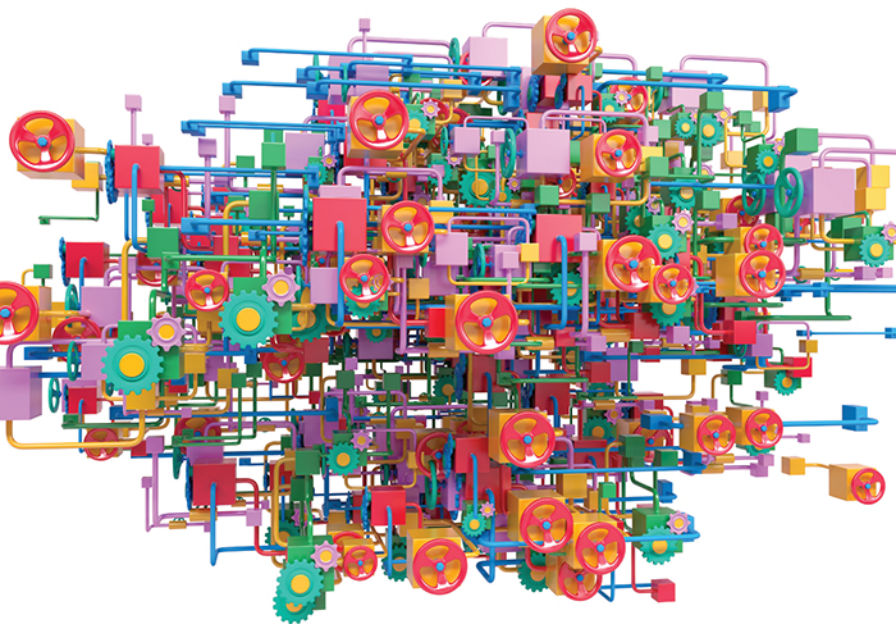


PROCESSES, SYSTEMS, AND INFORMATION

An Introduction
to MIS



Earl H. McKinney Jr. | David M. Kroenke

4E

PROCESSES, SYSTEMS, AND INFORMATION

An Introduction to MIS

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PROCESSES, SYSTEMS, AND INFORMATION

An Introduction to MIS

FOURTH EDITION

EARL MCKINNEY JR.

Bowling Green State University

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SAP Introduction Tutorial is available online at Pearson Instructor Resource Center

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Preface

Since the emergence of ERP and EAI systems in the early 1990s, the MIS discipline has undergone a slow but persistent change. Whereas the early emphasis of MIS was on the management and use of information systems *per se*, emerging cross-functional systems began to place the focus on processes that utilize such systems. We believe that existing MIS textbooks, particularly those at the introductory level, do not sufficiently recognize this change in emphasis. Hence, we offer this textbook that provides a strong process orientation.

Why This Fourth Edition?

We have made a number of changes to this fourth edition; these are listed in Table 1. While Table 1 spells out the changes in detail, there are several significant changes that warrant a short explanation.

First, the technology landscape has changed rapidly from the time the third edition was written. At that time, the significance of AI, 5G, SAP HANA S/4, analytics, and work at home were just beginning to emerge. These changes led to updates of many of the chapters. Further, security has continued to evolve at a pace that demands updating.

One key change is the addition of a new chapter on AI and robots. The business environment is rapidly discovering effective applications of these technologies, so we created this new chapter from a chapter extension in the previous edition. We greatly expanded our treatment of machine learning and deep learning as well as added new descriptions of the impact of AI and robots on the job market.

As we were writing this edition, the Coronavirus pandemic hit. This event had a number of implications for business that we added to different sections of the book. These topics included work from home collaboration, the ethics of contact tracing, the rapid use of Zoom and other teleconferencing apps, the opportunity to 3D print health care products, expanded telemedicine, fake virus news via social media, and the challenges of analyzing health data.

Another significant update to the text is the change in SAP to S/4. SAP has been transitioning from the R/3 environment for several years, and many universities are seeking to prepare graduates to work with S/4. We changed all the SAP tutorials and updated our discussion of the SAP platform in Chapter 8. We also produced a new Introduction to SAP tutorial for first-time students to learn about the SAP interface so that the procurement, sales, and production tutorials would be more effective. While the new tutorials are a part of this text, the old R/3 tutorials are still available on the IRC.

A significant change is our coverage of security. Security is becoming more essential for all business students. Often the only exposure business students get to security is in an MIS class. For this reason we greatly expanded our discussion of security, particularly security of mobile devices and personal safeguards and habits all students and professionals should learn to practice.

We also restructured our SAP chapters on procurement and sales. In the previous edition we contrasted a company before its initial implementation of SAP and after implementation to explain the benefits and challenges of ERP systems. Now that virtually all companies use some type of ERP system, we changed the contrast to with ERP and without. For this reason we also added a section on ERP upgrades.

Finally, we renamed and reorganized our Analytics chapter. In the previous edition this topic was labeled *Business Intelligence*; here we use the broader term *Analytics*, a term already known by most students and a subject they will know is essential. With this change, we also restructured the chapter into the widely used analytics categories of descriptive, predictive, and prescriptive analytics.

Many colleagues have told us they are “flipping” their classrooms and are using more student engagement activities during class meeting times. As a result, we updated half of the MIS InClass exercises and improved the instructions on the others.

At times introductory classes like MIS can devolve into a mastery of vocabulary lists. We’ve tried to counter this by helping the student see the value of using the vocabulary and

the usefulness of the models presented in the text by consistently applying the course vocabulary to familiar domains such as a hospital, a bicycle company, and a university. We also ask students to self-inspect; we don't ask them to memorize the definition of collaboration and experimentation—we ask them to evaluate themselves and find ways to improve. Just as important, we tried to identify key themes for entire chapters highlighting them in the introduction and returning to them at various points in the chapters. For example, the security chapter theme is that security is a tradeoff; a tradeoff between freedom and security and between cost and security. All these changes seek to make student engagement more natural and frequent.

Finally, to improve currency and readability all the chapters were updated, and many new figures added or repurposed. In addition, 8 opening vignettes, 10 end of chapter cases, and 7 application exercises were completely rewritten. We also tried to be more efficient with page use, reducing the length of chapter opening vignettes, cases, and ethical guides.

TABLE 1 Changes in the 4th Edition

Chapter	Change
1	2 new Figures, 2 updated New examples, data, and job opportunities related to current technology New case study on Apple
2	1 new Figure, 2 updated New chapter opening vignette describing a process New application of topics to work New case study on Amazon
3	1 new Figure, 8 updated New chapter opening vignette describing the impact of the cloud 5G discussion added Cloud market share updated New vocabulary—IoT, dated vocabulary dropped New case study on cashless payment systems
4	4 updated Figures New chapter opening vignette describing data challenges Role of data administrator added New MIS In Class New Ethics Guide New case study on the impact of data to sports
5	8 new Figures, 10 updated New chapter opening vignette describing new scooter supply chain in Vietnam Current examples and the impact of AI updated, AI and robots brief history added AI discussion reorganized into reasoning and pattern matching systems Machine and deep learning discussion widely expanded Impact of AI and robots on job market added New discussion of AI and robots in 2031 added New ethics guide and MIS In-Class 15 new vocabulary added New case study on Alpha Go
6	3 new Figures, 8 updated New chapter opening vignette describing security and data loss prevention New current examples of attacks added

Chapter	Change
	<p>Discussion of privacy and risk expanded</p> <p>Types of threats organized in categories</p> <p>Mobile device threats and losses discussion added</p> <p>Personal and smartphone security precautions, and graceful degradation discussion expanded</p> <p>New discussion of security issues in 2031 added</p> <p>New ethics guide</p> <p>11 new vocabulary added, 5 dated vocabulary dropped</p> <p>New case study on Bitcoin and Blockchain</p>
7	<p>1 new Figure, 1 updated</p> <p>New chapter opening vignette describing process improvement</p> <p>New S/4 screen Figures</p> <p>New case study on Alexa</p>
8	<p>4 new Figures, 1 updated</p> <p>Chapter reorganized, contrast now between a company with and without SAP</p> <p>New S/4 screen Figures</p> <p>New section on ERP upgrade options added</p> <p>New current examples of ERP failures and ERP trends added</p> <p>Data on ERP market share updated</p> <p>New vocabulary—ERP upgrade, functional test, performance test</p> <p>New case study on EPIC</p>
9	<p>1 new Figure, 7 updated</p> <p>New chapter opening vignette describing supply chain process problems</p> <p>Chapter reorganized, contrast now between a company with and without SAP</p> <p>New S/4 screen Figures</p> <p>Impact of ERP systems on job skills added</p> <p>New topics in 2031—analytics of supply chains, AI/robots, and 3D printing</p>
10	<p>6 new Figures, 4 updated</p> <p>Chapter reorganized, contrast now between a company with and without SAP</p> <p>New S/4 screen Figures</p> <p>New topics in 2031—social CRM, darknet, smartphone payment, and marketing services</p>
11	<p>6 updated Figures</p> <p>New chapter opening vignette describing angry customer social media post</p> <p>Previous chapters on collaboration and social media combined into one chapter</p> <p>Collaboration and Social media use data and examples updated</p> <p>Discussion of business use of TikTok and Microsoft Teams added</p> <p>New example processes</p> <p>New case study on Zoom</p>
12	<p>3 new Figures, 18 updated</p> <p>New chapter opening vignette on using customer data and privacy</p> <p>Renamed chapter Analytics</p> <p>Data on analytics use updated</p> <p>Discussion reorganized under descriptive, predictive, prescriptive categories</p> <p>New example processes</p> <p>Expanded people challenges</p> <p>New topics in 2031—augmented analytics, digital twins, and privacy</p> <p>New vocabulary—Analytics, digital twin, descriptive, predictive, prescriptive analytics</p> <p>New case study</p>

Chapter	Change
Extensions	2 new Figures, 5 updated Voice and NLP discussion added New current examples of technologies and job opportunities added Updated data on LBD use
Tutorials	Completely new with S/4 data and screens New Introduction to SAP tutorial available online at IRC New Analytics tutorial with Microsoft Power BI

Importance of MIS

Chapter 1 claims 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 otherwise help them accomplish their strategies. In the past year, AI, robots, 5G, new security challenges, and the Coronavirus are posing new opportunities and requirements on organizations. More sophisticated and demanding users push organizations into a rapidly changing future, one that requires continual adjustments in business planning. To participate, our graduates need to know how to apply emerging technologies to better achieve their organizations' strategies. Knowledge of MIS is critical to this application.

The effects of changing technology and new user demands fall on processes and information systems at all levels—workgroup, organizational, and inter-enterprise. The impact on the latter is especially dramatic because cloud-based hosting and mobile devices enable independent organizations to work together in ways previously unimaginable.

As stated, we continue to believe we can enter the classroom with the confidence that we are teaching the single most important course in the business school—an argument that relies on two observations. First, because of nearly free data storage and data communications, businesses are increasingly finding and, more important, 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 a minimum, need to assess the efficacy of proposed IS applications. To excel, business professionals will need to not only assess but define innovative IS applications. These applications will increasingly take advantage of advances in Big Data and analytical software.

Such skills will not be optional. Businesses that fail to create systems that take advantage of nearly free data storage and communication will fall prey to the 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 Clinton administration. In *The Work of Nations*,¹ Reich identifies four essential employability skills for knowledge workers in the 21st century:

- Abstract reasoning
- Systems thinking
- Collaboration
- Experimentation

For reasons set out in Chapter 1, beginning on page 2, we believe the MIS course is the single best course in the curriculum for learning these four key skills.

While most Introduction to MIS textbooks address technical innovation and nonroutine skills, *Processes, Systems, and Information, Third Edition*, uniquely enables the Intro course to also address business processes. The process view of business is the dominant view of business today;

¹Robert B. Reich, *The Work of Nations* (New York: Alfred A. Knopf, 1991), p. 229.

students need a consistent, extended opportunity to master the language and apply it. The Introduction to MIS class that uses this textbook can expose both IS and non-IS students to process concepts and appropriately place IS in its vital role of supporting and improving processes. With this process foundation, students are better able to understand the benefits and challenges of ERP systems.

Background on Processes and IS

The relationship between business processes and information systems is complex. They are not one and the same; a given process might use several different information systems, and, at the same time, a given information system might support many different processes. So, we cannot say that a process encapsulates all of its information systems, nor can we say that an information system encapsulates all of its processes.

In part because of this complex relationship, we define *MIS* as creating, monitoring, and adapting *processes, information systems, and information* to help organizations achieve their strategy (Chapter 1). The fabric of this text is woven around and through these definitions.

Potential adopters of this textbook are departments that make business processes a key component or thread throughout their curricula. This group includes all of the universities that are part of the SAP University Alliance, those that are part of the Microsoft Dynamics Academic Alliance, and other institutions for which a business process orientation is important. Chapters 9 and 10 provide specific examples of the use of SAP, and the cases that conclude each of those chapters provide tutorial exercises that use the SAP University Alliance's Global Bikes Inc. (GBI) case. This is the same case and client data used in University Alliance training, so it will be familiar to many instructors.

In our opinion, a text must go beyond the operational processes that comprise Chapters 9 and 10. Of course, operational processes are most important, and five chapters and an Appendix of our text include or are devoted to them. However, other dynamic processes, such as collaboration, project management, problem solving, business intelligence, and social networking, are also important. Hence, we believe that this text should include much more than SAP-oriented processes.

Text Features

A challenge of teaching the Introduction to MIS course from a process orientation is the lack of business knowledge and experience on the part of most students. Many universities offer the Introduction to MIS course at the sophomore and even freshman levels. Most of these students have completed few business courses. Even when this course is taught to higher-level students, however, few of them have significant business or process experience. They have been lifeguards or baristas. When we attempt to talk about, for example, the impact of process change on departmental power, that discussion goes over the heads of students. They may memorize the terms, but they often lose the essence of the discussion. The features of this text are designed, in part, to address this problem.

Question-Based Pedagogy

Research by Marilla Svinicki in the Psychology Department of the University of Texas indicates that today's students need help managing their time. She asserts that we should never give homework assignments such as "read pages 75–95." The problem, she says, is that students will fiddle with those pages for 30 minutes and not know when they're done. Instead, she recommends that we give our students a list of questions and the assignment that they be able to answer those questions. When they can answer the questions, they're done studying. We have used this approach in our classrooms, and we believe that it is most effective. Students like it as well. Hence, we have organized each chapter as a list of questions.

Opening Vignettes

Each chapter opens with a short vignette of a business situation and problem that necessitates knowledge of that chapter. We use Chuck's Bikes, Inc., a bicycle manufacturer for this 4th edition. CBI is also the organization used for the SAP tutorials. CBI is a bicycle assembly company that purchases parts from vendors, assembles final products, and ships them to customers

who sell to individuals. CBI recently added a scooter division and expanded its supply chain to Vietnam.

Each of these vignettes presents a situation that illustrates the use of the chapter's contents in an applied setting. Most contain a problem that requires knowledge of the chapter to understand and solve.

MIS InClass Exercises

Every chapter includes a student group exercise that is intended to be completed during class. These exercises are designed for teachers who seek to use active learning exercises, also called flipping the classroom. The purpose of the exercise is to engage the student with knowledge gained from the chapter. These exercises are part lab and part case study in nature. In our experience, some of them lead to spirited discussions, and we could have let them run on for two or three class periods, had we had that luxury.

SAP Tutorial Exercises

The appendices to Chapters 9 and 10 as well as Appendix A contain business process exercises that involve the SAP Alliance's Global Bike case. Professors at institutions that are members of the alliance can use these with their students. Because not every department that uses this book is a member of that alliance, we have made these exercises optional appendices. You can omit the exercises without any loss of continuity.

New to the 4th Edition is an Introduction to SAP tutorial. Available from the IRC, this tutorial is designed to help first-time students learn to use SAP so that subsequent tutorials on the business processes are more effective. The exercises are, we hope, purposeful yet simple to do. Our goal is to make it possible for them to be conducted by teaching assistants and faculty who have not yet attended the SAP university training. To that end, we provide extensive instructor support materials. Instructors who have had training by the SAP University Alliance will immediately recognize that these tutorials use exactly the same data and screens they used during training.

Earl McKinney, the author of the tutorial exercises, has been teaching SAP for 12 years at Bowling Green State University. The tutorial exercises included in this book have been tested extensively with Introduction to MIS students in a BGSU lab setting. In addition to the exercises, Earl has written a detailed teaching guide on how to best use the exercises as well as tips and pointers about their use and his experience about where students are most likely to struggle.

A fourth tutorial is offered at the end of the Chapter 12 on analytics. This tutorial uses Microsoft PowerBI to analyze Chuck's Bikes data. While a particular set of data is specified in the tutorial, students and instructors can also simply read the tutorial, learn how the operations like slicing and filtering are done, and use these skills on any dataset.

Over these years, Earl learned that when doing SAP exercises, it is far too easy for students to slip into "monkey-see, monkey-do" mode without any clear understanding of what they are doing or why. Based on this classroom experience, we believe that the setup to procurement and sales in Chapters 9 and 10, together with the exercises themselves, help students move beyond simple copy mode, in which they learn the SAP keystrokes, to learn the nature of process-oriented software and its role in organizations.

Like all who have used the GBI case, we are grateful to the SAP Alliance and to the case's authors. In accordance with both the letter and spirit of the SAP Alliance community's policy, we have placed these exercises on the SAP University Alliance Web site. We hope you will find sufficient value in this text to use it in your classroom, but please feel free to use these exercises even if you do not adopt this text.

By the way, the body of Chapters 9 and 10 uses the example of Chuck's Bikes, Inc., rather than GBI. We made this change at the request of the SAP Alliance. The alliance prefers that authors not add new material to GBI, change any characters, make videos, and so forth. We created CBI so as to comply with that request while at the same time providing more detailed business scenarios that are compatible with GBI.

Ethics Guides

We believe that business ethics are a critically important component of the Introduction to MIS course and that the best way to teach ethics is in the context of case-like situations. We also believe that ethics ought not to be relegated to a single chapter or chapter section. Including ethics in one

place leads to the inoculation theory of education: “We don’t need to discuss ethics, we’ve already done that.” Accordingly, each chapter contains one two-page spread called an Ethics Guide. They are shown in the table of contents; to sample just one of them, turn to page 20.

In recent years, we believe there has been a shift in students’ attitudes about ethics. Many students seem to be increasingly cynical and callous about ethical issues. As a result, when we try to raise interest with them about unethical behavior, we find ourselves interjecting and defending a particular set of values, a role that strikes many students as inappropriate. A common attitude seems to be, “We should think for ourselves, thank you anyway.”

In frustration about the situation, we turned to a good friend of many years, Dr. Chuck Yoos, emeritus professor from the U.S. Air Force Academy. We told him our goals for presenting the Ethics Guides and asked him what criteria he would use with his students if he only had 20 minutes per guide. His response was that while there are many ways of addressing ethics in business, Kant’s categorical imperative and the utilitarianism of Bentham and Mill would be at the top of his list. We investigated both and decided to use them with this edition.

Our goal in doing so is to ask students, whose ethical standards may be immature, to learn and apply the categorical imperative and utilitarianism perspectives. By doing so, students are asked to “try on” those perspectives and in the process think more deeply about ethical principles than they do when we allow them simply to apply their personal ethical standards.

The Ethics Guide in Chapter 1 introduces the categorical imperative, whereas the Ethics Guide in Chapter 2 introduces utilitarianism. If you choose to use these perspectives, you will need to assign both of those guides.

Collaboration Exercises

As stated in Chapter 1, collaboration is a key skill for today’s business professionals. Accordingly, we believe that teaching collaboration, collaboration processes, and collaboration information systems is an important component of this course. To that end, each chapter includes a collaboration exercise to be accomplished by a student team. In our opinion, it is not possible for students to complete all of these in one term. Instead, we recommend using three or four of them throughout the term.

In doing these exercises, we recommend that students not meet face to face, at least not most of the time, but use modern collaboration tools for their meetings. Google Docs and related tools are one possibility. We prefer requiring students to use Microsoft OneDrive.

End-of-Chapter Cases

The chapter-opening vignettes are based on real-life experience, but the organizations they describe are fictitious. We use fictitious companies because we want students to learn from organizational mistakes and, at times, even organizational foolishness. We have not found many real companies that will allow us to share their laundry in this way, and, in any case, it seems unfair to ask for an organization’s cooperation and then turn around and publish its problems.

However, we do believe students need to see examples of the role of MIS in actual organizations to help them bridge the chapter content to the real world. Hence, each chapter concludes with a case that illustrates some aspect of the chapter’s contents in a real-world company.

Active Reviews

Each chapter includes an Active Review at the end. These reviews help students ensure that they have learned the most essential material. They also serve as a list of potential exam questions and thus help students prepare for exams.

Application Exercises

For courses that involve a Microsoft Office component, we have developed a set of Excel and Access exercises for all chapters. These exercises, which assume the student has beginner’s level expertise with these products, appear beginning on page 448. They are listed approximately in increasing order of difficulty.

What We Left Out

We chose to keep this book to the traditional 12-chapter length because we find that this number of chapters fits best into the number of class lessons of most courses. Because we are adding

substantial process-oriented material, however, that meant we needed to remove some content from the typical Introduction to MIS text.

In this text, we have reduced and simplified the discussions of hardware, software, and data communications. Furthermore, we simplified and shortened the discussion of information systems development. Finally, you will find no mention of IS departmental management in this text. It is not that we believe the shortened and omitted content is unimportant; rather, we think the opportunity cost is the least for these topics.

This text includes some material that has been previously published in David Kroenke's text *Using MIS*. The two texts differ in that *Using MIS* makes information systems primary, whereas this text makes business processes primary. Both texts will continue to be published. Because of this difference, however, every sentence that was brought over was examined from the perspective of business processes and much of that content was changed in both minor and major ways. The discussion of collaboration, for example, is reframed into the context of dynamic business processes. That said, the majority of the material in this text is new.

Chapter Outline

This text is organized into four parts: Introduction, Technology, Structured Processes, and Dynamic Processes.

Introduction

Chapter 1 sets the stage by illustrating the need for this course and especially for the behaviors and skills that students gain in the course. It defines *MIS* and summarizes the means by which organizations obtain goals and objectives. Porter's industry, five forces, and value chain models are presented.

Chapter 2 defines and illustrates processes, information systems, and information. It uses a common fast food restaurant to illustrate the relationship of processes and information systems. It also defines information using the Gregory Bateson definition that *information* is a difference that makes a difference.

Technology

Chapters 3, 4, 5, and 6 address technology. Chapter 3 provides a quick summary of networks and the cloud. Chapter 4 discusses database processing. Security is the topic of Chapter 5. Chapter 6 is a new chapter that describes AI and robots. These chapters serve as a technology platform for the discussions in the remaining chapters.

Structured Processes

Chapters 7 through 10 discuss structured processes and related information systems and information. Chapter 7 provides an overview of the scope and objectives of business processes. It also discusses process adaptation and improvement and the use of process objectives and measures in making process changes. Chapter 8 is a survey of ERP information systems, their benefits, and their challenges.

Chapters 9 and 10 are "applied" chapters. They show how SAP is used in two representative processes: procurement and sales. Two processes were chosen so that students could begin to see what is common to all processes and what might differ between processes. These two processes, buying and selling, are fundamental to business and are widely used. Each chapter includes a student lab exercise appendix that uses the Global Bikes case from the SAP Alliance's curriculum.

Dynamic Processes

Chapters 11 and 12 address what we term *dynamic processes*. Such processes are neither as structured nor as rigid as the more structured operational processes. We dislike the term *unstructured processes* because we believe that such processes do have structure, at least at a meta-level. Both of these chapters follow a similar flow: The IS that supports each process is discussed first, followed by the activities in the process, and concluding with the business processes supported by the dynamic process.

Chapter 11 discusses two dynamic processes—collaboration and social media. We discuss Lin’s theory of social capital, apply that theory to organizational use of social media systems, and survey the processes supported by social media systems. Chapter 12 considers business processes supported by analytics and discusses analytics systems, data warehouses, data mining, and Big Data.

Extensions

Four Extensions to this edition of the textbook discuss, in order, IS Careers, Software and Hardware, Process Management and IS Design, and Location Based Data IS.

Appendix

The appendix is a third structured process SAP tutorial. This tutorial takes a student through the SAP inputs required to accomplish the Production process.

Supplements

The following supplements are available at the Online Instructor Resource Center, accessible through www.pearsonhighered.com/kroenke.

MyLab MIS

MIS Video Exercises—videos illustrating MIS concepts, paired with brief quizzes
 MIS Decision Simulations—interactive exercises allowing students to play the role of a manager and make business decisions
 Chapter Warm Ups and Quizzes—objective-based quizzing to test knowledge
 Discussion Questions—end of chapter short essay style questions
 Dynamic Study Modules—on-the-go adaptive quizzing, also available for mobile devices
 Learning Catalytics—bring your own device classroom response tools
 Enhanced eText—an accessible, mobile-friendly eText
 Excel and Access Grader Projects—live in the application auto-graded Grader projects provided inside MyLab MIS to support classes covering Office tools.

Instructor’s Manual

The Instructor’s Manual, prepared by Hasan Bassam of the University of Toledo, includes a chapter outline, list of key terms, suggested answers to the MIS InClass questions, and answers to all end-of-chapter questions.

Test Item File

This Test Item File, prepared by Noreen Power of Bentley University, contains more than 1,500 questions, including multiple-choice, true/false, and essay questions. Each question is followed by the correct answer, the learning objective it ties to, page reference, AACSB category, and difficulty rating.

PowerPoint Presentations

The PowerPoints, prepared by Nancy Lamm of N. Lamm Consulting Associates, Ltd., highlight text learning objectives and key topics and serve as an excellent aid for classroom presentations and lectures.

Image Library

This collection of the figures and tables from the text offers another aid for classroom presentations and PowerPoint slides.

TestGen

Pearson Education’s test-generating software is available from www.pearsonhighered.com/irc. The software is PC/MAC compatible and preloaded with all of the Test Item File questions. You can manually or randomly view test questions and drag and drop to create a test.

You can add or modify test bank questions as needed. Our TestGens are converted for use in BlackBoard, WebCT, Moodle, D2L, and Angel. These conversions can be found on the Instructor's Resource Center. The TestGen is also available in Respondus and can be found on www.respondus.com.

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We thank our friend and colleague, Chuck Yoos, of Fort Lewis College, for hours and hours and hours of conversation on the meaning of information, the role of information in organizations today, and how to address the instruction of business ethics. Chuck is responsible for the helpful distinction between *perceiving data* and *conceiving information* and many other insights that have shaped this text's material. Chuck recently passed away, and Chuck's Bikes is named in honor of him.

Finally, we are most grateful to our families, who have lovingly supported us through these processes; to them we dedicate this book.

Earl McKinney Jr.
Bowling Green, Ohio

David Kroenke
Whidbey Island, Washington

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About the Authors

Earl McKinney Jr. Teaching the introduction to MIS course has been Earl McKinney's passion for 20 years. He first caught the bug at his alma mater, the U.S. Air Force Academy, and has continued his addiction during his tenure at Bowling Green State University. While teaching that class and other undergraduate and graduate classes, Earl has also introduced a half dozen new courses on security, social media, ERP, and information. He has been awarded a number of department and college teaching awards by students and fellow faculty. His interest in the broader context of the business curriculum is reflected in several of his publications and by the Decision Science Institute's National Instructional Innovation Award.

Earl's research in e-commerce, small team communication during a crisis, and theoretical work on the notion of information has been published in *Behaviour and Information Technology*, *Human Factors*, *Information and Management*, *European Journal of IS*, and *MIS Quarterly*. He consults with James Hall, the former head of the NTSB for British Petroleum, the U.S. Forest Service, and several Air Force agencies on human factors and aviation communication issues. He recently was awarded a Fulbright Scholarship to teach and study ambiguity in analytics at the Salzburg University of Applied Sciences in Austria. He holds an undergraduate economics degree from the Air Force Academy, a Master's of Engineering from Cornell University, and a PhD in MIS from the University of Texas. A former Air Force fighter pilot, Earl lives in Bowling Green with his wife and has two grown sons.



David Kroenke 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 start-up of three companies. He also was vice president of product marketing and development for the Microrim Corporation and was chief of technologies for the database division of 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 collaboration in education and industry.

His text *Database Processing* was first published in 1977 and is now in its 13th edition. He has published many other textbooks, including *Database Concepts*, 6th ed. (2013), *Using MIS*, 7th ed. (2015), *Experiencing MIS*, 5th ed. (2015), *MIS Essentials*, 4th ed. (2015), *SharePoint for Students* (2012), and *Office 365 in Business* (2012). David lives on Whidbey Island, Washington. He has two children and three grandchildren.



To Susan, James, and Daniel —Earl McKinney

To C.J., Carter, and Charlotte —David Kroenke

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Part 1

Why MIS?

Knowledge of information systems will be critical to your success in business. If you major in accounting, marketing, management, or another major, you may not yet know how important such knowledge will be to you. The purposes of Part 1 of this textbook are to demonstrate why this subject is so important to every business professional today and to introduce important terms and concepts that you will need to succeed in business.

Chapter 1 lays the foundation. First, we discuss why this course is of critical importance to every business student today. We claim, in fact, that it is the most important course you will take. Then we define *MIS* and explain how organizational strategy determines the structure and functions of MIS components.

In Chapter 2, we will define and illustrate business processes, information systems, and information. As you will see, these three constructs are closely interwoven. Understanding the relationships among them sets the foundation for the rest of this text.

We begin each chapter with a short business vignette to help you relate the chapter's concepts to the business world. Chapter 1 begins with Chuck's Bikes, Inc. (CBI), a bicycle wholesaler that also assembles its own line of bicycles. Throughout the text, we'll meet various employees of CBI; in Chapter 1, we see Kelly terminating an employee, for reasons that you will soon learn.

In Chapter 2, we will investigate the processes at Chuck's Bikes Inc. At CBI we'll meet Jake and see how he puts the ideas of this textbook to work.

Extension 1 describes IS careers. It provides the student an opportunity to consider the types of jobs MIS graduates have, the characteristics of those jobs, and what IS professionals like about those jobs.

Chapter 1

The Importance of MIS

“Fired? You’re firing me?”

“Well, *fired* is a harsh word, but . . . well, Chuck’s Bikes 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 we can generate additional revenue from our existing retailers.”

“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 4 months!”

“It’s called teamwork. Sure, you’re just learning our business, but I made sure all of our best salespeople would be available to you . . .”

“I didn’t want to bother them.”

“Well, you succeeded. I asked Jason what he thought of the plans you’re working on. ‘Who’s Jennifer?’ he asked.”

“But doesn’t he work out of our other office?”

“Right . . . and 37 percent of our sales come out of that office. Probably 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’ll 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 sales 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 answers. Our plans get better when we discuss and rework them . . . I think I told you that.”

“Maybe you did. But I’m just not comfortable with that.”

“Well, it’s a required skill here.”

“I know I can do this job.”

“Jennifer, you’ve been here almost 4 months; you have a degree in business. Several weeks ago, I asked you for your first idea about how to up-sell our customers. 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



CHAPTER OVERVIEW

- Q1-1.** Why is Introduction to MIS the most important class in the business school?
- Q1-2.** What is MIS?
- Q1-3.** How does MIS relate to organizational strategy?
- Q1-4.** What five forces determine industry structure?
- Q1-5.** What is competitive strategy?
- Q1-6.** How does competitive strategy determine value chain structure?
- Q1-7.** How does competitive strategy determine business processes and information systems?

PSI BIG PICTURE

PROCESS: A way of doing something

IS: A collection of components that produces information

INFORMATION: Meaningful insight in a person

task, I backed up and asked you to send me a diagram of the life cycle for new clients... how we first contact them, how we make our first sale, how we grow our sales to them..."

"Yes, I sent you that diagram."

"Jennifer, it made no sense. Your diagram had clients talking to Neil in accounts receivable before they were even customers."

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

"Well, I appreciate that attitude, but times are tight. We don't have room for trainees. When the economy was strong, I'd have been able to look for a spot for you, see if we can 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."

For a similar story, see also www.youtube.com/watch?v=8UQx-zUuGf4.

PREVIEW

"But today, they're not enough."

Do you find that statement sobering? And if timely hard work isn't enough, what is? We will begin this book by discussing the key skills that Jennifer (and you) needs and explain 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 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. Once you have gained an understanding of how important this class will be to your career, we will discuss fundamental concepts.

MyLab MIS

- Using Your Knowledge Questions 1-1, 1-2, 1-3
- Essay Questions 1-10, 1-11
- Excel and Access Application Questions 1-1, 1-2

Q1-1 Why Is Introduction to MIS the Most Important Class in the Business School?

Introduction to MIS is the most important class in the business school. That statement was not true in 2010, and it may not be true in 2031. But it is true in 2021.

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 essence 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.¹ See Figure 1-1.

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

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

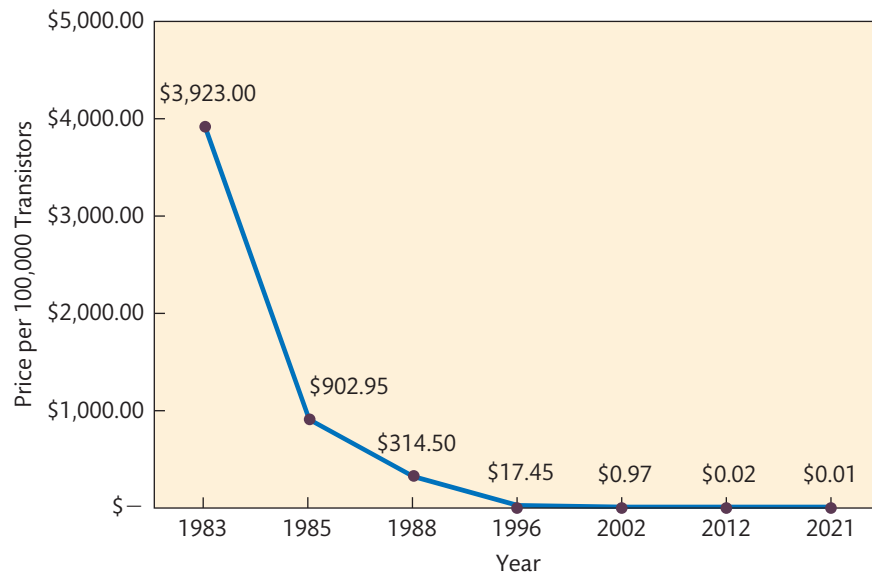
Moore’s Law is relentlessly driving down the cost of computing. As a result, computers are everywhere in business—every job requires extensive computer use, and every product you see needed IT to make it, deliver it, market it, and sell it. Seriously, every product. Look around.

This avalanche is not stopping. Moore’s Law will continue to reduce costs, so Moore and Moore technology will flood business, and new opportunities will arise all the time as what was once too expensive becomes a very real possibility.

What happens when the cost of technology is essentially zero? Here are some of the recent consequences:

SoundCloud	Blockchain	Airbnb	Apply Pay	3D printers
Siri	FitBits	TikTok	WhatsApp	driverless cars
Instagram	Venmo	Spotify	Big Data	Echo
FaceTime	Uber	Internet of Things	the cloud	virtual reality

FIGURE 1-1
Changes in Price/Performance of Processors



These technologies and others before them have ushered in the **Information Age** where the production, distribution, and control of information are the primary drivers of the economy. Indicators of this age—the exploding quantities of data and the growth of Internet users—are shown in Figure 1-2.

There are two unique aspects of this age. First, the global world is *flat*. A new IT opportunity in India can quickly find the capital and connections needed to spread rapidly worldwide. Two, in such a flat and connected world, businesses must *adapt* quickly or be overtaken by those who do.

While the business world is driven by technology, so too are the people in it. Think about how many IT-enabled events you have participated in today—all the apps you have used, games you have played, music you have listened to, and videos you have watched as well as all your texts, posts, and tweets. In fact, the average adult spends more than 5 hours a day on their smartphones, social media, and laptops for work and entertainment.

Wherever we work or whatever we do, IT is there. Businesses need you to help them use IT wisely whether you are a graduate in MIS, accounting, marketing, or any other discipline. You need to use IT wisely to be effective at work, education, or even leisure. That’s why MIS is the most important course in the business school today.

Jeff Bezos, CEO of Amazon, sees this unprecedented period of IT as the most exciting era of business: “It’s pretty easy to wake up excited.” We share Mr. Bezos’s passion. It’s an exciting time. We want you to be effective in it; we wrote this book for only that reason.

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 these skills, and having these skills will lead to greater job security.

How Can I Attain Job Security?

A wise and experienced business executive once said 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? Job seekers used to name particular skills, such as computer programming, tax accounting, or marketing. But today, because of Moore’s Law, because the cost of data processing, storage, and communications is essentially zero, any routine skill can and will be outsourced to the lowest bidder. And if you live in the United States, Canada, Australia, Europe, and so on, that is unlikely to be you. Numerous organizations and experts have studied the question of what skills will be marketable during your career. Consider two of them.

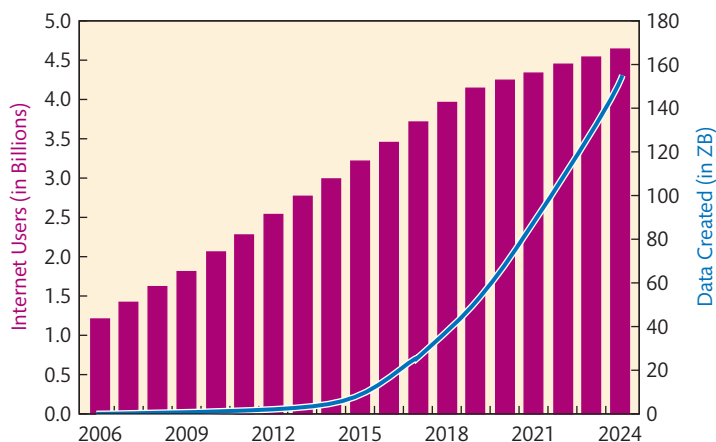


FIGURE 1-2
Data Created and Worldwide Internet Users

Source: https://recodetech.files.wordpress.com/2014/01/pimintel_graphic-1.jpg<http://www.internetlivestats.com/internet-users/>

First, the RAND Corporation, a think tank located in Santa Monica, California, has published innovative and groundbreaking ideas for more than 70 years, including the initial design for the Internet. Recently, RAND published a description of the skills that workers in the twenty-first 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. These shifts in the nature of organizations... favor strong nonroutine cognitive skills.²

Whether you are majoring in accounting or marketing or finance or information systems, you need to develop these strong nonroutine cognitive skills. These nonroutine skills will be increasingly important in the near future as robots and artificial intelligence replace more and more people doing routine work.

A second study by Robert Reich, former Secretary of Labor, enumerates these nonroutine cognitive skills, which we call the four employability skills:³

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

Figure 1-3 shows an example of each. Reread the CBI case that started this chapter, and you will see that Jennifer lost her job because of her inability to practice these skills.

How Can Intro to MIS Help You Learn Employability Skills?

The second reason Introduction to MIS is the best course in the business school is that it allows you to learn and practice 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. An abstraction is a simplification of an object; it is an idea, model, or concept that can then be manipulated with a logical or reasonable thought process. You will work with one or more models in every course topic and book chapter. For example, in Chapter 2, you will learn ways to *model* business processes, and you will also learn a *model* of the five components of an information system.

In this course, you will not just manipulate models provided in this text or a model that your instructor has developed; you will also be asked to construct models of your own. In Chapter 4, for example, you will learn how to create data models, and in Chapter 7, you will learn how to make process improvement models.

SYSTEMS THINKING Can you go to a grocery store, look at a can of green beans, and connect that can to U.S. immigration policy? Can you watch tractors dig up a forest of pulpwood trees and connect that woody trash to Moore's Law? Do you know why one of the major beneficiaries of YouTube is Cisco Systems? Answers to all of these questions require systems thinking.

FIGURE 1-3
Need for Employability Skills

Skill	Example	Jennifer's Problem
Abstract reasoning	Construct a model or representation.	Confusion about life cycle for new clients.
Systems thinking	See the whole and show how inputs and outputs relate to one another.	Confusion about when/how customers contact accounts receivable.
Collaboration	Develop ideas and plans with others. Provide and receive critical feedback.	Unwilling to work with others with work-in-progress.
Experimentation	Create and test promising new alternatives, consistent with available resources.	Fear of failure prohibited discussion of new ideas.

Systems thinking is the ability to see the whole, not just the parts; it is the ability to model the components of the system and to connect the inputs and outputs among those components into a sensible whole, one that explains the phenomenon observed. For example, why is Uber profitable as a whole, and how do inputs like riders and drivers get connected to create successful outcomes for both?

As you are about to learn, this class is about processes and information *systems*. Processes are parts of systems—the output of one process is the input to another process. For example, the process of acquiring the material to make bicycles is the input to the process of production; and the output of production is the input to the sales process. Systems thinking is also important to information systems. Throughout this book, we will discuss and illustrate systems. You will be asked to critique systems, compare alternative systems, and apply different systems to different situations. All of those tasks will prepare you for systems thinking as a professional.

COLLABORATION Here’s a fact that surprises many students: Effective collaboration isn’t about being nice. It includes planning discussions, anticipating reactions, being inquisitive and not defensive, educating, and influencing. Interestingly, 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 will 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 that will be of use for such collaboration. Even better, you will have many opportunities to practice them. Chapter 10 will teach you collaboration skills and illustrate several sample collaboration information systems. In addition, every chapter of this book includes collaboration exercises that you may be assigned in class or as homework.

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?”

The fear of failure is a major stumbling block 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 the fear of failure.

But think again about 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 twenty-first century need to develop experimentation skills.

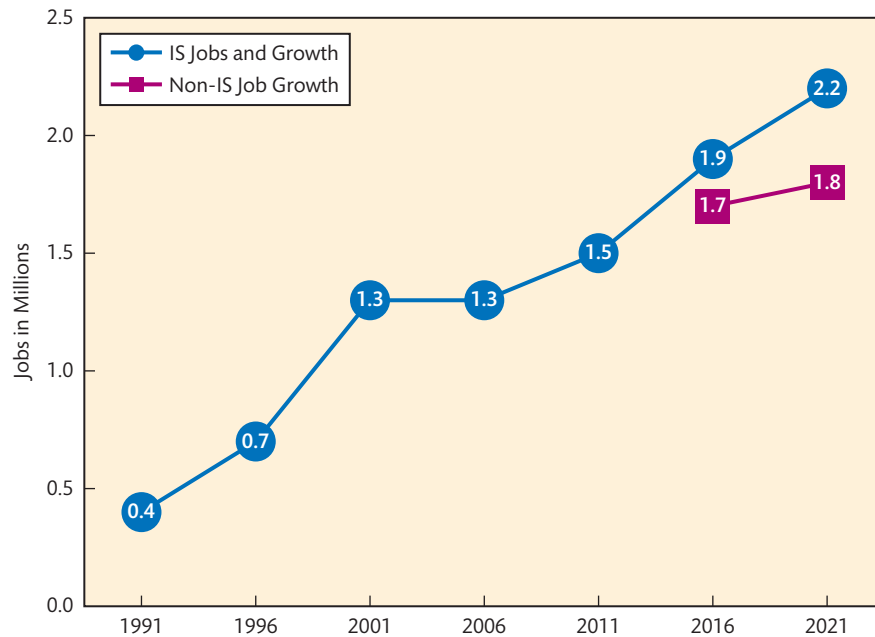
Successful experimentation is not throwing buckets of money at every crazy idea that enters your head. **Experimentation** is, however, making a careful and reasoned analysis of an opportunity, envisioning potential products or solutions or applications of technology, and then developing those ideas that seem to have the most promise, consistent with the resources you have. Successful experimentation also means learning from the experience: If it worked, why? If not, why not?

Experimentation is essential in a flat and connected global economy as the payoff for success in a global market is higher than ever. If a company does not experiment, it has lowered its chances of a breakthrough success. Experimentation is like drawing cards in poker or a game of cards. You do not know when a good card will come to you, but if you quit drawing cards, and your opponents continue, you’re done.

In this course, you will be asked to use products with which you have no familiarity. Those products might be Microsoft Access, Visio, or something called SAP, or they might be features and functions of Blackboard that you have not used. You may be asked to collaborate using Microsoft Office 365 or Google Docs. Will your instructor explain every feature of those products that you will need? You should hope not. You should hope your instructor will leave it up to you to envision new possibilities on your own and to experiment with those possibilities, consistent with the time you have available.

FIGURE 1-4
IS Job History and Forecast Growth

Source: Bureau of Labor Statistics:
<https://www.bls.gov/opub/btn/volume-2/careers-in-growing-field-of-information-technology-services.htm>



Jobs

As shown in Figure 1-4, jobs in IS have grown rapidly over the past 25 years, from less than 0.5 million to now more than 2 million. The figure also shows that the growth of IS jobs for the last 5 years exceeded job growth by all non IS jobs. Many of the jobs fulfilled by IS trained graduates do not have IS in the job title. These jobs and their descriptions are described in Extension 1. Particularly hot now are jobs in security, analytics, and AI, many of which will be filled by IS graduates.

However, information systems and computer technology provide job and wage benefits beyond just IS professionals. Acemoglu and Autor published an impressive empirical study of job and wages in the United States and parts of Europe from the 1960s to 2010.⁴ 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. For example, plentiful, high-paying jobs are available to business professionals who know how to use information systems to improve business process quality, interpret data mining results for improved marketing, enhance information security, or use 3D printing to create new products and address new markets.

What Is the Bottom Line?

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

1. It will give you the background you need to assess, evaluate, and apply emerging information systems technology to business.
2. It can give you the ultimate in job security—employability skills—by helping you learn abstract reasoning, systems thinking, collaboration, and experimentation.
3. Job opportunities.

Please give this course your best shot; we believe that effort will pay off handsomely. We understand everyone says this about their topic, so ask non-IS friends, teachers, friends of parents, and others how important is it for you to be able to use and understand how technology is employed by businesses. Think of it this way: If you were planning a future in Germany, wouldn't you want to be good with the German language? Same here—you're going into a high-tech business environment...so be good with technology language. With that introduction, let's get started!⁵

Q1-2 What Is MIS?

We’ve used the term *MIS* several times, and you may be wondering what it is. **MIS** stands for **management information systems**, which we define as creating, monitoring, and adapting processes, information systems, and information to help organizations achieve their strategies. This definition has three key elements:

- Processes, information systems, and information
- Creating, monitoring, and adapting
- Achieve strategies

Consider each, starting with processes, information systems, and information.

Processes, Information Systems, and Information

Chapter 2 discusses these three terms and their interrelationships in detail. For now, however, consider the following intuitive definitions. A *process*, or, as it is sometimes called, a *business process*, is a way of doing something. CBI has a process for acquiring new customers. The process involves finding potential customers, contacting them, assigning a sales person, and so forth. Because organizations accomplish work via processes, focusing on them is key to improving organizational effectiveness and efficiency, as you will learn throughout this book.

An *information system* is a collection of components, including but not limited to a computer, that stores and retrieves data and produces information. Business processes and information systems are not the same things. A process may use multiple information systems, and an information system may touch many different processes. You can avoid considerable confusion by differentiating between these two concepts. Finally, *information* is a meaningful insight that helps employees do their jobs. But we’re getting ahead of the story. In Chapter 2, we will formalize these definitions, explore them in detail, and investigate their relationships. Use these informal definitions as placeholders just to get started.

Creating, Monitoring, and Adapting

The next element in our definition of MIS is creating, monitoring, and adapting processes, information systems, and information, as shown in Figure 1-5.

Consider CBI’s process for acquiring new customers. That process did not just pop up like a mushroom after a hard rain; it was constructed by someone to meet CBI’s needs. Over time, requirements for that process will change; perhaps CBI will introduce a discount for first-time customers. CBI needs to monitor its processes to detect when a new customer places an order. When it does, the process will need to be adapted to meet the new requirements.

Similar statements apply to information systems. Information systems need to be created; computers, programs, databases, and other elements need to be constructed in such a way that they meet the requirements of the business processes that they serve. Like processes, they need to be monitored to ensure that they continue to meet their requirements, and they need to be adapted when they do not.

The same comments pertain to information. For example, managers at CBI have a set of reports that show bike sales. Over time, monitoring of manager decisions about sales may indicate that new information is needed to help managers improve those decisions. If so, the information system will need to be adapted to help managers find more meaningful insights.

At this point, you might be saying, “Wait a minute. I’m a finance (or accounting or management) major, not an information systems major. I don’t need to know how to build or adapt

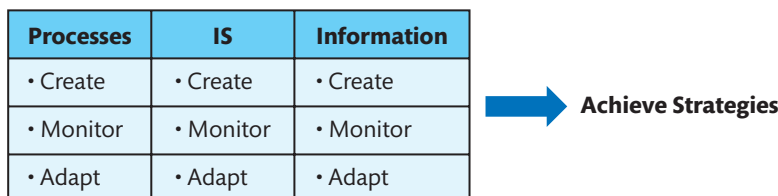


FIGURE 1-5
Scope of MIS