

Experiencing

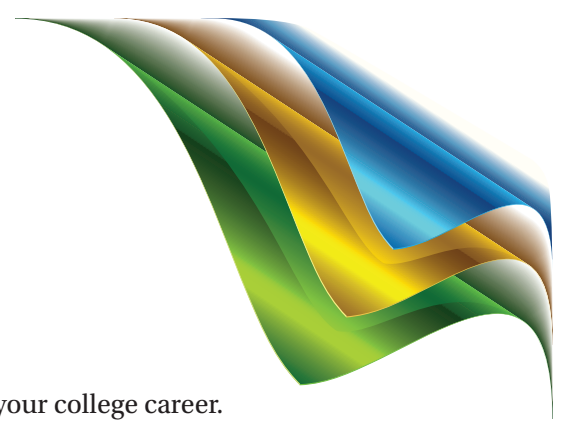
MIS

FIFTH EDITION

2014

David M. Kroenke





Dear Student,

You are about to embark on the study of one of the most important subjects in your college career. In fact, Chapter 1 argues that it is the most important course you will take. Why? Because in modern business, knowledge of information systems is key to obtaining and succeeding in interesting and rewarding professional jobs.

Like all college students, you have many claims on your time: friends, family, sports, hobbies, love life, whatever, but you owe it to your future to seriously consider how you want to spend the bulk of your waking hours for the next 30 to 40 years. You want a job that you find so satisfying that you can hardly wait to get to work in the morning. Believe it or not, there are such jobs, and there is one for you. But that kind of job won't be handed to you at graduation. You have to prepare for it, find it, and obtain it in an intensely competitive job market; then you have to know enough to be able to thrive in that job.

This course is key to that endeavor because information systems are the major influence on the modern economy, and that influence has not been beneficial for everyone. Bank lobbies were once filled with bookkeepers, accountants, and accounting managers. Those jobs disappeared with computer systems. Half-asleep, mediocre business school graduates once managed rooms full of typists and clerical workers. Those jobs disappeared as attorneys, auditors, and business professionals began conducting their own correspondence using email, text, and videoconferencing.

The trick to turning information systems to your advantage is getting ahead of their effect. During your career, you will find many opportunities for the innovative application of information systems in business and government, but only if you know how to look for them. Once found, those opportunities become your opportunities when you—as a skilled, non-routine problem solver—apply emerging technology to facilitate your organization's strategy. This is true whether your job is in marketing, operations, sales, accounting, finance, entrepreneurship, or another discipline.

Congratulations on your decisions so far. Congratulations on deciding to go to college, and congratulations on deciding to study business. Now, double down on those good decisions and use this course to help you obtain and then thrive in an interesting and rewarding career. Start in Chapter 1 by learning how Jennifer lost her job and what you can do to ensure that you are never in her shoes! After that, learn more than just the MIS terminology; understand the ways information systems are transforming business and the many, many ways you can participate in that transformation.

In this endeavor, I wish you, a future business professional, the very best success!

David Kroenke
Whidbey Island, WA

Why This Fifth Edition?

The changes in this fifth edition are listed in Table 1. Chapters 1 through 6 begin with a discussion of a new case, AllRoad Parts, an online vendor of parts that is considering 3D printing and ultimately rejects that idea because of the effect it would have on business processes and IS. Instead, the company offers 3D printing designs as a product as revealed in Chapters 1 through 6.

Because of the importance of mobility and the cloud, Chapters 7 through 12 continue to be introduced with PRIDE, an information system that uses cloud technology and a wide array of mobile devices to integrate patient exercise data with healthcare providers, health clubs, insurance agencies, and employers. In addition to motivating the chapter material, both case scenarios provide numerous opportunities for you to practice one of Chapter 1's key skills: "Assess, evaluate, and apply emerging technology to business."

A second broad change in this fifth edition concerns the teaching of ethics. In this edition, every Ethics Guide asks you to apply Immanuel Kant's categorical imperative, utilitarianism, or both to the business situation described in the guide. I hope you find the ethical considerations richer and deeper with these

exercises. The categorical imperative is introduced in the Ethics Guide in Chapter 1 (pages 16–17), and utilitarianism is introduced in the Ethics Guide in Chapter 2 (pages 40–41).

As shown in Table 1, some sort of change was made to every chapter. One of the major changes is the rewrite of Chapter 6 to focus entirely on the cloud. Data communications technology is presented only in its role as supporting the cloud. I've also increased coverage of SOA and provided more material on Web services that is used in subsequent chapters. Also this edition teaches and uses the latest versions of Microsoft Excel and Microsoft Access.

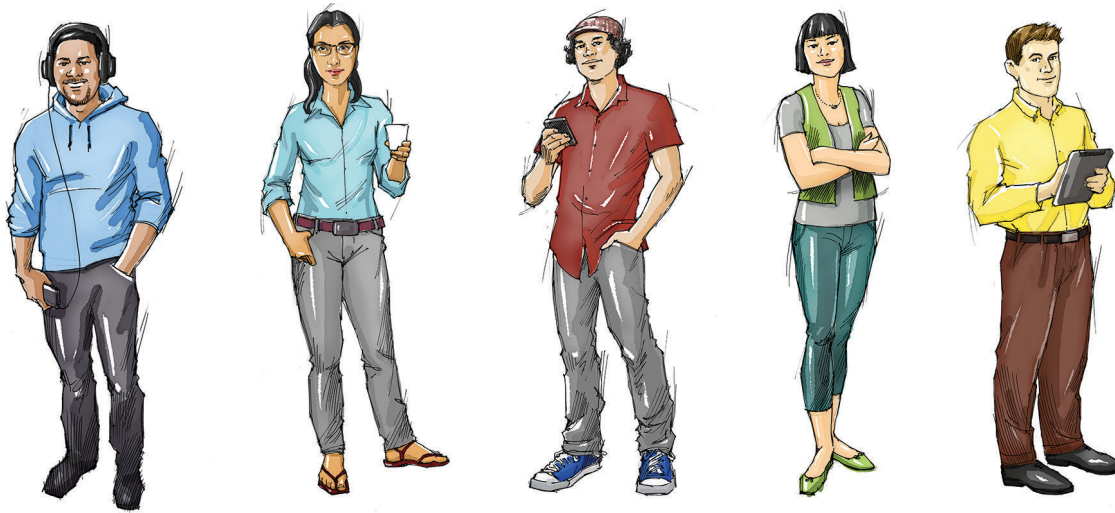
Numerous changes were made throughout the chapters in an attempt to keep them up to date. Events move fast and to keep the text current, we check every sentence and industry reference for obsolescence. For example, the fourth edition's glorification of Apple's success in Chapter 4 needed to be softened given Apple's recent experience. The excitement about Microsoft Surface that was prevalent when I wrote the fourth edition had to be placed into context of Surface's mediocre success. Meanwhile, 3D printing is hot and I wanted to give you an opportunity to consider its effect on processes and IS in the AllRoad scenarios.

Table 1 Changes in the Fifth Edition

Chapter	Description of Change
1–6	New AllRoad Parts case vignettes introduce chapters and are integrated throughout.
All	Categorical imperative and utilitarianism used in Ethics Guides.
1	New employment data; updated job requirements from MIT study.
1	New Ethics Guide.
2	Revised description and process diagrams to address the AllRoad Parts example.
2	New Ethics Guide.
2	New Collaboration Exercise.
3	Worked AllRoad Parts into competitive strategy.
3	Adjusted and updated Yikes! Bikes Ethics Guide.
4	Worked AllRoad Parts into discussion.
4	Reduced Microsoft presence; discussed flop of Windows RT, problems in Win 8 and Surface Pro.
4	New showrooming Ethics Guide.
4	Updated and adapted InClass Exercise.
5	Used AllRoad Parts to set up the need for database knowledge.
5	New Ethics Guide addresses corporate social responsibility.
5	Rewrote database application to include thin-client, browser-based apps. Introduced Node.js and other server-side concepts.
5	Updated discussion of NoSQL and nonrelational DBMS, including MondoDB.
6	Rewrote all to focus entirely on the cloud. Incorporated AllRoad Parts' use of the cloud.
6	New Ethics Guide on a partnership's use of excess profits.
6	Introduced topic of cloud security.
6	New InClass Exercise on cloud security.
6	New FinQloud case.
7	New InClass Exercise; former exercise moved to Chapter 12.
7	Updated chapter to take advantage new content in Chapter 6.
8	New InClass Exercise on Salesforce.com's Chatter. GE's jet engines as social media participants?
8	Updated discussion of Web revenue to remove fear of revenue loss due to use of mobile devices.
9	New examples in Q1.
9	Changed illustrative case to use the simpler, easier-to-teach All Road Parts business model.
9	New Ethics Guide on data aggregators.
10	Updated Ethics Guide.
11	Updated Ethics Guide.
12	Updated computer crime statistics.
12	New collaboration exercise to investigate the cost of computer crime.
12	New case introduces FIDO as a replacement for current use of passwords.

Chapter Extensions	Description of Change
2	Updated terms, especially Microsoft's new definition of <i>Office 365</i> .
2	Reduced Microsoft emphasis. Illustrated use of Google Grid/Docs. Incorporated product changes since fourth edition. Introduced LibreOffice and thin-client Office alternatives.
2	Sharpened the discussion to use students' collaboration IS to enforce IS concepts.
3	Moved fourth edition CE7 here. Emphasized importance of JavaScript and recognized it as an object-oriented language.
4	Revised to use Excel 2013.
6	Revised to use Access 2013.
7	Revised to use Excel and Access 2013.
8	Rewrote to focus on data communications technology in its support for the cloud.
8	Enlarged discussion of SOA and Web services.
Prior edition CE8	Deleted (to make room for newer topics).
9	Updated ERP market leaders and related discussion.
11	New Guide on discussing your personal brand.
16	New extension on agile development and scrum.
17	Update example to use AllRoad Parts.
18	Include Ghemawat's "Why the World Isn't Flat" data. Modernized discussion of hardware and distributed databases to utilize cloud terms.

The Guides



Each chapter includes two unique guides that focus on current issues in information systems. In each chapter, one of the guides focuses on an ethical issue in business. The other guide focuses on the application of the chapter's contents to some other dimension of business. The content of each guide is designed to stimulate thought, discussion, and active participation in order to help *you* develop your problem-solving skills and become a better business professional.

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LEARNING AIDS FOR STUDENTS

We have structured this book so you can maximize the benefit from the time you spend reading it. As shown in the table below, each chapter includes a series of learning aids to help you succeed in this course.

Resource	Description	Benefit	Example
Question-Driven Chapter Learning Objectives	These queries, and the subsequent chapter sections written around them, focus your attention and make your reading more efficient.	Identify the main point of the section. When you can answer each question, you've learned the main point of the section.	Chapter 6 starting on pg. 141 with Q1 "Why Is the Cloud the Future for Most Organizations?"
Guides	Each chapter includes two guides that focus on current issues relating to information systems. One addresses ethics and the other addresses other business topics.	Stimulate thought and discussion. Help develop your problem-solving skills. Help you learn to respond to ethical dilemmas in business.	"Yikes! Bikes," p. 66
Experiencing MIS InClass Exercise	Each chapter of this text includes an exercise called <i>Experiencing MIS InClass</i> . This feature contains exercises, projects, and questions for you and a group of your fellow students to perform in class. Some of these exercises can be done in a single class period; others span several class sections with out-of-class activities in between. For example, see the first Experiencing MIS InClass Exercise on online dating in Chapter 1, page 11.	These exercises help you relate the knowledge you are learning in the chapter to everyday situations.	Experiencing MIS InClass 4, "Place Your Bets Now" on the tablet marketing race p. 97
How Does the Knowledge in This Chapter Help You? (near the end of each chapter)	This section revisits the opening scenario and discusses what the chapter taught you about it.	Summarizes the "takeaway" points from the chapter as they apply to the company or person in the story and to you.	Chapter 8, p. 215
Active Review	Each chapter concludes with a summary-and-review section, organized around the chapter's study questions.	Offers a review of important points in the chapter. If you can answer the questions posed, you understand the material.	Chapter 5, p. 134

Resource	Description	Benefit	Example
Key Terms and Concepts	Highlight the major terms and concepts with their appropriate page references.	Provide a summary of key terms for review before exams.	Chapter 2, p. 44
Using Your Knowledge	These exercises ask you to take your new knowledge one step further by applying it to a practice problem.	Tests your critical-thinking skills and keeps reminding you that you are learning material that applies to the real world.	Chapter 3, questions 3-1 through 3-3, p. 71
Collaboration Exercise	A team exercise that focuses on the chapter's topic.	Use Google Drive, Windows SkyDrive, Microsoft SharePoint, or some other tool to collaborate on team answers.	Chapter 2, Understanding business processes, p. 45
Case Study	A case study closes each chapter. You will reflect on real organizations' use of the technology or systems presented in the chapter and recommend solutions to business problems.	Requires you to apply newly acquired knowledge to real situations.	Case Study 4, "Apple of Your i," p. 107
Application Exercises (at the end of the book)	These exercises ask you to solve business situations using spreadsheet (Excel) or database (Access) applications, and other Office applications.	Help develop your computer skills.	p. 626
SharePoint Hosting	Pearson will host Microsoft SharePoint site collections for your university. Students need access to MyMISLab and a browser to participate.	Enables students to collaborate using the world's most popular collaboration software.	<i>www.pearsonhighered.com/kroenke</i>

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Experiencing MIS

Fifth Edition

David M. Kroenke

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To C.J., Carter, and Charlotte

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Experiencing MIS offers basic topic coverage of MIS in its 12 chapters and more in-depth, expanded coverage in its chapter extensions. This modular organization allows you to pick and choose among those topics. Here chapter extensions are shown below the chapters to which they are related. You will preserve continuity if you use each of the 12 chapters in sequence. In most cases, a chapter extension can be covered any time in the course after its related chapter. You need not use any of the chapter extensions if time is short.

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TO THE STUDENT

If you were to walk into my office today and ask me for advice about how to use this book, here's what I'd say:

1. This class may be the most important course in the business school. Don't blow it off. See the first few pages of Chapter 1.
2. This class is much broader than you think. It's not just about Excel or Web pages or computer programs. It's about business and how businesses can be more successful with computer-based systems.
3. The design of this book is based on research into how you learn. Every chapter or extension starts with a list of questions. Read the material until you can answer the questions. Then, go to the Active Review and do the tasks there. If you're successful with those tasks, you're done. If it takes you 5 minutes to do that, you're done. If it takes you 5 hours to do that, you're done. But you aren't done until you can complete the Active Review tasks.
4. Pay attention to the issues raised by the opening cases. Those cases are based on real people and real companies and real stories. I changed the names to protect the innocent, the guilty, the publisher, and me.
5. Read the guides. Those stories are what my own students tell me teach them the most.
6. To make it easy to pick up and read, this book includes a lot of colorful and interesting art. However, don't forget to read.
7. I have worked in the computer industry for more than 40 years. There isn't anything in this text that a business professional might never use. It's all relevant, depending on what you decide to do.
8. However, this book contains more than you can learn in one semester. All of the content in this book will be needed by someone, but it may not be needed by you. Pay attention to what your professor says you should learn. He or she knows the job requirements in your local area.
9. With the national unemployment rate for young adults over 10 percent, your primary task in college is to learn something that will get you a job. Many exercises ask you to prepare something for a future job interview. Do those exercises!
10. Technology will create wonderfully interesting opportunities in the next 10 years. Get involved, be successful, and have fun!

David Kroenke
Whidbey Island, WA

ABOUT THE AUTHOR



David Kroenke has many years of teaching experience at Colorado State University, Seattle University, and the University of Washington. He has led dozens of seminars for college professors on the teaching of information systems and technology; in 1991, the International Association of Information Systems named him Computer Educator of the Year. In 2009, David was named Educator of the Year by the Association of Information Technology Professionals-Education Special Interest Group (AITP-EDSIG).

David worked for the U.S. Air Force and Boeing Computer Services. He was a principal in the startup of three companies, serving as the vice president of product marketing and development for the Microrim Corporation and as chief of database technologies for Wall Data, Inc. He is the father of the semantic object data model. David's consulting clients have included IBM, Microsoft, and Computer Sciences Corporation, as well as numerous smaller companies. Recently, David has focused on using information systems for teaching collaboration and teamwork.

His text *Database Processing* was first published in 1977 and is now in its 13th edition. He has authored and coauthored many other textbooks, including *Database Concepts*, 6th edition (2013), *Using MIS*, 7th edition (2015), *MIS Essentials*, 4th edition (2015), *SharePoint for Students* (2012), *Office 365 in Business* (2012), and *Processes, Systems, and Information*, 2nd edition (2015). David lives on Whidbey Island, WA, and has two children and three grandchildren. He enjoys woodworking, making both furniture and small sailboats.

part

1

Why MIS?

AllRoad Parts is a 10-year-old, privately owned company that sells parts for adventure vehicles. Its products include specialized brakes and suspension systems for mountain bikes and suspensions and off-road gear for dirt bikes (motorcycles designed for use in rough terrain), and it has recently started selling bumpers, doors, and soft tops for Jeeps and other off-road, four-wheel-drive vehicles. Jason Green is AllRoad Parts' founder and CEO. Jason always had an interest in off-road vehicles; as a teenager he rebuilt a Volkswagen in his parents' garage for off-road use. In college, he started mountain

This could happen to you



biking and competitively raced cross-country, winning several regional contests and placing high in the world championships in Purgatory, Colorado. He knew that a big part of his success was his innovative, high-quality equipment. In his senior year of college, he started an informal but

successful eBay business buying and selling hard-to-find mountain bike parts.

Jason was a strong believer in (and customer of) Fox mountain bike racing parts (www.RideFox.com), and through contacts he made at one of the championship events, he obtained a job in marketing at Fox. Part of his job was testing new equipment, which he loved to do. Jason worked at Fox for five years, gaining marketing and management experience. However, he never forgot the success he'd had selling parts on eBay and was convinced he could start a similar but larger business on his own. In 2003, he left Fox to start AllRoad Parts.

Today, AllRoad Parts sells nearly \$20 million of bike, motorcycle, and four-wheel parts for all-road riding. Jason no longer uses eBay, but true to his vision, the bulk of AllRoad's revenue is earned via online, direct sales to customers.



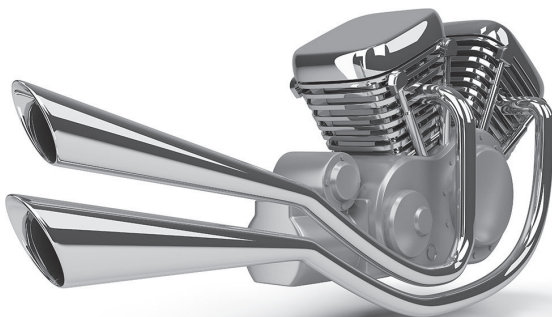
Source: julien tromeur/Fotolia

In addition to selling high-end, expensive parts obtained from Fox and other manufacturers, AllRoad also sells a line of specialized, hard-to-find repair parts. These parts have high margins, but those margins are reduced by the cost of the large number of items AllRoad must carry in its inventory. Jason knows that inventory is expensive, but having a large selection of repair parts is key to AllRoad's competitive success. "People know they will find that rare, 10 mm stainless steel Nylex cap on our site. Sure, it sells for maybe a dollar, but once we get people on our site, we have a chance to sell them a \$2,000 suspension system as well. It doesn't happen every day, but it does happen. Our huge parts inventory is bait to our customers, and I'm not going to cut back on it."

Recently Jason has been thinking about 3D printing.¹ AllRoad hasn't used it yet, and Jason's not sure that it makes sense for the company. Still, he knows that if AllRoad could manufacture very small quantities, even single units, of some of the more specialized parts, it could substantially reduce its inventory costs. But he has so many questions: Is 3D printing technology real? Does it produce quality products? How can he analyze past sales to determine how much AllRoad might save? Which parts should the company manufacture and which should it continue to buy? How much will it cost for equipment and information systems to support 3D printing? How can AllRoad integrate in-house manufacturing into its existing purchasing and sales information systems?

Jason doesn't know the answers to these questions, but he doesn't want to wait for AllRoad's competition to show him the way. So, he forms a project team to investigate. He asks Kelly Summers,

AllRoad's CFO, to lead a team to assess the opportunity. Kelly asks Lucas Massey, AllRoad's director of IT services, Drew Mills, Operations Manager, and Addison Lee, head of Purchasing, to participate. Kelly also includes Jennifer Cooper, a relatively new employee about whom she's received a number of complaints. "I'll work closely with her to learn what she can do," Kelly thinks to herself.



Source: AnatolyM/Shutterstock

¹**3D printing**, also known as **additive manufacturing**, is the process of creating three-dimensional objects by fusing two-dimensional layers of plastic, metal, and other substances on top of one another. Because there are very small machine setup costs, 3D printing can economically produce in single-unit quantities. If you haven't yet seen it, search the Internet for *3D printing examples*.

chapter

1

The Importance of MIS

"Fired? You're firing me?"

"Well, *fired* is a harsh word, but... well, AllRoad has no further need for your services."

"But, Kelly, 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 inventory 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 Drew what he thought of the plans you're working on. 'Who's Jennifer?' he asked."

"But doesn't he work down at the warehouse?"

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

"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?"

This could happen to you





STUDY QUESTIONS

- Q1** WHY IS INTRODUCTION TO MIS THE MOST IMPORTANT CLASS IN THE BUSINESS SCHOOL?
- Q2** WHAT IS AN INFORMATION SYSTEM?
- Q3** WHAT IS MIS?
- Q4** WHY IS THE DIFFERENCE BETWEEN INFORMATION TECHNOLOGY AND INFORMATION SYSTEMS IMPORTANT TO YOU?
- Q5** WHAT IS YOUR ROLE IN IS SECURITY?

MyMISLab™

Visit mymislab.com for simulations, tutorials, and end-of-chapter problems.

How does the **knowledge** in this chapter help **you**?

"But today, they're not enough."

"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 to conceptualize a way to identify potential products for 3D production. Do you remember what you told me?"

"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 diagram of our supply chain... how we select vendors and how we negotiate with them, how we order parts and add them to our Web pages, how we manage inventory and ship goods, and so on. Not details, just the overview."

"Yes, I sent you that diagram."

"Jennifer, it made no sense. Your diagram had us shipping goods to customers before we'd taken payment or verified credit."

"I know that process, I just couldn't put it down on paper. But I'll try again!"

"Well, I appreciate that attitude, but we're a small company, really still a startup. Everyone needs to pull more than their own weight here. Maybe if we were a bigger

CE

Optional Extension for this chapter is • CE1: Collaboration Information Systems for Decision Making, Problem Solving, and Project Management 347



company, I'd be able to find for 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."

Q1 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. That statement was not true in 2005, and it may not be true in 2025. But it is true in 2014.

Why?

The ultimate reason lies in a principle known as **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." 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.

Because of Moore's Law, the ratio of price to performance of computers has fallen from something like \$4,000 for a standard computing device to a fraction of a penny for that same device. See Figure 1-1.

As a future business professional, however, you needn't care how fast a computer your company can buy for \$100. That's not the point. Here's the point:

Because of Moore's Law, the cost of data processing, communications, and storage is essentially zero.

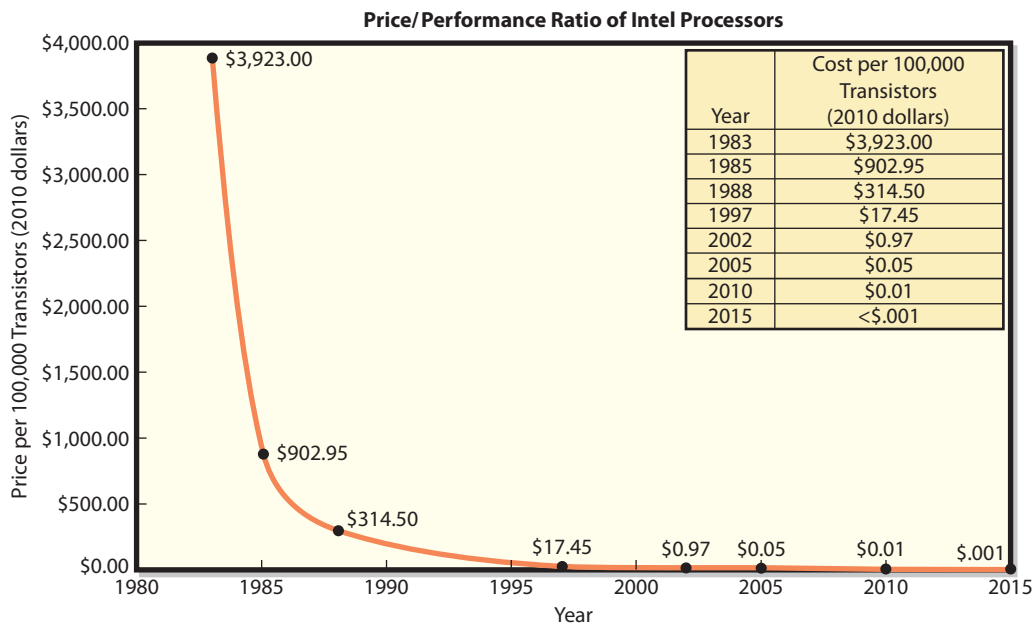


Figure 1-1
Computer Price/Performance Ratio Decreases

Think about that statement before you hurry to the next paragraph. What happens when those costs are essentially zero? Here are some consequences:

- YouTube
- Pandora
- Pinterest
- Twitter
- Facebook
- LinkedIn
- Foursquare
- Hulu

None of these companies were prominent in 2005, and, in fact, most didn't exist in 2005.

WHAT ARE COST-EFFECTIVE BUSINESS APPLICATIONS OF FACEBOOK, TWITTER, AND WHATEVER WILL SOON APPEAR?

Social networking is the rage. Go to any Web page and you'll find the Facebook "Like" and the Twitter "Follow" buttons. The question is, are these applications cost-effective? Do they generate revenue worth the time and expense of running them? Someone needs to be examining that question, and that person works in marketing...not in a technical field. We'll examine this question in more depth in Chapter 8. For now, think about the first businesses that saw the potential of Facebook and Twitter. They gained a competitive advantage by being ahead of the crowd in adopting these new technologies.

It's not over. Facebook and Twitter are not the end. Right now, AllRoad and PRIDE (an application you'll study in Chapters 7–12) are employing new processing capabilities called *the cloud* in innovative ways, using technology and techniques that have never been seen before. All of 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, and having that skill will lead to greater job security.

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, because 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, and so on, that 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:²

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.

²From Lynn A. Kaoly and Constantijn W. A. Panis, *The 21st Century at Work* (Santa Monica, CA: RAND Corporation, 2004), p. xiv.

Skill	Example	Jennifer's Problem
Abstract reasoning	Construct a model or representation.	Hesitancy and uncertainty when conceptualizing a method for identifying parts for 3D printing.
Systems thinking	Model system components and show how components' inputs and outputs relate to one another.	Inability to model AllRoad's supply chain.
Collaboration	Develop ideas and plans with others. Provide and receive critical feedback.	Unwilling to work with others with 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 1-2
Examples of Critical Skills
for Nonroutine Cognition

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 components:³

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

Figure 1-2 shows an example of each. Reread the AllRoad Parts case that started this chapter, and you'll see that Jennifer lost her job because of her inability to practice these skills.

HOW CAN INTRO TO MIS HELP YOU LEARN NONROUTINE SKILLS?

Introduction to MIS is the best course in the business school for learning these four key skills because every topic will require 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 all of the five components of an information system. Chapter 2 will describe 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 your instructor or I 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 10 you'll learn to make process models.

Systems Thinking

Can you go down 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 one of the major beneficiaries of YouTube is Cisco Systems?

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.

³From Robert B. Reich, *The Work of Nations* (New York, NY: Alfred A. Knopf, 1991), p. 229.

The first two chapter extensions on pages 347–379 discuss collaboration in detail and guide you in how to collaborate with your peers.

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 Extensions 1 and 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 paralyzes many good people and 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.

Think about AllRoad’s margin problem. Is there a way it could use social networking within the company to reduce expenses? Could buyers use Facebook or Twitter to share ideas on negotiating the best price? Or would Google+ be a better choice? 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’ve not used. Or you may be asked to collaborate using Microsoft 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 the third factor that makes the Introduction to MIS course vitally important to you. During most of 2013, the U.S. unemployment rate averaged 7.5 percent over all ages and job categories, but according to the U.S. Bureau of Labor Statistics, unemployment of those ages 20 to 24 averaged more than 13 percent.⁴ Employment was better for college graduates than for those

⁴Bureau of Labor Statistics, “Labor Force Statistics from the Current Population Survey,” U.S. Department of Labor, last modified August 2, 2013, <http://www.bls.gov/web/empsit/cpseea10.htm>.

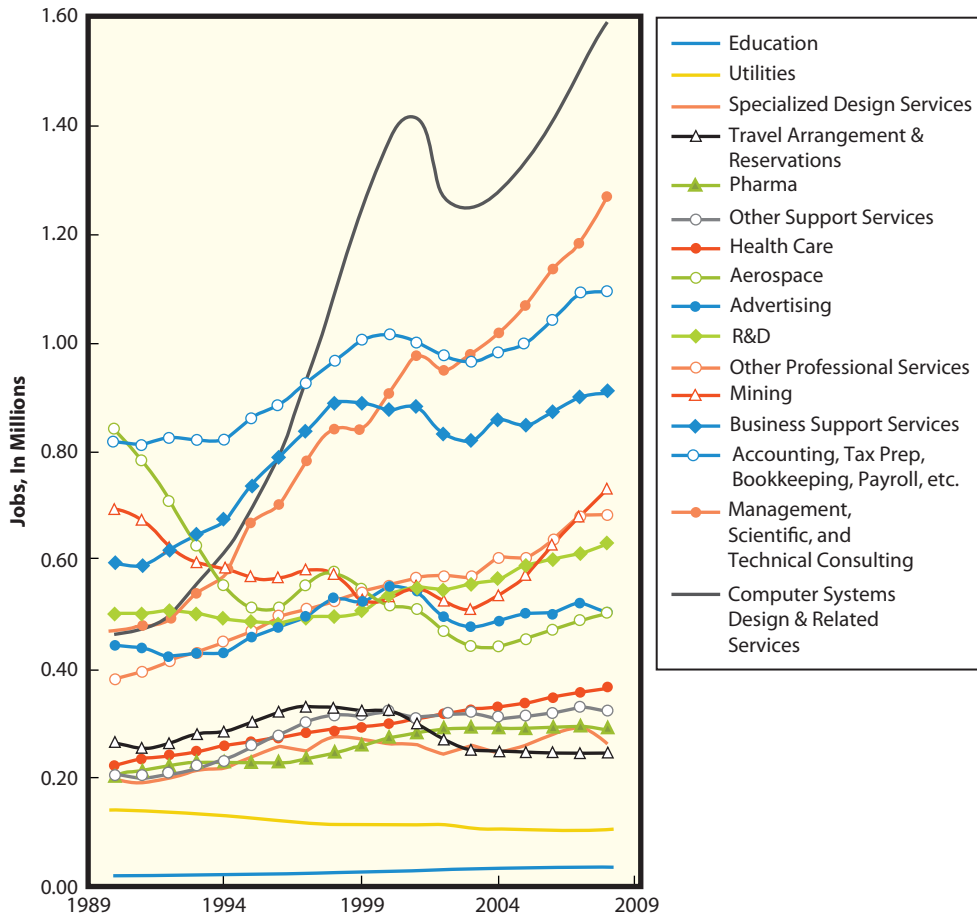


Figure 1-3
Growth of Jobs by Sector
from 1989 to 2009

Source: From *The Evolving Structure of the American Economy and the Employment Challenge* by Michael Spence and Sandile Hlatshwayo. Copyright © 2011 by The Council on Foreign Relations Press. Reprinted with permission.

without degrees, but even college grads had a high rate of unemployment. Hope Yen, writing for the Associated Press in April 2012, stated that one in two college graduates are either unemployed or underemployed.⁵ But not in job categories that are related to information systems.

Spence and Hlatshwayo studied employment in the United States from 1990 to 2008.⁶ 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 1-3, 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 has accelerated dramatically. While this category includes technical jobs like computer programmer and database administrator, it also includes nontechnical sales, support, and business management jobs. By the way, because Figure 1-3 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.

However, 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

⁵Hope Yen, "1 in 2 new graduates are jobless or underemployed," *Yahoo! News*, last modified April 23, 2012, <http://news.yahoo.com/1-2-graduates-jobless-underemployed-140300522.html>.

⁶Michael Spence and Sandile Hlatshwayo, *The Evolving Structure of the American Economy and the Employment Challenge* (New York, NY: Council on Foreign Relations, 2011).