

GLOBAL
EDITION



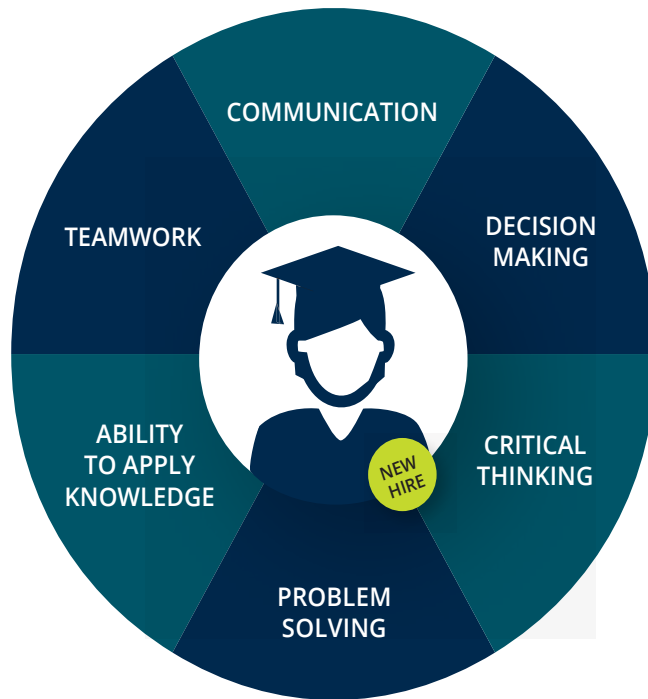
Using MIS

TENTH EDITION

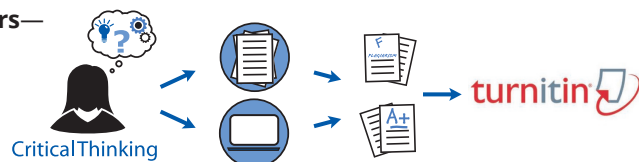
David M. Kroenke • Randall J. Boyle



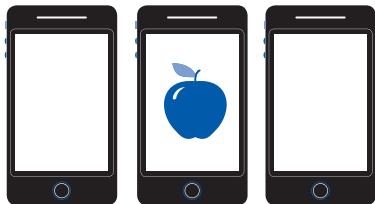
MIS: Engage, Apply, Empower



- **Writing Space**—Better writers make better **communicators**— who become better managers. Designed to help develop and assess concept mastery and **critical thinking**, the Writing Space offers assisted auto-graded writing assignments so students can receive meaningful, personalized feedback quickly and easily. And because of Intergration with Turnitin®, Writing Space can check students' work for improper citation or plagiarism.



- **Dynamic Study Modules**—help students learn the language of MIS by continuously assessing their activity and performance in real time by adapting to the student's **knowledge** and confidence on each concept. These are available as graded assignments prior to class, and accessible on smartphones, tablets, and computers.



- **Learning Catalytics™**—is an interactive, student response tool that uses students' smartphones, tablets, or laptops to engage them in more sophisticated tasks and **critical thinking** as well as **collaboration** with other class members. Included with MyLab with eText, Learning Catalytics enables you to generate classroom discussion, guide your lecture, and promote peer-to-peer learning with real-time analytics.

- **Reporting Dashboard**—View, analyze, and report learning outcomes clearly and easily, and get the information needed to keep students on track throughout the course with the new Reporting Dashboard. Available via the MyLab Gradebook and fully mobile-ready, the Reporting Dashboard presents student performance data at the class, section, and program levels in an accessible, visual manner.



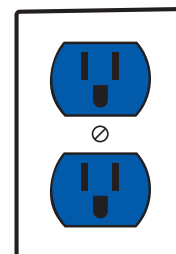
- **Pearson eText**—keeps students engaged in learning on their own time, while helping them achieve greater conceptual understanding of course material. Combining resources that illuminate content with accessible self-assessment, MyLab with Pearson eText provides students with a complete digital learning experience—all in one place.



- **Accessibility (ADA)**—Pearson is working toward WCAG 2.0 Level AA and Section 508 standards, as expressed in the **Pearson Guidelines for Accessible Educational Web Media**. Moreover, our products support customers in meeting their obligation to comply with the Americans with Disabilities Act (ADA) by providing access to learning technology programs for users with disabilities.

Please email our Accessibility Team at disability.support@pearson.com for the most up-to-date information.

- **LMS Integration**—You can now link from Blackboard Learn, Brightspace by D2L, Canvas, or Moodle to MyLabMIS. Professors can access assignments, rosters, and resources, and synchronize grades with your LMS gradebook. Single sign-on provides students access to all the personalized learning resources that make studying more efficient and effective.



<http://www.pearsonmylabandmastering.com>

PEARSON

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.

Chapter 1

Ethics: Ethics and Professional Responsibility 57
Security: Passwords and Password Etiquette 60
Career Guide: Five-Component Careers 62

Chapter 2

Ethics: Big Brother Wearables 94
Security: Evolving Security 104
Career Guide: Software Product Manager 106

Chapter 3

Ethics: The Lure of Love Bots 120
Security: Hacking Smart Things 134
Career Guide: Director of Architecture 137

Chapter 4

Ethics: Free Apps For Data 176
Security: Poisoned App-les 182
Career Guide: Technical Account Manager 184

Chapter 5

Ethics: Querying Inequality? 200
Security: Big Data ... Losses 222
Career Guide: Database Engineer 224

Chapter 6

Ethics: Cloudy Profit? 250
Security: From Anthem to Anathema 272
Career Guide: Senior Network Manager 275

Chapter 7

Ethics: Paid Deletion 302
Security: It's Not Me ... It's You 314
Career Guide: IT Technical Manager 316

Chapter 8

Ethics: Synthetic Friends 346
Security: Digital Is Forever 359
Career Guide: International Content Director 361

Chapter 9

Ethics: MIS-diagnosis 384
Security: Semantic Security 406
Career Guide: Manager, Data and Analytics 408

Chapter 10

Ethics: Securing Privacy 432
Security: Exhaustive Cheating 446
Career Guide: Senior Consultant 448

Chapter 11

Ethics: Training Your Replacement 466
Security: Watching the Watchers 476
Career Guide: Senior Data Analyst 478

Chapter 12

Ethics: Estimation Ethics 500
Security: Psst. There's another Way, You Know ... 522
Career Guide: Developing Your Personal Brand 524

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?

This page intentionally left blank

TENTH EDITION
GLOBAL EDITION

Using MIS

David M. Kroenke
Randall J. Boyle



Harlow, England • London • New York • Boston • San Francisco • Toronto • Sydney • Dubai • Singapore • Hong Kong
Tokyo • Seoul • Taipei • New Delhi • Cape Town • Sao Paulo • Mexico City • Madrid • Amsterdam • Munich • Paris • Milan

VP Editorial Director: Andrew Gilfillan
Senior Portfolio Manager: Samantha Lewis
Content Development Team Lead: Laura Burgess
Program Monitor: Ann Pulido/SPi Global
Editorial Assistant: Michael Campbell
Project Manager, Global Edition: Nitin Shankar
Acquisitions Editor, Global Edition: Tahnee Wager
Senior Project Editor, Global Edition: Daniel Luiz
Managing Editor, Global Edition: Steven Jackson
Manager, Media Production, Global Edition: M. Vikram Kumar

Senior Manufacturing Controller, Production, Global Edition:
Trudy Kimber
Product Marketing Manager: Kaylee Carlson
Project Manager: Katrina Ostler/Cenveo® Publisher Services
Text Designer: Cenveo® Publisher Services
Cover Designer: Lumina Datamatics, Inc.
Cover Art: ©kentoh/Shutterstock
Full-Service Project Management: Cenveo® Publisher Services
Composition: Cenveo® Publisher Services

Microsoft and/or its respective suppliers make no representations about the suitability of the information contained in the documents and related graphics published as part of the services for any purpose. All such documents and related graphics are provided “as is” without warranty of any kind. Microsoft and/or its respective suppliers hereby disclaim all warranties and conditions with regard to this information, including all warranties and conditions of merchantability, whether express, implied or statutory, fitness for a particular purpose, title and non-infringement. In no event shall Microsoft and/or its respective suppliers be liable for any special, indirect or consequential damages or any damages whatsoever resulting from loss of use, data or profits, whether in an action of contract, negligence or other tortious action, arising out of or in connection with the use or performance of information available from the services.

The documents and related graphics contained herein could include technical inaccuracies or typographical errors. Changes are periodically added to the information herein. Microsoft and/or its respective suppliers may make improvements and/or changes in the product(s) and/or the program(s) described herein at any time. Partial screen shots may be viewed in full within the software version specified.

Microsoft® and Windows® are registered trademarks of the Microsoft Corporation in the U.S.A. and other countries. This book is not sponsored or endorsed by or affiliated with the Microsoft Corporation.

Pearson Education Limited
KAO Two
KAO Park
Harlow
CM17 9NA
United Kingdom

and Associated Companies throughout the world

Visit us on the World Wide Web at:
www.pearsonglobaleditions.com

© Pearson Education Limited 2018

The rights of David M. Kroenke and Randall J. Boyle to be identified as the authors of this work have been asserted by them in accordance with the Copyright, Designs and Patents Act 1988.

Authorized adaptation from the United States edition, entitled Using MIS, 10th edition, ISBN 978-0-13-460699-6, by David M. Kroenke and Randall J. Boyle, published by Pearson Education © 2018.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without either the prior written permission of the publisher or a license permitting restricted copying in the United Kingdom issued by the Copyright Licensing Agency Ltd, Saffron House, 6–10 Kirby Street, London EC1N 8TS.

All trademarks used herein are the property of their respective owners. The use of any trademark in this text does not vest in the author or publisher any trademark ownership rights in such trademarks, nor does the use of such trademarks imply any affiliation with or endorsement of this book by such owners.

ISBN 10: 1-292-22250-6
ISBN 13: 978-1-292-22250-9

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

10 9 8 7 6 5 4 3 2 1
14 13 12 11 10

Typeset in 9.5/13 Photina MT Pro by Cenveo® Publisher Services.

Printed and bound by Vivar, Malaysia.

BRIEF CONTENTS

Part 1: Why MIS? 35

- 1 The Importance of MIS 37
- 2 Collaboration Information Systems 71
- 3 Strategy and Information Systems 115

Part 2: Information Technology 145

- 4 Hardware, Software, and Mobile Systems 147
- 5 Database Processing 193
- 6 The Cloud 235

Part 3: Using IS for Competitive Advantage 283

- 7 Processes, Organizations, and Information Systems 285
- 8 Social Media Information Systems 327
- 9 Business Intelligence Systems 369

Part 4: Information Systems Management 415

- 10 Information Systems Security 417
- 11 Information Systems Management 457
- 12 Information Systems Development 485

The International Dimension 532

Application Exercises 553

Glossary 572

Index 589

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 open source, Web applications, mobile systems, 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 *Big Data* and describes nonrelational and NoSQL databases.

Explains why organizations are moving to the cloud and how they can use the cloud effectively. Describes basic network technology that underlies the cloud and how the Internet works. Explains Web servers, SOA, and Web services standards. Discusses how organizations, including Falcon Security, can use the cloud securely.

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 how revenue can be generated using social media. Explains the ways organizations can use ESN and manage the risks of SMIS.

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

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

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

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.

CONTENTS

Part 1: Why MIS?

1: The Importance of MIS 37

- Q1-1** Why Is Introduction to MIS the Most Important Class in the Business School? 39
 - The Digital Revolution 39
 - Evolving Capabilities 40
 - Moore's Law 40
 - Metcalf's Law 41
 - Other Forces Pushing Digital Change 42
 - This Is the Most Important Class in the School of Business 43
- Q1-2** How Will MIS Affect Me? 43
 - How Can I Attain Job Security? 43
 - How Can Intro to MIS Help You Learn Nonroutine Skills? 44
 - What Is the Bottom Line? 48
- Q1-3** What Is MIS? 48
 - Components of an Information System 48
 - Management and Use of Information Systems 49
 - Achieving Strategies 50
- Q1-4** How Can You Use the Five-Component Model? 50
 - The Most Important Component—You 51
 - All Components Must Work 51
 - High-Tech Versus Low-Tech Information Systems 51
 - **So What?** *A Is for Alphabet* 52
 - Understanding the Scope of New Information Systems 53
 - Components Ordered by Difficulty and Disruption 53
- Q1-5** What Is Information? 53
 - Definitions Vary 54
 - Where Is Information? 54
- Q1-6** What Are Necessary Data Characteristics? 55
 - Accurate 55
 - Timely 55
 - Relevant 56
 - Just Barely Sufficient 56
 - Worth Its Cost 56

- Q1-7** 2027? 56
- **Ethics Guide:** *Ethics and Professional Responsibility* 57
 - **Security Guide:** *Passwords and Password Etiquette* 60
 - **Career Guide:** *Five-Component Careers* 62
- Case Study 1: Tesco** 67

2: Collaboration Information Systems 71

- Q2-1** What Are the Two Key Characteristics of Collaboration? 73
- Importance of Constructive Criticism 74
 - Guidelines for Giving and Receiving Constructive Criticism 74
 - Warning! 75
- Q2-2** What Are Three Criteria for Successful Collaboration? 76
- Successful Outcome 76
 - Growth in Team Capability 77
 - Meaningful and Satisfying Experience 77
- Q2-3** What Are the Four Primary Purposes of Collaboration? 77
- Becoming Informed 78
 - Making Decisions 78
 - Solving Problems 80
 - Managing Projects 80
- Q2-4** What Are the Requirements for a Collaboration Information System? 82
- The Five Components of an IS for Collaboration 82
 - Primary Functions: Communication and Content Sharing 83
- Q2-5** How Can You Use Collaboration Tools to Improve Team Communication? 83
- Q2-6** How Can You Use Collaboration Tools to Manage Shared Content? 87
- Shared Content with No Control 89
 - Shared Content with Version Management on Google Drive 89
 - Shared Content with Version Control 92
 - **Ethics Guide:** *Big Brother Wearables* 94
- Q2-7** How Can You Use Collaboration Tools to Manage Tasks? 96
- Sharing a Task List on Google Drive 96
 - Sharing a Task List Using Microsoft SharePoint 96
 - **So What?** *Augmented Collaboration* 97

Q2-8 Which Collaboration IS Is Right for Your Team? 99

Three Sets of Collaboration Tools 100

Choosing the Set for Your Team 101

Don't Forget Procedures and People! 102

Q2-9 2027? 103

- **Security Guide:** *Evolving Security* 104

- **Career Guide:** *Software Product Manager* 106

Case Study 2: Eating Our Own Dog Food 109**3: Strategy and Information Systems 115****Q3-1 How Does Organizational Strategy Determine Information Systems Structure? 117****Q3-2 What Five Forces Determine Industry Structure? 118****Q3-3 How Does Analysis of Industry Structure Determine Competitive Strategy? 119**

- **Ethics Guide:** *The Lure of Love Bots* 120

Q3-4 How Does Competitive Strategy Determine Value Chain Structure? 122

Primary Activities in the Value Chain 122

Support Activities in the Value Chain 123

Value Chain Linkages 123

Q3-5 How Do Business Processes Generate Value? 124**Q3-6 How Does Competitive Strategy Determine Business Processes and the Structure of Information Systems? 126****Q3-7 How Do Information Systems Provide Competitive Advantages? 127**

Competitive Advantage via Products 127

- **So What?** *The Autonomous Race* 128

Competitive Advantage via Business Processes 129

How Does an Actual Company Use IS to Create Competitive Advantages? 130

How Does This System Create a Competitive Advantage? 131

Q3-8 2027? 133

- **Security Guide:** *Hacking Smart Things* 134

- **Career Guide:** *Director of Architecture* 137

Case Study 3: The Amazon of Innovation 140

Part 2: Information Technology

4: Hardware, Software, and Mobile Systems 147

- Q4-1** What Do Business Professionals Need to Know About Computer Hardware? 149
 - Hardware Components 149
 - Types of Hardware 150
 - Computer Data 151
- Q4-2** How Can New Hardware Affect Competitive Strategies? 153
 - Internet of Things 153
 - Digital Reality Devices 155
 - Self-driving Cars 156
 - 3D Printing 159
- Q4-3** What Do Business Professionals Need to Know About Software? 160
 - What Are the Major Operating Systems? 161
 - Virtualization 163
 - Own Versus License 165
 - What Types of Applications Exist, and How Do Organizations Obtain Them? 165
 - What Is Firmware? 166
- Q4-4** Is Open Source Software a Viable Alternative? 167
 - Why Do Programmers Volunteer Their Services? 167
 - **So What?** *New from CES 2016* 168
 - How Does Open Source Work? 169
 - So, Is Open Source Viable? 170
- Q4-5** What Are the Differences Between Native and Web Applications? 170
 - Developing Native Applications 170
 - Developing Web Applications 171
 - Which Is Better? 173
- Q4-6** Why Are Mobile Systems Increasingly Important? 173
 - Hardware 174
 - Software 175
 - Data 175
 - **Ethics Guide:** *Free Apps For Data* 176
 - Procedures 178
 - People 178
- Q4-7** What Are the Challenges of Personal Mobile Devices at Work? 179
 - Advantages and Disadvantages of Employee Use of Mobile Systems at Work 179
 - Survey of Organizational BYOD Policy 180

- Q4-8** 2027? 181
 - **Security Guide:** *Poisoned App-les* 182
 - **Career Guide:** *Technical Account Manager* 184
- Case Study 4: PSA: Cruising with Information Systems** 189

5: Database Processing 193

- Q5-1** What Is the Purpose of a Database? 195
- Q5-2** What Is a Database? 197
 - Relationships Among Rows 198
 - Metadata 199
 - **Ethics Guide:** *Querying Inequality?* 200
- Q5-3** What Is a Database Management System (DBMS)? 202
 - Creating the Database and Its Structures 202
 - Processing the Database 203
 - Administering the Database 203
 - **So What?** *Slick Analytics* 204
- Q5-4** How Do Database Applications Make Databases More Useful? 206
 - Traditional Forms, Queries, Reports, and Applications 206
 - Browser Forms, Reports, Queries, and Applications 208
 - Multi-user Processing 209
- Q5-5** How Are Data Models Used for Database Development? 210
 - What Is the Entity-Relationship Data Model? 211
- Q5-6** How Is a Data Model Transformed into a Database Design? 214
 - Normalization 215
 - Representing Relationships 216
 - Users' Role in the Development of Databases 218
- Q5-7** How Can Falcon Security Benefit from a Database System? 220
- Q5-8** 2027? 221
 - **Security Guide:** *Big Data... Losses* 222
 - **Career Guide:** *Database Engineer* 224
- Case Study 5: Searching for Classic and Vintage Car Parts . . .** 228

6: The Cloud 235

- Q6-1** Why Are Organizations Moving to the Cloud? 237
 - Cloud Computing 238
 - Why Do Organizations Prefer the Cloud? 239
 - When Does the Cloud Not Make Sense? 240

- Q6-2** How Do Organizations Use the Cloud? 241
- Resource Elasticity 241
 - Pooling Resources 242
 - Over the Internet 243
 - Cloud Services from Cloud Vendors 243
 - Content Delivery Networks 246
 - Using Web Services Internally 247
- Q6-3** What Network Technology Supports the Cloud? 248
- What Are the Components of a LAN? 249
 - **Ethics Guide:** *Cloudy Profit?* 250
 - Connecting Your LAN to the Internet 252
- Q6-4** How Does the Internet Work? 254
- The Internet and the U.S. Postal System 254
 - Step 1: Assemble Package (Packets) 255
 - Step 2: Put Name on Package (Domain Names) 255
 - Step 3: Look Up Address (IP Address) 255
 - Step 4: Put Address on Package (IP Address on Packet) 256
 - Step 5: Put Registered Mail Sticker on Package (TCP) 256
 - Step 6: Ship Package (Packets Transported by Carriers) 257
- Q6-5** How Do Web Servers Support the Cloud? 258
- Three-Tier Architecture 259
 - Watch the Three Tiers in Action! 259
 - Service-Oriented Architecture (SOA) 260
 - A SOA Analogy 260
 - SOA for Three-Tier Architecture 262
 - Internet Protocols 263
 - TCP/IP Protocol Architecture 263
- Q6-6** How Can Falcon Security Use the Cloud? 265
- SaaS Services at Falcon Security 265
 - PaaS Services at Falcon Security 266
 - IaaS Services at Falcon Security 266
- Q6-7** How Can Organizations Use Cloud Services Securely? 266
- Virtual Private Networks (VPNs) 267
 - Using a Private Cloud 267
 - Using a Virtual Private Cloud 269
 - **So What?** *Quantum Learning* 270
- Q6-8** 2027? 271
- **Security Guide:** *From Anthem to Anathema* 272
 - **Career Guide:** *Senior Network Manager* 275
- Case Study 6: Cloud Solutions and Infrastructure That Safely Test for Consumer Risk and Financial Stability 279**

Part 3: Using IS for Competitive Advantage

7: Processes, Organizations, and Information Systems 285

- Q7-1** What Are the Basic Types of Processes? 287
- How Do Structured Processes Differ from Dynamic Processes? 288
 - How Do Processes Vary by Organizational Scope? 289
- Q7-2** How Can Information Systems Improve Process Quality? 291
- How Can Processes Be Improved? 292
 - How Can Information Systems Improve Process Quality? 292
- Q7-3** How Do Information Systems Eliminate the Problems of Information Silos? 293
- What Are the Problems of Information Silos? 294
 - How Do Organizations Solve the Problems of Information Silos? 295
 - An Enterprise System for Patient Discharge 296
- Q7-4** How Do CRM, ERP, and EAI Support Enterprise Processes? 296
- The Need for Business Process Engineering 297
 - Emergence of Enterprise Application Solutions 297
 - Customer Relationship Management (CRM) 298
 - Enterprise Resource Planning (ERP) 299
 - **So What? Workflow Problems** 300
 - **Ethics Guide: Paid Deletion** 302
 - Enterprise Application Integration (EAI) 304
- Q7-5** What Are the Elements of an ERP System? 306
- Hardware 306
 - ERP Application Programs 307
 - ERP Databases 307
 - Business Process Procedures 307
 - Training and Consulting 308
 - Industry-Specific Solutions 309
 - Which Companies Are the Major ERP Vendors? 310
- Q7-6** What Are the Challenges of Implementing and Upgrading Enterprise Information Systems? 310
- Collaborative Management 310
 - Requirements Gaps 310
 - Transition Problems 311
 - Employee Resistance 311
 - New Technology 311
- Q7-7** How Do Inter-enterprise IS Solve the Problems of Enterprise Silos? 312

Q7-8 2027? 313

- **Security Guide:** *It's Not Me . . . It's You* 314
- **Career Guide:** *IT Technical Manager* 316

Case Study 7: A Tale of Two Interorganizational IS 322**8: Social Media Information Systems** 327**Q8-1** What Is a Social Media Information System (SMIS)? 329

- Three SMIS Roles 329
- SMIS Components 332

Q8-2 How Do SMIS Advance Organizational Strategy? 334

- Social Media and the Sales and Marketing Activity 334
- Social Media and Customer Service 335
- Social Media and Inbound and Outbound Logistics 336
- Social Media and Manufacturing and Operations 336
- Social Media and Human Resources 337

Q8-3 How Do SMIS Increase Social Capital? 337

- What Is the Value of Social Capital? 338
- How Do Social Networks Add Value to Businesses? 338
- Using Social Networking to Increase the Number of Relationships 339
 - **So What?** *Enhanced Golf Fan* 340
- Using Social Networks to Increase the Strength of Relationships 341
- Using Social Networks to Connect to Those with More Resources 342

Q8-4 How Do (Some) Companies Earn Revenue from Social Media? 343

- You Are the Product 343
- Revenue Models for Social Media 343
- Does Mobility Reduce Online Ad Revenue? 344
 - **Ethics Guide:** *Synthetic Friends* 346

Q8-5 How Do Organizations Develop an Effective SMIS? 347

- Step 1: Define Your Goals 348
- Step 2: Identify Success Metrics 348
- Step 3: Identify the Target Audience 349
- Step 4: Define Your Value 349
- Step 5: Make Personal Connections 350
- Step 6: Gather and Analyze Data 350

Q8-6 What Is an Enterprise Social Network (ESN)? 351

- Enterprise 2.0 351
- Changing Communication 352
- Deploying Successful Enterprise Social Networks 352

Q8-7 How Can Organizations Address SMIS Security Concerns? 353

- Managing the Risk of Employee Communication 353
- Managing the Risk of Inappropriate Content 354

- Q8-8** 2027? 356
- **Security Guide:** *Digital is Forever* 359
 - **Career Guide:** *International Content Director* 361
- Case Study 8: Sedona Social** 364

9: Business Intelligence Systems 369

- Q9-1** How Do Organizations Use Business Intelligence (BI) Systems? 372
- How Do Organizations Use BI? 373
 - What Are Typical BI Applications? 373
- Q9-2** What Are the Three Primary Activities in the BI Process? 375
- Using Business Intelligence to Find Candidate Parts 375
- Q9-3** How Do Organizations Use Data Warehouses and Data Marts to Acquire Data? 380
- Problems with Operational Data 382
 - Data Warehouses Versus Data Marts 383
 - **Ethics Guide:** *MIS-diagnosis* 384
- Q9-4** How Do Organizations Use Reporting Applications? 386
- Basic Reporting Operations 386
 - RFM Analysis 386
 - Online Analytical Processing (OLAP) 387
- Q9-5** How Do Organizations Use Data Mining Applications? 389
- Intelligent Machines 390
 - Unsupervised Data Mining 391
 - Supervised Data Mining 391
 - Market-Basket Analysis 392
 - Decision Trees 393
- Q9-6** How Do Organizations Use Big Data Applications? 395
- MapReduce 395
 - **So What?** *BI for Securities Trading?* 396
 - Hadoop 397
- Q9-7** What Is the Role of Knowledge Management Systems? 398
- What Are Expert Systems? 398
 - What Are Content Management Systems? 400
 - What Are the Challenges of Content Management? 400
 - What Are Content Management Application Alternatives? 401
 - How Do Hyper-Social Organizations Manage Knowledge? 401
 - Hyper-Social KM Alternative Media 402
 - Resistance to Knowledge Sharing 402
- Q9-8** What Are the Alternatives for Publishing BI? 403
- Characteristics of BI Publishing Alternatives 403
 - What Are the Two Functions of a BI Server? 404

Q9-9 2027? 405

- **Security Guide:** *Semantic Security* 406
- **Career Guide:** *Manager, Data and Analytics* 408

Case Study 9: Hadoop the Cookie Cutter 412

Part 4: Information Systems Management

10: Information Systems Security 417

Q10-1 What Is the Goal of Information Systems Security? 420

- The IS Security Threat/Loss Scenario 420
- What Are the Sources of Threats? 421
- What Types of Security Loss Exist? 422
- Goal of Information Systems Security 424

Q10-2 How Big Is the Computer Security Problem? 424**Q10-3** How Should You Respond to Security Threats? 426**Q10-4** How Should Organizations Respond to Security Threats? 428

- **So What?** *New from Black Hat 2015* 429

Q10-5 How Can Technical Safeguards Protect Against Security Threats? 430

- Identification and Authentication 430
- Single Sign-on for Multiple Systems 431
- Encryption 431
- **Ethics Guide:** *Securing Privacy* 432
- Firewalls 435
- Malware Protection 436
- Design for Secure Applications 437

Q10-6 How Can Data Safeguards Protect Against Security Threats? 438**Q10-7** How Can Human Safeguards Protect Against Security Threats? 439

- Human Safeguards for Employees 439
- Human Safeguards for Nonemployee Personnel 441
- Account Administration 441
- Systems Procedures 443
- Security Monitoring 443

Q10-8 How Should Organizations Respond to Security Incidents? 444**Q10-9** 2027? 445

- **Security Guide:** *Exhaustive Cheating* 446
- **Career Guide:** *Senior Consultant* 448

Case Study 10: Hitting the Target 452**11: Information Systems Management 457****Q11-1** What Are the Functions and Organization of the IS Department? 459

How Is the IS Department Organized? 460

Security Officers 461

What IS-Related Job Positions Exist? 461

Q11-2 How Do Organizations Plan the Use of IS? 463

Align Information Systems with Organizational Strategy 463

- **So What?** *Managing the IS Department* 464

Communicate IS Issues to the Executive Group 465

Develop Priorities and Enforce Them Within the IS Department 465

Sponsor the Steering Committee 465

Q11-3 What Are the Advantages and Disadvantages of Outsourcing? 465

- **Ethics Guide:** *Training Your Replacement* 466

Outsourcing Information Systems 467

International Outsourcing 469

What Are the Outsourcing Alternatives? 470

What Are the Risks of Outsourcing? 471

Q11-4 What Are Your User Rights and Responsibilities? 473

Your User Rights 473

Your User Responsibilities 474

Q11-5 2027? 475

- **Security Guide:** *Watching the Watchers* 476

- **Career Guide:** *Senior Data Analyst* 478

Case Study 11: Automating Labor 481**12: Information Systems Development 485****Q12-1** How Are Business Processes, IS, and Applications Developed? 487

How Do Business Processes, Information Systems, and Applications Differ and Relate? 488

Which Development Processes Are Used for Which? 489

Q12-2	How Do Organizations Use Business Process Management (BPM)?	491
	Why Do Processes Need Management?	491
	What Are BPM Activities?	492
Q12-3	How Is Business Process Modeling Notation (BPMN) Used to Model Processes?	494
	Need for Standard for Business Processing Notation	494
	Documenting the As-Is Business Order Process	494
Q12-4	What Are the Phases in the Systems Development Life Cycle (SDLC)?	497
	Define the System	499
	• Ethics Guide: <i>Estimation Ethics</i>	500
	Determine Requirements	502
	Design System Components	504
	System Implementation	505
	Maintain System	506
Q12-5	What Are the Keys for Successful SDLC Projects?	507
	Create a Work Breakdown Structure	507
	Estimate Time and Costs	508
	Create a Project Plan	509
	Adjust Plan via Trade-offs	510
	Manage Development Challenges	512
Q12-6	How Can Scrum Overcome the Problems of the SDLC?	513
	• So What? <i>Banking on IoT</i>	514
	What Are the Principles of Agile Development Methodologies?	515
	What Is the Scrum Process?	516
	How Do Requirements Drive the Scrum Process?	518
Q12-7	2027?	520
	Fetch!	520
	User-Driven Systems	521
	Industry Will Push Change	521
	• Security Guide: <i>Psst. There's another Way, You Know...</i>	522
	• Career Guide: <i>Developing Your Personal Brand</i>	524
	Case Study 12: When Will We Learn?	529
	The International Dimension	532
	Application Exercises	553
	Glossary	572
	Index	589

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	Chapter	Change
1	New SoWhat? Feature: A Is for Alphabet		New SoWhat? Feature: New from CES 2016
	New and updated charts for CPU and data storage growth		New Career Guide: Technical Account Manager
	Updated BLS job statistics		Updated industry statistics throughout the chapter
	New 2027? discussion in Q1-7		Expanded augmented/mixed/virtual reality discussion
2	New Ethics Guide: Big Brother Wearables	5	New Security Guide: Big Data... Losses
	New Career Guide: Software Product Manager		New SoWhat? Guide: Slick Analytics
	Discussion of constructive criticism and groupthink		New Career Guide: Database Engineer
	New examples of providing and receiving constructive criticism		Updated images for Microsoft Office 2016 and SharePoint 2016
	Expanded discussion of real-time surveying software (Socrative)	6	Reorganized chapter content for Q6-1 through Q6-5
	Updated So What? Guide about augmented collaboration		New Q6-1 discussion about the origin of the cloud
	New 2027? discussion in Q2-9		New Q6-1 cloud adoption examples statistics
3	New SoWhat? Feature: The Autonomous Race		New discussion about scalability
	New Career Guide: Technology and Operations Executive		Expanded cloud versus in-house comparison
	New Ethics Guide: The Lure of Love Bots		New Q6-2 example using transportation as a service
	New 2027? discussion in Q3-8		New Q6-2 graphics to illustrate differences between IaaS, PaaS, and SaaS
	Updated Amazon case study		New Q6-2 example and graphics for CDNs
4	New Security Guide: Poisoned App-les		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 SoWhat? 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 SoWhat? 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 SoWhat? 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 SoWhat? 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