

DAVID M. KROENKE

# Using MIS

2014

7E

3D Printing  
The Cloud  
BigData  
BYOD  
SOA / Web Services  
BPM

*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 other 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 Seventh Edition?

The changes in this seventh edition are listed in Table 1. Chapters 1 through 6 begin with a new discussion of AllRoad Parts, an on-line vendor of off-road 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 students to practice one of Chapter 1’s key skills: “Assess, evaluate, and apply emerging technology to business.”

A second broad change in this seventh edition concerns the teaching of ethics. In this edition, every Ethics Guide asks students 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 20–21) and utilitarianism is introduced in the Ethics Guide in Chapter 2 (pages 56–57).

As shown in Table 1, some sort of change was made to every chapter. Major changes include using the collaboration IS from Chapter 2 to make the notion of IS more personal to students. Chapter 4 includes recent developments in operating systems and a reduced emphasis on Microsoft. See in particular Chapter 4’s 2024 discussion (page 144).

The biggest change has been the major 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 increased coverage of SOA and provided more material on Web services that is used in subsequent chapters.

Numerous changes are 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 sixth 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 sixth edition had to be placed into context of Surface’s mediocre success. Meanwhile, 3D printing is hot, and I wanted to give students an opportunity to consider its effect on processes and IS in the AllRoad scenarios.

**TABLE 1 CHANGES IN THE SEVENTH EDITION**

**Chapter Change**

1–6	New AllRoad Parts case vignettes introduce chapters and are integrated throughout.	6	Entirely rewritten to focus on the cloud. Incorporate AllRoad Parts’ use of the cloud.
all	Categorical imperative and utilitarianism used in Ethics Guides.	6	Rewrite data communications technology as support for the cloud.
1	New employment data; update job requirements from MIT study.	6	Enlarge discussion of SOA and Web services.
2	Update terms, especially Microsoft’s new definition of <i>Office 365</i> .	6	Discuss how organizations, including AllRoad, can use the cloud and cloud services like SaaS, PaaS, IaaS, and CDN.
2	Reduce Microsoft emphasis. Illustrate use of Google Drive. Incorporate product changes since sixth edition. Introduce LibreOffice and thin-client Office alternatives.	6	New Ethics Guide on a partnership’s use of excess profits.
2	Sharpen the discussion to use collaboration IS to enforce IS concepts (Q4 and Q8). New collaboration case to enable students to practice creating a collaboration IS.	6	New end-of-chapter case addresses FinQloud.
3	Work AllRoad Parts into competitive strategy. Adjust Yikes! Bikes! Ethics Guide. Adapt Case 3 for AllRoad Parts.	7	New InClass Exercise; former exercise moved to Chapter 12.
3	Add new theme to 2024 discussion.	7	Update chapter to take advantage of SOA and related new content in Chapter 6.
4	Work AllRoad Parts into hardware/software discussion. Reduce Microsoft presence. Discuss flop of Win 8 RT, problems in Win 8 and Surface Pro.	8	New InClass Exercise on Salesforce.com’s Chatter. GE jet engines as social network participants?
4	New Ethics Guide replaces Churn and Burn.	8	New Guide discusses use of social media for developing a personal brand.
4	Update and adapt InClass Exercise.	8	Update discussion of Web revenue to remove fear of revenue loss due to use of mobile devices.
4	Emphasize importance of JavaScript and recognize it as an object-oriented language.	9	New examples in Q1.
4	Rewrite 2024? to consider the death of the PC; pick Amazon as the ultimate winner.	9	Change illustrative case to use the simpler, easier-to-teach AllRoad business model (Q2).
5	Use AllRoad Parts to set up the need for database knowledge.	9	New Ethics Guide concerning data aggregators.
5	New Ethics Guide addresses corporate social responsibility.	10	Move sixth edition Chapter 7 InClass Exercise to Chapter 10 where it is a better fit.
5	Replace Q4 with a more modern thin-client database application. Introduce Node.js and other server-side concepts used in new Chapter 6.	10	Update Ethics Guide.
5	Update 2024? to use term <i>nonrelational DBMS</i> ; introduce MongoDB as well as NoSQL products.	10	Update Ethics Guide.
		11	Update Ethics Guide.
		12	Update 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.
		International Dimension	Include Ghemawat’s “Why the World Isn’t Flat” data. Modernize discussion of hardware and distributed databases to utilize cloud terms.

# The Guides

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Each chapter includes three unique **guides** that focus on current issues in information systems. In each chapter, one of the guides focuses on an ethical issue in business, and the second focuses on security. The third guide addresses 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 following table, each chapter includes various learning aids to help you succeed in this course.

Resource	Description	Benefit	Example
<b>Guides</b>	Each chapter includes three guides that focus on current issues in information systems. One addresses ethics, one addresses security, and the third addresses other business topics.	Stimulate thought and discussion. Address ethics and security once per chapter. Help develop your problem-solving skills.	"Social Recruiting," p. 314
<b>Chapter Introduction Business Example</b>	Each chapter begins with a description of a business situation that motivates the need for the chapter's contents. We focus on two different businesses over the course of the text: AllRoad Parts, an online vendor of off-road vehicle parts, and PRIDE, a cloud-based, healthcare start-up opportunity.	Understand the relevance of the chapter's content by applying it to a business situation.	Chapter 1, "Fired?," p. 3; Chapter 7, "Every morning I get a report about the exercise your mother's getting so I can see how she's doing," p. 242
<b>Query-Based Chapter Format</b>	Each chapter starts with a list of questions, and each major heading is a question. The Active Review contains tasks for you to perform in order to demonstrate your ability to answer the questions.	Use the questions to manage your time, guide your study, and review for exams.	Chapter 6, starting on p. 199 with "Q1 Why Is the Cloud the Future for Most Organizations?"
<b>Using MIS InClass</b>	Each chapter of this text includes an exercise called "Using MIS InClass." 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.	Understand how the material in the chapter applies to everyday situations.	Using MIS InClass 4, "Place Your Bets Now" on the tablet marketing race, p. 124
<b>2024?</b>	Each chapter concludes with a discussion of how the concepts, technology, and systems described in that chapter might change by 2024.	Learn to anticipate changes in technology and recognize how those changes may impact the future business environment.	Chapter 4, "The PC Is Dead, So What?," p. 144; Chapter 7, "Mobile Devices Meet SAP," p. 269

Resource	Description	Benefit	Example
Active Review	This review provides a set of activities for you to perform in order to demonstrate your ability to answer the primary questions addressed by the chapter.	After reading the chapter, use the Active Review to check your comprehension. Use for class and exam preparation.	Chapter 2, Active Review, p. 72
Using Your Knowledge	These exercises ask you to take your new knowledge one step further by applying it to a practice problem.	Test your critical-thinking skills.	Chapter 3, Questions 3-1 through 3-3, p. 105
Collaboration Exercises	These exercises and cases ask you to collaborate with a group of fellow students, using collaboration tools introduced in Chapter 2.	Practice working with colleagues toward a stated goal.	Chapter 2, Construct a collaboration IS, p. 74
Case Studies	Each chapter includes a case study at the end.	Apply newly acquired knowledge to real-world situations.	Case Study 3, "Fulfillment by Amazon (FBA)," p. 106; Case Study 9, "Hadoop the Cookie Cutter," p. 369
Application Exercises	These exercises ask you to solve situations using spreadsheet (Excel) or database (Access) applications.	Develop your computer skills.	Exercise 1-1, p. 506; Exercise 7-1, p. 515
International Dimension	Module at the end of the text that discusses international aspects of MIS. Includes the importance of international IS, the localization of system components, the roles of functional and cross-functional systems, international applications, supply chain management, and challenges of international systems development.	Understand the international implications and applications of the chapters' content.	p. 489

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# Using MIS

David M. Kroenke

SEVENTH EDITION

**PEARSON**

Boston Columbus Indianapolis New York San Francisco Upper Saddle River  
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montréal Toronto  
Delhi Mexico City São Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo



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**Text Font:** 9.5/13 Utopia

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## Library of Congress Cataloging-in-Publication Data

Kroenke, David M.  
Using MIS / David M. Kroenke.—Seventh edition.  
pages cm  
Includes index.  
ISBN 978-0-13-354643-9  
1. Management information systems. I. Title.  
HD30.213.K76 2015  
658.4'038011—dc23

2013035311

10 9 8 7 6 5 4 3 2 1

**PEARSON**

ISBN 10: 0-13-354643-8  
ISBN 13: 978-0-13-354643-9

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Describes how this course teaches four key skills for business professionals. Defines *MIS*, *information systems*, and *information*.

Describes characteristics, criteria for success, and the primary purposes of collaboration.

Discusses components of collaboration IS and describes collaboration for communication and content sharing. Illustrates use of Google Drive, SharePoint, and other collaboration tools.

Describes reasons why organizations create and use information systems: to gain competitive advantage, to solve problems, and to support decisions.

Describes the manager's essentials of hardware and software technology. Discusses mobile device operating systems, mobile UX, and BYOD policies.

Explores database fundamentals, applications, modeling, and design. Discusses the entity-relationship model. Explains the role of Access and enterprise DBMS products. Defines BigData and describes nonrelational and NoSQL databases.

Explains why the cloud is the future. Describes basic network technology that underlies the cloud, how the cloud works, and how organizations, including AllRoad Parts, can use the cloud. Explains SOA and summarizes fundamental Web services standards.

Discusses workgroup, enterprise, and inter-enterprise IS. Describes problems of information silos and cross-organizational solutions. Presents CRM, ERP, and EAI. Discusses ERP vendors and implementation challenges.

Describes components of social media IS (SMIS) and explains how SMIS can contribute to organizational strategy. Discusses the theory of social capital and the role of SMIS in the hyper-social organization. Explains the ways organizations manage the risks of SMIS.

Describes business intelligence and knowledge management, including reporting systems, data mining, and social media-based knowledge management systems.

Discusses the need for BPM and the BPM process. Introduces BPMN. Differentiates between processes and information systems. Presents SDLC stages. Describes agile technologies and scrum and discusses their advantages over the SDLC.

Describes the role, structure, and function of the IS department; the role of the CIO and CTO; outsourcing; and related topics.

Describes organizational response to information security: security threats, policy, and safeguards.

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## 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 Corporations, 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 ed. (2013), *Experiencing MIS*, 5th ed. (2015), *MIS Essentials*, 4th ed. (2015), *SharePoint for Students* (2012), *Office 365 in Business* (2012), and *Processes, Systems, and Information: An Introduction to MIS*, 2nd ed. (2015). David lives on Whidbey Island, Washington, and has two children and three grandchildren. He enjoys woodworking, making both furniture and small sailboats.

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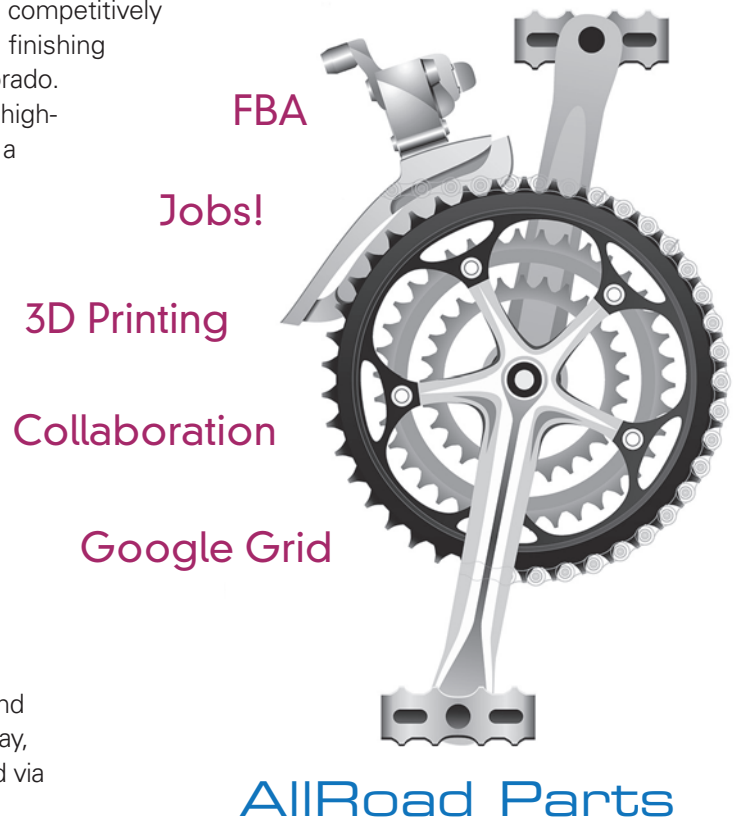
# Why MIS?

**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, 4-wheel-drive vehicles. Two-thirds of the company's sales are to small businesses like bike shops, motorcycle specialty stores, and off-road customization businesses. The other third are direct sales to consumers.

Jason Green is AllRoad's founder and CEO. Jason has always had a strong 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 biking and competitively raced cross-country, winning several regional contests and finishing near the top 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 a part-time, profitable 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](http://www.RideFox.com)), and through contacts made at one of the championship events, he obtained a marketing job at Fox. Part of his job was road testing new equipment, a task he loved. Jason worked at Fox for five years, gaining marketing and management experience. However, he never forgot the success he had selling parts himself on eBay and was convinced he could start a parts business on his own. In 2003, he left Fox to start AllRoad Parts.

Today, AllRoad sells nearly \$20 million in bike, motorcycle, and 4-wheel parts for adventure riding. Jason no longer uses eBay, but true to his vision, the bulk of AllRoad's revenue is earned via online sales.





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 inventory AllRoad must carry. Jason knows his inventory is expensive, but he views having a large selection of repair parts as 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. We don't sell one every day, but it does happen. Our huge parts selection is strong bait to our customers, and I'm not going to cut back on it."

At a recent manufacturer's trade show, Jason saw a demonstration of 3D printing, which 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 3D printing has very small machine setup costs, it can be used to economically produce single-unit quantities. It also enables anyone who can afford a 3D printer to become a manufacturer.<sup>1</sup>

AllRoad hasn't used 3D printing 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 inventory costs. But he has so many questions: Is 3D printing technology real? Does it produce quality products? How can past sales be analyzed to determine how much the company might save? Which parts should AllRoad 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, the director of IT services, Drew Mills, the 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 says to herself.

---

<sup>1</sup>**3D printing**, also known as **additive manufacturing**, is fascinating. If you haven't yet seen it in action, search the Internet for *3D printing examples*.

# 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?”

“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 determine the products for 3D printing. When I asked you how you were doing, 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 diagram of our supply chain... how we select the vendors, how we negotiate with them, how we order, receive the goods in our inventory, track sales, and reorder, and so on. Not details, just the overview."

"Yes, I sent you that diagram."

"Jennifer, it made no sense. Your diagram had us placing goods in inventory before we'd even ordered them."

"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 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."



**"But today,  
they're not  
enough."**



## STUDY QUESTIONS

- Q1** Why is Introduction to MIS the most important class in the business school?
- Q2** What is MIS?
- Q3** How can you use the five-component model?
- Q4** Why is the difference between information technology and information systems important?
- Q5** What is information?
- Q6** What are necessary data characteristics?
- Q7** 2024?

## 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 all of 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.



## 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 2020. But it is true in 2014.

Why?

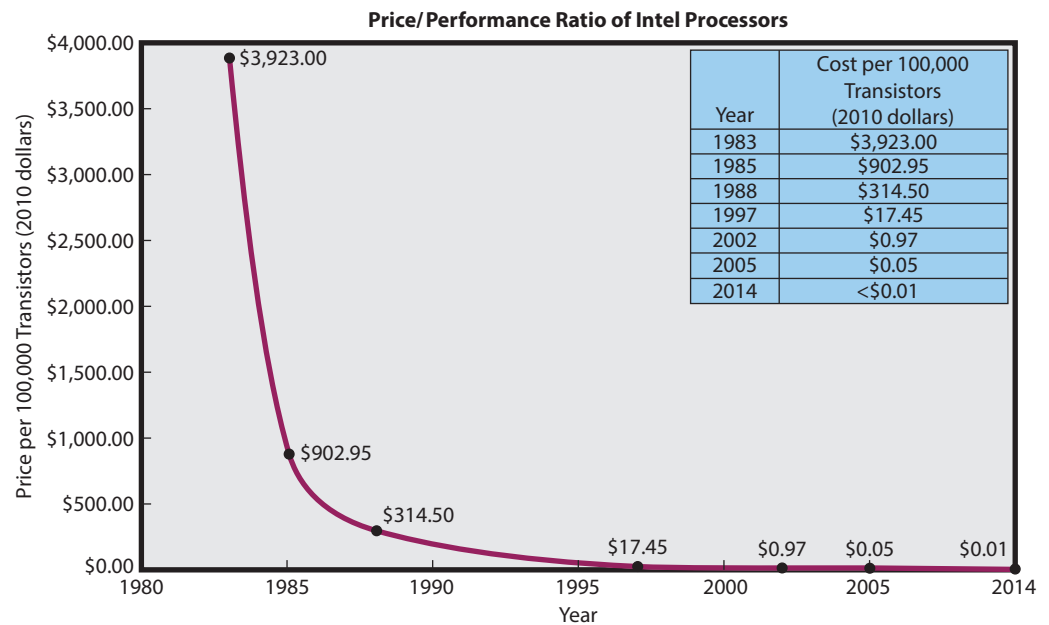
The ultimate reason lies in a principle known as **Moore’s Law**. In 1965, Gordon Moore, cofounder of Intel Corporation, stated that because of technology improvements in electronic chip design and manufacturing, “The number of transistors per square inch on an integrated chip doubles every 18 months.” 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 computing device.<sup>2</sup> See Figure 1-1.

As a future business professional, however, you needn’t care how fast of 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.**

<sup>2</sup>These figures represent the cost of 100,000 transistors, which can roughly be translated into a unit of a computing device. If you doubt any of this, just look at your \$199 Kindle Fire and realize that you pay nothing for its wireless access. Geoff Colvin claims the cost of 125,000 transistors is less than the cost of a grain of rice. See: <http://choutimes.com/2010/09/11/food-for-thought/food-for-thought/>.



**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
- Facebook
- Pandora
- LinkedIn
- Pinterest
- Woot
- Twitter
- Foursquare

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

### What Are Cost-Effective Business Applications of Facebook or Twitter, or Whatever Else 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 Parts 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.

## 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, or another advanced economy, 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:

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.<sup>3</sup>

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:<sup>4</sup>

- 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 key skills.

Skill	Example	Jennifer’s Problem at AllRoad Parts
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 Parts’ supply chain.
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 1-2**  
Examples of Critical Skills for  
Nonroutine Cognition

<sup>3</sup>Lynn A. Kaoly and Constantijn W. A. Panis, *The 21st Century at Work* (Santa Monica, CA: RAND Corporation, 2004), p. xiv.

<sup>4</sup>Robert B. Reich, *The Work of Nations* (New York: Alfred A. Knopf, 1991), p. 229.



## 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 a *model* of the five components of an information system. This chapter 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 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 take 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've not used. Or you may be asked to collaborate using Office 365 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 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 over 13 percent.<sup>5</sup> Employment was better for college graduates than for those without degrees, but even college grads had a high rate of unemployment. Hope Yen, writing for the Associated Press, said in April 2012 that one in two college graduates is either unemployed or underemployed.<sup>6</sup> But this is not the case in job categories that are related to information systems.

Spence and Hlatshwayo studied employment in the United States from 1990 to 2008.<sup>7</sup> 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 accelerated dramatically. While this category includes technical positions such as computer programmer and database administrator, it includes non-technical sales, support, and business management jobs as well. 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 benefit from it increases dramatically.<sup>8</sup> 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 Guide on pages 26–27 for more thoughts on how you might consider an IS-related job.

<sup>5</sup>Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," United States Department of Labor, last modified July 5, 2013, <http://www.bls.gov/web/empsit/cpseea10.htm>.

<sup>6</sup><http://news.yahoo.com/1-2-graduates-jobless-underemployed-140300522.html>.

<sup>7</sup>Michael Spence and Sandile Hlatshwayo, *The Evolving Structure of the American Economy and the Employment Challenge* (New York: Council on Foreign Relations, 2011).

<sup>8</sup>Daron Acemoglu and David Autor, "Skills, Tasks, and Technologies: Implications for Employment and Earnings" (working paper, National Bureau of Economic Research, June 2010), <http://www.nber.org/papers/w16082>.