a job that you would find so exciting that you could hardly wait to get to sleep on Sunday night so that you could wake up and go to work on Monday.

- Describe that job. Name the industry, the type of company or organization for which you'd like to work, the products and services it produces, and your specific job duties.
- Explain what it is about that job that you find so compelling.
- In what ways will the skills of abstraction, systems thinking, collaboration, and experimentation facilitate your success in that job?
- Given your answers to parts a through c, define three to five personal goals for this class. None of these goals should include anything about your GPA. Be as specific as possible. Assume that you are going to evaluate yourself on these goals at the end of the quarter or semester. The more specific you make these goals, the easier it will be to perform the evaluation.

1-2. [MyMISLab](#) Consider costs of a system in light of the five components: costs to buy and maintain the hardware; costs to develop or acquire licenses to the software programs and costs to maintain them; costs to design databases and fill them with data; costs of developing procedures and keeping them current; and finally, human costs both to develop and use the system.

- Many experts believe that, over the lifetime of a system, the single most expensive component is people. Does

this belief seem logical to you? Explain why you agree or disagree.

- Consider a poorly developed system that does not meet its defined requirements. The needs of the business do not go away, but they do not conform themselves to the characteristics of the poorly built system. Therefore, something must give. Which component picks up the slack when the hardware and software programs do not work correctly? What does this say about the cost of a poorly designed system? Consider both direct money costs as well as intangible personnel costs.
- What implications do you, as a future business manager, take from parts a and b? What does this say about the need for your involvement in requirements and other aspects of systems development? Who eventually will pay the costs of a poorly developed system? Against which budget will those costs accrue?

1-3. [MyMISLab](#) Consider the four definitions of information presented in this chapter. The problem with the first definition, "knowledge derived from data," is that it merely substitutes one word we don't know the meaning of (*information*) for a second word we don't know the meaning of (*knowledge*). The problem with the second definition, "data presented in a meaningful context," is that it is too subjective. Whose context? What makes a context meaningful? The third definition, "data processed by summing, ordering, averaging, etc.," is too mechanical. It tells us what to do, but it doesn't tell us what information is. The fourth definition, "a difference that makes a difference," is vague and unhelpful.

Also, none of these definitions helps us to quantify the amount of information we receive. What is the information content of the statement that every human being has a navel? Zero—you already know that. In contrast, the statement that someone has just deposited \$50,000 into your checking account is chock-full of information. So, good information has an element of surprise.

Considering all of these points, answer the following questions:

- a. What is information made of?

- b. If you have more information, do you weigh more? Why or why not?
- c. When you give a copy of your transcript to a prospective employer, how is information produced? What part of that information production process do you control? What, if anything, can you do to improve the quality of information that the employer conceives?
- d. Give your own best definition of information.
- e. Explain how you think it is possible that we have an industry called the *information technology industry*, but we have great difficulty defining the word *information*.

COLLABORATION EXERCISE 1

Collaborate with a group of fellow students to answer the following questions. For this exercise, do not meet face-to-face. Coordinate all of your work using email and email attachments only. Your answers should reflect the thinking of the entire group, not just one or two individuals.

1-4. Abstract reasoning.

- a. Define *abstract reasoning*, and explain why it is an important skill for business professionals.
- b. Explain how a list of items in inventory and their quantity on hand is an abstraction of a physical inventory.
- c. Give three other examples of abstractions commonly used in business.
- d. Explain how Jennifer failed to demonstrate effective abstract-reasoning skills.
- e. Can people increase their abstract-reasoning skills? If so, how? If not, why not?

1-5. Systems thinking.

- a. Define *systems thinking*, and explain why it is an important skill for business professionals.
- b. Explain how you would use systems thinking to explain why Moore's Law caused a farmer to dig up a field of pulpwood trees. Name each of the elements in the system, and explain their relationships to each other.
- c. Give three other examples of the use of systems thinking with regard to consequences of Bell's Law, Moore's Law, or Metcalfe's Law.
- d. Explain how Jennifer failed to demonstrate effective systems-thinking skills.
- e. Can people improve their systems-thinking skills? If so, how? If not, why not?

1-6. Collaboration.

- a. Define *collaboration*, and explain why it is an important skill for business professionals.
- b. Explain how you are using collaboration to answer these questions. Describe what is working with regard to your group's process and what is not working.

- c. Is the work product of your team better than any one of you could have done separately? If not, your collaboration is ineffective. If that is the case, explain why.
- d. Does the fact that you cannot meet face-to-face hamper your ability to collaborate? If so, how?
- e. Explain how Jennifer failed to demonstrate effective collaboration skills.
- f. Can people increase their collaboration skills? If so, how? If not, why not?

1-7. Experimentation.

- a. Define *experimentation*, and explain why it is an important skill for business professionals.
- b. Explain several creative ways you could use experimentation to answer this question.
- c. How does the fear of failure influence your willingness to engage in any of the ideas you identified in part b?
- d. Explain how Jennifer failed to demonstrate effective experimentation skills.
- e. Can people increase their willingness to take risks? If so, how? If not, why not?

1-8. Job security.

- a. State the text's definition of *job security*.
- b. Evaluate the text's definition of job security. Is it effective? If you think not, offer a better definition of job security.
- c. As a team, do you agree that improving your skills on the four dimensions in the Collaboration Exercise Questions will increase your job security?
- d. Do you think technical skills (accounting proficiency, financial analysis proficiency, etc.) provide job security? Why or why not? Do you think you would have answered this question differently in 2000? Why or why not?

CASE STUDY 1

zulily

On November 15, 2013, zulily, a Seattle corporation, issued its initial stock (i.e., went public) at \$22 a share. By the end of the day, the stock was trading at \$38, and 4 months later it reached \$62, nearly tripling its initial price. At \$62, the holdings of the company’s chairman, Mark Vadon, totaled more than \$2B.

Before dismissing this as just another successful public offering, consider the company. What is its business model? A high-tech company offering the latest gee-whiz technology? A new tablet? A new Facebook competitor? Another way of sharing pictures? No, no, no, and no. zulily sells to mothers: primarily children’s clothes and toys, but also women’s clothes, accessories, and décor items. The oldest and most traditional forms of retail. So what is the excitement? Cofounders Mark Vadon and Darrell Cavens found a way to harness information technology to provide an entertaining shopping experience to mothers, one that offers name-brand goods as well as unique and difficult-to-find off-brands and often sells them at substantial discounts. According to the zulily prospectus, 45 percent of its sales occur over mobile devices, as mothers churn through the day’s specials while they sit in playgrounds, in cars waiting for kids at

soccer practice, or anywhere else young mothers have a break long enough to shop on their mobile devices.

One of your goals for this class should be to learn *to assess, evaluate, and apply emerging information technology to business*. Seem like an empty platitude? Not to Mr. Vadon, who turned that exact principle into \$2B ... so far.

The zulily Business Model

zulily conducts flash sales of children’s and women’s clothing and other items of interest to women. Sales open at 6 AM Pacific time each day and last 72 hours. Customers find brand-name merchandise intermingled with hard-to-find boutique products. zulily uses the term *curated sale* to mean the sale of items specifically selected and grouped by its shopping experts to be exciting to women. Because these curated sales provide interesting variety, women enjoy the thrill of discovery while shopping. zulily thus provides entertainment as well as a rewarding shopping experience. And those low prices, some as low as 70 percent off retail, are available for only 72 hours. So, shop and buy now, ladies!

Does it work? Apparently so. As shown in Figure 1-13, in 5 years zulily increased the number of its active customers by

FIGURE 1-12
zulily Merchandise Variety
Courtesy of Zuilly Inc. Used by permission



FIGURE 1-13
zulily Performance

	2010	2011	2012	2013	2014	2015
Number of active customers (thousands)	157	791	1,580	3,200	4,900	5,000
Revenue (millions)	\$18	\$143	\$331	\$696	\$1,200	\$1,361
Sales per active customer	\$117	\$180	\$210	\$218	\$245	\$272

3,185 percent while increasing revenue per active customer by 233 percent. That combination resulted in revenue growth from \$18M to \$1.36B; that's a 137 percent annual growth rate!

How zulily Did It

The sales process begins when zulily buyers identify goods to be sold. Buyers negotiate with vendors to establish both wholesale and retail prices, terms, and maximum quantities by size. zulily then obtains sample merchandise and, if necessary, photographs it in-house. It also writes ad copy to be displayed along with the photos during the sale. By taking photos when needed and writing its own ad copy, zulily ensures a consistent quality of presentation on its site. zulily also adds considerable value to smaller vendors who do not otherwise have access to such high-quality expertise.

Items are then grouped together into 3-day sales events. zulily accepts orders for items up to the maximum quantity negotiated with the vendor. At that point, the item (or a particular size of an item) is marked as no longer available, thus increasing pressure to buy remaining items *now*. After the event closes, zulily orders the items from the vendor, receives them, packages them, and then ships the items to customers. zulily thus maintains almost no inventory. Customers receive their items in zulily packaging, thus reinforcing the zulily brand.

zulily is subject to errors and mistakes from vendors. If, for example, the vendor promises to ship 1,000 pairs of shoes of a particular size and zulily sells all 1,000 pairs, but later the vendor delivers only, say, 900 pairs in that size, some customers will be disappointed. And those customers will hold zulily, not the vendor, responsible for their disappointment.

Use of Technology

zulily's business model would be infeasible without information systems. For one, it needs the Internet to reach customers, and it needs mobile technology to do so on phones and other mobile devices. Further, zulily buyers use the Internet to find vendors and items to sell. But what else?

In the prospectus for its initial public offering, zulily stated, "Continual innovation through investment in technology is core to our business."¹⁸ It states that it developed a proprietary technology platform to manage the enormous spikes in Web processing demand that occur due to the nature of flash sales. Reflect on the challenges of such development: In 2010, zulily's platform supported \$18M in sales; 5 years later, it supported \$1.36B in sales, a 75-fold increase in demand. You will learn some of the ways that such enormous growth can be accommodated in Chapter 6. For now, understand that such growth would be impossible in a world without information systems.

But there's more. In that same prospectus, zulily stated that it has developed "extensive data collection and analytics

capabilities" that enable it to anticipate its customers' shopping preferences and to tailor the customers' shopping experiences accordingly. So, as with any good salesperson, what you see and how it is shown to you depend on what you've purchased in the past. That same data can also be analyzed to help buyers determine the items customers are most likely to purchase. You will learn about data analytics in Chapter 9.

Growth-Management Problems

Such spectacular growth does not come without problems. zulily increased its headcount from 329 at the end of 2011 to more than 3,000 by mid-2015. That's an increase in zulily's workforce of more than 900 percent in 3 years. That rate of growth is exceedingly difficult to manage, a fact the company recognized:

To support continued growth, we must effectively integrate, develop and motivate a large number of new employees, while maintaining our corporate culture. In particular, we intend to continue to make substantial investments to expand our merchandising and technology personnel.¹⁹

Unfortunately, zulily is located just down the street from Amazon and Nordstrom and just across a lake from Microsoft. Finding (and retaining) those merchandising and technology personnel in Seattle will be difficult. In its annual report, zulily mentioned particularly the need to hire mid-level managers.

Learning from zulily

In mid-2015 Liberty Interactive's QVC Group bought zulily for \$2.4B.²⁰ It's hard to imagine a startup in a traditional market (women's clothes) could go from a valuation of \$0 to \$2.4B in just 5 years. Or that the company could increase its workforce by 900 percent in 4 years.

In the final analysis, zulily succeeded because its founders developed an innovative application of information systems technology. As you will learn, the technology zulily uses is not groundbreaking. The creative genius was finding a way to apply that technology to a business opportunity and then to have the managerial skill to develop that idea into a thriving business. Without doubt, dozens of such opportunities lie in front of you. You just need to recognize and build on them.

QUESTIONS

- 1-9.** Go to zulily.com and register. Identify features of the site that make shopping entertaining to mothers and explain why those features entertain. Explain why this is important to the zulily business model.
- 1-10.** Go to Nordstrom.com and shop for children's clothes. How does the zulily shopping experience differ from that at Nordstrom? Briefly describe the advantages and disadvantages of each type of experience.

- 1-11.** If you were a buyer for zulily, what data would you like to have about customer purchase habits?
- 1-12.** If you were a buyer for zulily, what data would you like to have about past vendor performance?
- 1-13.** In the general course of life, 2-year-old boys become 3-year-old boys, 4-year-old girls become 5-year-old girls, and so on. How can zulily use this not-so-remarkable phenomenon to customize a customer's shopping experience? What data would you need to do this?

- 1-14.** As a business professional, it is likely information systems professionals will ask you data questions like those in questions 1-11 to 1-13. What is the best way for you to respond? Verbally in a meeting? With a written document? With a sketch or diagram? How will you know if you have been understood?

MyMISLab™

Go to the Assignments section of your MyLab to complete these writing exercises.

- 1-15.** The text states that data should be worth its cost. Both cost and value can be broken into tangible and intangible factors. *Tangible* factors can be directly measured; *intangible* ones arise indirectly and are difficult to measure. For example, a tangible cost is the cost of a computer monitor; an intangible cost is the lost productivity of a poorly trained employee.
- Give five important tangible and five important intangible costs of an information system. Give five important tangible and five important intangible measures of the value of an information system. If it helps to focus your thinking, use the example of the class scheduling system at your university or some other university information system. When determining whether an information system is worth its cost, how do you think the tangible and intangible factors should be considered?
- 1-16.** The U.S. Department of Labor publishes descriptions of jobs, educational requirements, and the outlook for many jobs and professions. Go to its site at www.bls.gov and answer the following questions:
- Search for the job title *systems analyst*. Describe what such people do. Is this a job that interests you? Why or why not? What education do you need? What is the median pay and job growth projection?
 - Click the Similar Occupations link at the bottom of the page. Find another job that you might want. Describe that job, median salary, and educational requirements.
 - The BLS data is comprehensive, but it is not up to date for fast-changing disciplines such as IS. For example, one very promising career today is social media marketing, a job that does not appear in the BLS data. Describe one way that you might learn about employment prospects for such emerging job categories.
 - Considering your answer to part c, describe an IS-related job that would be the best match for your skills and interests. Describe how you can learn if that job exists.

ENDNOTES

- Gordon Bell. "Bell's Law for the birth and death of computer classes: A theory of the computer's evolution" November 1, 2007. <http://research.microsoft.com/pubs/64155/tr-27-146.pdf>
- These figures were compiled from both Intel's specification archive (<http://ark.intel.com/>) and TechPowerUP's CPU Database (<http://www.techpowerup.com/cpub/>).
- Zipf's Law is a more accurate, though less easily understood, way of explaining how the value of a network increases as additional network nodes are added. See Briscoe, Odlyzko, and Tilly's 2006 article "Metcalfe's Law Is Wrong" for a better explanation: <http://spectrum.ieee.org/computing/networks/metcalfes-law-is-wrong>.
- Lynn A. Kaoly and Constantijn W. A. Panis, *The 21st Century at Work* (Santa Monica, CA: RAND Corporation, 24), p. xiv.

5. Robert B. Reich, *The Work of Nations* (New York: Alfred A. Knopf, 1991), p. 229.
6. In the 2011 book "Literacy Is NOT Enough: 21st Century Fluencies for the Digital Age," Lee Crockett, Ian Jukes, and Andrew Churches list problem solving, creativity, analytical thinking, collaboration, communication, and ethics, action, and accountability as key skills workers need for the 21st century.
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8. Michael Spence and Sandile Hlatshwayo, *The Evolving Structure of the American Economy and the Employment Challenge* (New York: Council on Foreign Relations, 2011).
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14. Josh Constine, "Google Shreds Bureaucracy to Keep Talent Loyal to the Alphabet," *TechCrunch.com*, August 10, 2015, accessed March 27, 2016, <http://techcrunch.com/2015/08/10/google-of-thrones>.
15. Actually, the word *data* is plural; to be correct, we should use the singular form *datum* and say, "The fact that Jeff Parks earns \$30.00 per hour is a datum." The word *datum*, however, sounds pedantic and fussy, and we will avoid it in this text.
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17. Edgar Alvarez, "Microsoft Shows How NFL Fans Could Use HoloLens in the Future," *Engadget*, February 2, 2016, accessed April 17, 2017, www.engadget.com/2016/02/02/microsoft-hololens-nfl-concept-video.
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