GLOBAL EDITION

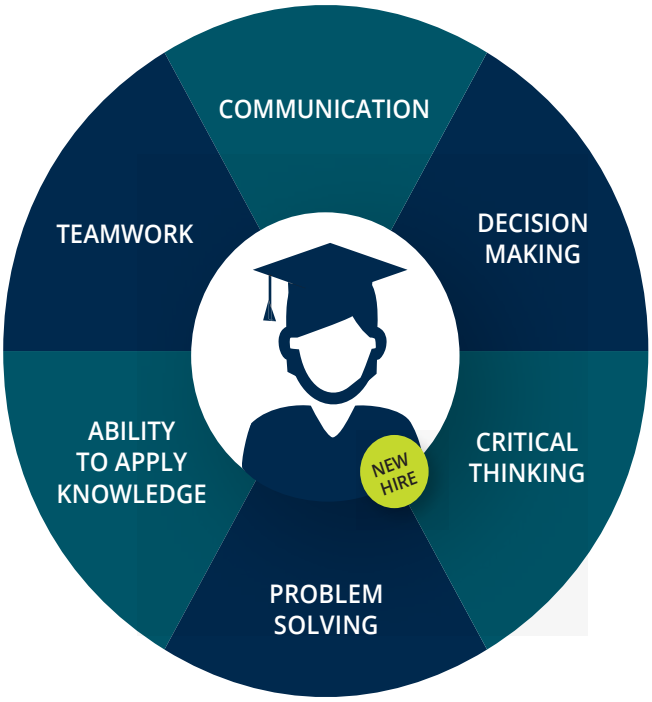
Using MIS

TENTH EDITION

David M. Kroenke • Randall J. Boyle

Pearson

MIS: Engage, Apply, Empower



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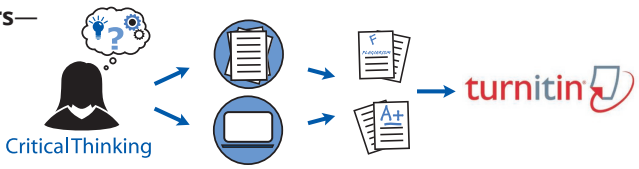

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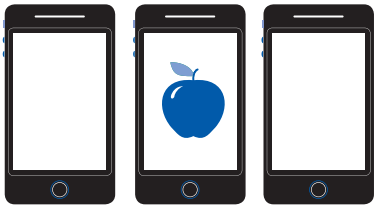

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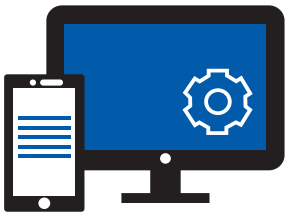

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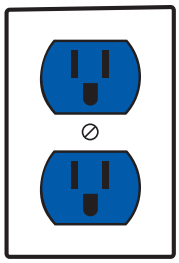

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Dear Student,

Honestly, this is a fun class. It's fun to take because you'll learn about things that dominate news headlines every day. You'll learn about things like self-driving cars, 3D printing, social media, Big Data, virtual reality, the cloud, and cybersecurity. No, it's not a programming class. It's not intended to be a class where you learn a bunch of boring technical terms and computer code. Not at all.

This class is about using technology to create value. For example, the smartphone sitting next to you is a piece of technology that is probably very valuable to you. It's an amazing piece of hardware that contains software, databases, and artificial intelligent agents. You use it to browse the Web, collaborate with friends, take pictures, post to social media, and make online purchases. More than 85 percent of college students have a smartphone, and 46 percent say they can't live without it. That's value, and they're willing to pay for it.

And that's what information systems are all about. Innovators like Steve Jobs, Bill Gates, Larry Ellison, Mark Zuckerberg, Larry Page Sergey Brin, and Jeff Bezos have used technology to create value for their customers. As a result, they have made billions of dollars, revolutionized commerce, and created some of the largest companies in the world. And you can do the same thing in your personal life.

You can use technology to get a great job, increase your earning potential, and become indispensable to your future employer. You may not be a superstar entrepreneur like Steve Jobs, but you can exceed beyond your expectations by applying the knowledge you learn in this class. Companies are becoming increasingly dependent on technology. They need people who understand how to use *new* technology to solve *new* types of problems. And that's you.

Think about it. Over time, technology creates new jobs that didn't exist before. Mobile application developers, social media analysts, information security specialists, business intelligence analysts, and data architects didn't exist 20—even 10—years ago. Similarly, the best jobs 20 years from now probably don't currently exist.

The trick to turning information systems to your advantage is being able to predict technological innovations and then get ahead of them. 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, creative, nonroutine 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 deciding to study business. Use this course to help you obtain and then thrive in an interesting and rewarding career. 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, we wish you, a future business professional, the very best success!

David Kroenke & Randy Boyle

The Guides

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 focuses on careers in the field of information systems. 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.

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
Guides	Each chapter includes three guides that focus on current issues in information systems. One addresses ethics, one addresses security, and the third addresses information systems careers.	Stimulate thought and discussion. Address ethics and security once per chapter. Learn about real-world IS jobs.	Chapter 5, Ethics Guide: Querying Inequality? Chapter 8, Security Guide: Digital Is Forever Chapter 9, Career Guide: Manager, Data and Analytics
Chapter Introduction Business Example	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: Falcon Security, a provider of aerial surveillance and inspection services; and ARES, an augmented reality exercise startup opportunity.	Understand the relevance of the chapter's content by applying it to a business situation.	Chapter 9, opening vignette: Business Intelligence Systems and ARES
Query-Based Chapter Format	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 1, Q1-4: How Can You Use the Five Component Model? Chapter 6, Q6-4: How Does the Internet Work?
So What?	Each chapter of this text includes an exercise called "So What?" This feature challenges the students to apply the knowledge they've gained from the chapter to themselves, often in a personal way. The goal is to drive home the relevancy of the chapter's contents to their future professional lives. It presents a current issue in IS that is relevant to the chapter content and asks you to consider why that issue matters to you as a future business professional.	Understand how the material in the chapter applies to everyday situations.	Chapter 2, So What? Augmented Collaboration

Resource	Description	Benefit	Example
2027?	Each chapter concludes with a discussion of how the concepts, technology, and systems described in that chapter might change by 2027.	Learn to anticipate changes in technology and recognize how those changes may affect the future business environment.	Chapter 7, 2027? discusses the future of ERP applications
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 9, Active Review
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 4, Using Your Knowledge
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.	Collaboration Exercise 3 discusses how to tailor a high-end resort's information system to fit its competitive strategy
Case Studies	Each chapter includes a case study at the end.	Apply newly acquired knowledge to real-world situations.	Case Study 6, Cloud Solutions and Infrastructure That Safely Test for Consumer Risk and Financial Stability
Application Exercises	These exercises ask you to solve situations using spreadsheet (Excel) or database (Access) applications.	Develop your computer skills.	AE10-2 builds on your knowledge from Chapter 10 by asking you to score the websites you visit using WOT
International Dimension	This module at the end of the text discusses international aspects of MIS. It 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.	International Dimension QID-3, How Do Inter-enterprise IS Facilitate Global Supply Chain Management?

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PREFACE

In Chapter 1, we claim that MIS is the most important class in the business curriculum. That's a bold statement, and every year we ask whether it remains true. Is there any discipline having a greater impact on contemporary business and government than IS? We continue to doubt there is. Every year brings important new technology to organizations, and many of these organizations respond by creating innovative applications that increase productivity and help them accomplish their strategies.

Over the past year, we've seen long-discussed innovations take big leaps forward. Digital reality (sometimes called virtual reality) really took off. Microsoft (HoloLens), Meta (Meta 2), and Facebook (Oculus Rift) released their digital reality devices in early 2016. The reviews for these devices from early adopters were glowing. These devices will create entirely new types of companies and could change the way people live, work, shop, and entertain themselves.

Internet of Things (IoT) smart devices once again dominated the Consumer Electronics Show (CES), which is the industry's annual display of the latest innovative products. Smart refrigerators, smart beds, and smart sensors of every kind were a hit. But it isn't just consumers who are excited for IoT devices; businesses see their potential value, too. More importantly, these businesses recognize the need to collect, store, and analyze the data these devices will generate. As a result, jobs in analytics, business intelligence, and Big Data are all in high demand right now.

In addition to changing the ways we live and gather data, recent innovations are changing the way companies work, too. For example, over the past year Amazon experienced tremendous success using Kiva robots in its fulfillment centers. It expanded their use to 13 warehouses around the world. These 30,000 Kiva robots have reduced operating costs by 20 percent ($22 million per warehouse); they have also reduced click-to-ship times from 60 minutes to just 15 minutes.[1] If Amazon rolls out these robots to all of its 110 warehouses, it could save billions. Technology—in this case, an automated workforce—is fundamentally changing the way organizations operate. It's enabling them to be more productive, innovative, and adaptable.

Another technological advancement that made huge strides over the past year was self-driving cars. Tesla Motors turned a regular car into a self-driving car by simply pushing out a software update. In 6 months the nearly autonomous vehicles logged more than 100 million miles on autopilot (with a few traffic incidents). Google, Mercedes-Benz, and nearly all other automobile manufacturers are running full tilt to turn their traditional cars into fully autonomous smart cars. The implications for autonomous vehicles go beyond consumers, too. Consider what would happen if Amazon started using self-driving trucks. It could reduce shipping costs by 80 percent!

Of course, not all of this year's technology news has been good. Large-scale data breaches continue to be a major problem. LinkedIn (117 million), Ashley Madison (30 million), Tumblr (65 million), and MySpace (360 million) all suffered enormous data losses. And these are just a fraction of the total number of organizations affected this year. Organizations saw a jump in the number of attacks from highly organized international hacking groups; they also saw the proliferation of cryptographic ransomware.

This edition of the text has been updated for these developments as well as normal revisions that address emergent technologies like cloud-based services, artificial intelligence, machine learning, and so on.

All of these changes highlight the fact that more sophisticated and demanding users push organizations into a rapidly changing future—one that requires continual adjustments in business planning. In order to participate in this business environment, our graduates need to know

how to apply emerging technologies to better achieve their organizations' strategies. Knowledge of MIS is critical to this endeavor. And this pace continues to remind us of Carrie Fisher's statement "The problem with instantaneous gratification is that it's just not fast enough."

Why This Tenth Edition?

To reiterate the preface of earlier editions, we believe it is exceedingly important to make frequent adaptations to this text because of the delays associated with a 2-year revision cycle. Text materials we develop in April of one year are published in January of the next year and are first used by students in September—a minimum 17-month delay.

For some areas of study, a year and a half may not seem long because little changes in that amount of time. But in MIS, entire companies can be founded and then sold for billions of dollars in just a few years. YouTube, for example, was founded in February 2005 and then sold in November 2006 to Google for $1.65B (21 months). And that wasn't just a one-time fluke. Facebook Inc. started in 2004, led the social media revolution, and became a public company valued at $341B as of mid-2016. That's a whopping $28B in growth per year for 12 years! MIS changes fast—very fast. We hope this new edition is the most up-to-date MIS textbook available.

The changes in this tenth edition are listed in Table 1. Substantial changes were made in Chapter 6 to provide some context about where the cloud came from and how it differs from previous architectures. New discussion about scalability and the advantages of cloud-based services is included as well as new graphics that more clearly differentiate between IaaS, PaaS, and SaaS. Chapter content was reorganized around an example that explains how the Internet works by comparing it to the U.S. postal system. Hopefully this new example ties abstract and unfamiliar networking concepts to real-world situations that students have experienced.

TABLE 1: CHANGES IN THE TENTH EDITION

Chapter	Change
1	New So What? Feature: A Is for Alphabet
	New and updated charts for CPU and data storage growth
	Updated BLS job statistics
	New 2027? discussion in Q1-7
2	New Ethics Guide: Big Brother Wearables
	New Career Guide: Software Product Manager
	Discussion of constructive criticism and groupthink
	New examples of providing and receiving constructive criticism
	Expanded discussion of real-time surveying software (Socrative)
	Updated So What? Guide about augmented collaboration
	New 2027? discussion in Q2-9
3	New So What? Feature: The Autonomous Race
	New Career Guide: Technology and Operations Executive
	New Ethics Guide: The Lure of Love Bots
	New 2027? discussion in Q3-8
	Updated Amazon case study
4	New Security Guide: Poisoned App-les

Chapter	Change
	New So What? Feature: New from CES 2016
	New Career Guide: Technical Account Manager
	Updated industry statistics throughout the chapter
	Expanded augmented/mixed/virtual reality discussion
5	New Security Guide: Big Data… Losses
	New So What? Guide: Slick Analytics
	New Career Guide: Database Engineer
	Updated images for Microsoft Office 2016 and SharePoint 2016
6	Reorganized chapter content for Q6-1 through Q6-5
	New Q6-1 discussion about the origin of the cloud
	New Q6-1 cloud adoption examples statistics
	New discussion about scalability
	Expanded cloud versus in-house comparison
	New Q6-2 example using transportation as a service
	New Q6-2 graphics to illustrate differences between IaaS, PaaS, and SaaS
	New Q6-2 example and graphics for CDNs
	New Q6-4 example comparing the Internet and the U.S. postal system

Chapter	Change
	New Q6-4 content about DNS, TCP, IP addresses, carriers, and IXPs
	Updated Active Review questions
	Updated 2027? discussion to include AaaS and BaaS
	New So What? Feature: Quantum Learning
	New Career Guide: Senior Network Manager
	Updated industry statistics throughout the chapter
7	New ARES introduction
	New Security Guide: It's Not Me, It's You
	New Career Guide: IT Technical Manager
	New Ethics Guide: Paid Deletion
	Updated Q7-7 for ARES example
8	New ARES introduction
	New So What? Feature: Enhanced Golf Fan
	New Career Guide: International Content Director
	Updated industry statistics throughout the chapter
	New social media chapter examples
9	New ARES introduction
	New Career Guide: Manager, Data and Analytics
	New Ethics Guide: MIS-Diagnosis
	Updated chapter examples using ARES
	Updated Office 2016 figures
	Updated RFM scoring
	New discussion of AI and machine learning
10	New ARES introduction
	New Security Guide: Exhaustive Cheating
	New So What? Feature: New from Black Hat 2015

Chapter	Change
	New Career Guide: IT Security Analyst
	New industry statistics and charts throughout the chapter
11	New ARES introduction
	New Security Guide: Watching the Watchers
	New Career Guide: Director of Architecture
	New Ethics Guide: Training Your Replacement
	New industry statistics and charts throughout the chapter
	Expanded discussion on outsourcing specialized tech skills
	New automated labor case study
12	New ARES introduction
	New So What? Feature: Banking on IoT
	New statistics about agile and scrum use
	New 2027? discussion in Q12-7
International Dimension	Updated section on localization using IBM's Watson
	New legal environment examples in QID-4
	New statistics and discussion about international Internet access (fixed and mobile)
	New Career Guide: Director of Asian Operations
Appl Ex	Updated data files
	New exercise looking up IT job salaries (O*NET and BLS)
	New exercise using an ad blocker (Adblock Plus)
	New exercise creating a mobile application (Microsoft Touch Develop)
	Updated Microsoft Office 2016 compliant files and chapter images

In addition, we've introduced a new "Career Guide" in this edition that let's students read firsthand accounts from people working in information systems jobs. Each of these guides is written by an MIS graduate and answers questions like "How did you get this type of job?" and "What does a typical workday look like for you?" Students taking an introductory course in MIS are often interested in majoring in MIS but aren't sure what it would be like to work in the field. These new guides answer some of the common questions students may have about working in the field.

Also, a secondary goal of these new Career Guides is to encourage female students not to be daunted by gender imbalances in a field that is 70 percent male and 30 percent female.[2] Half of the Career Guides are written by men and the other half by women. Hopefully, hearing from successful women working in MIS jobs will inspire female students considering a career in MIS.

Chapters 7 through 12 begin with a new discussion of ARES, a cloud-based augmented-reality exercise startup. Chapters 1–6 continue to be introduced by Falcon Security, a privately owned company that provides surveillance and inspection services for companies using flying drones. 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."

This edition also continues to focus on teaching ethics. Every Ethics Guide asks students to apply Immanuel Kant's categorical imperative, Bentham and Mill's utilitarianism, or both to the business situation described in the guide. We hope you find the ethical considerations

rich and deep with these exercises. The categorical imperative is introduced in the Ethics Guide in Chapter 1 (pages 57–58), and utilitarianism is introduced in the Ethics Guide in Chapter 2 (pages 94–95).

As shown in Table 1, additional changes were made to every chapter, including five new Security Guides, eight new So What? features, five new Ethics Guides, 11 new Career Guides, and updated chapter cases. Additional figures, like the one showing how CDNs work in Chapter 6, were added to make the text more accessible. Numerous changes were made throughout the chapters in an attempt to keep them up-to-date. MIS moves fast, and to keep the text current, we checked every fact, data point, sentence, and industry reference for obsolescence and replaced them as necessary.

Importance of MIS

As stated, we continue to believe we are teaching the single most important course in the business school. The rationale for this bold statement is presented in Part 1, starting on page 35. In brief, the argument relies on two observations.

First, processing power, interconnectivity of devices, storage capacity, and bandwidth are all increasing so rapidly that it's fundamentally changing how we use digital devices. Businesses are increasingly finding—and, more importantly, increasingly *required* to find—innovative applications for information systems. The incorporation of Facebook and Twitter into marketing systems is an obvious example, but this example is only the tip of the iceberg. For at least the next 10 years, every business professional will, at the minimum, need to be able to assess the efficacy of proposed IS applications. To excel, business professionals will also need to define innovative IS applications.

Further, professionals who want to emerge from the middle ranks of management will, at some point, need to demonstrate the ability to manage projects that develop these innovative information systems. Such skills will not be optional. Businesses that fail to create systems that take advantage of changes in technology will fall prey to competition that can create such systems. So, too, will business professionals.

The second premise for the singular importance of the MIS class relies on the work of Robert Reich, former Secretary of Labor for the Bill Clinton administration. In *The Work of Nations*,[3] Reich identifies four essential skills for knowledge workers in the 21st century:

- Abstract thinking
- Systems thinking
- Collaboration
- Experimentation

For reasons set out in Chapter 1, we believe the MIS course is the single best course in the business curriculum for learning these four key skills.

Today's Role for Professors

What is our role as MIS professors? Students don't need us for definitions; they have the Web for that. They don't need us for detailed notes; they have the PowerPoints. Consequently, when we attempt to give long and detailed lectures, student attendance falls. And this situation is even more dramatic for online courses.

We need to construct useful and interesting experiences for students to apply MIS knowledge to their goals and objectives. In this mode, we are more like track coaches than the chemistry professor of the past. And our classrooms are more like practice fields than lecture halls.[4]