RAINER & PRINCE

Introduction to INFORMATION SYSTEMS

[Supporting and Transforming Business]

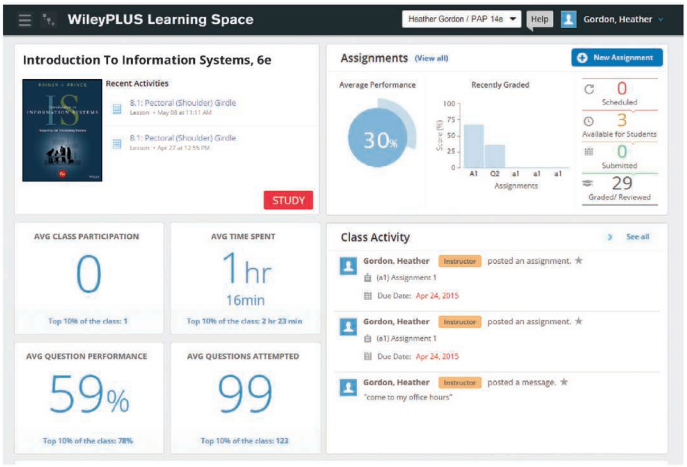
6e

WILEY

WileyPLUS Learning Space

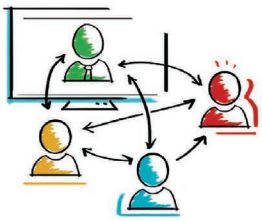
Includes ORION Adaptive Practice

An easy way to help your students learn, collaborate, and grow.



Diagnose Early

Educators assess the real-time proficiency of each student to inform teaching decisions. Students always know what they need to work on.



Facilitate Engagement

Educators can quickly organize learning activities, manage student collaboration, and customize their course. Students can collaborate and have meaningful discussions on concepts they are learning.

Measure Outcomes

With visual reports, it's easy for both educators and students to gauge problem areas and act on what's most important.

Instructor Benefits

- Assign activities and add your own materials
- Guide students through what's important in the interactive e-textbook by easily assigning specific content
- Set up and monitor collaborative learning groups
- Assess learner engagement
- Gain immediate insights to help inform teaching

Student Benefits

- Instantly know what you need to work on
- Create a personal study plan
- Assess progress along the way
- Participate in class discussions
- Remember what you have learned because you have made deeper connections to the content

Introduction to Information Systems

Supporting and Transforming Business

Sixth Edition

R. Kelly Rainer Jr.
Brad Prince

WILEY

Vice President & Director	George Hoffman
Executive Editor	Lisé Johnson
Executive Marketing Manager	Christopher DeJohn
Product Design Manager	Allison Morris
Sponsoring Editor	Jennifer Manias
Market Solutions Assistant	Amanda Dallas
Senior Content Manager	Dorothy Sinclair
Senior Production Editor	Jane Lee
Design Director	Harry Nolan
Senior Designer	Wendy Lai
Senior Photo Editor	Billy Ray
Production Management Services	Thomson Digital
Front Cover Image	A-Digit/Getty Images, Inc.
Back Cover Image	Pedro Castellano/Getty Images, Inc.

This book was set in 9.5/11.5 Electra LT Std by Thomson Digital, and printed and bound by Donnelley/Von Hoffman. The cover was printed by Donnelley/Von Hoffman. This book is printed on acid free paper.

ISBN 978-1-119-10800-9 (Binder-Ready Version)

Rainer, R. Kelly, Jr., 1949–
Introduction to Information Systems : Supporting and Transforming Business / R. Kelly Rainer Jr., Brad Prince. — Sixth edition.
1 online resource.
Includes index.
Description based on print version record and CIP data provided by publisher; resource not viewed.
ISBN 978-1-119-10799-6 (pdf) – ISBN 978-1-119-10800-9 (looseleaf)
1. Information technology. 2. Computer networks. 3. Management information systems.
I. Prince, Brad, 1978- II. Title.
T58.5
658.4'038011—dc23

2015025301

The inside back cover will contain printing identification and country of origin if omitted from this page. In addition, if the ISBN on the back cover differs from the ISBN on this page, the one on the back cover is correct.

Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

Preface

What Do Information Systems Have to Do with Business?

This edition of Rainer and Prince's *Introduction to Information Systems* will answer this question for you. In every chapter, you will see how real global businesses use technology and information systems to increase their profitability, gain market share, improve their customer service, and manage their daily operations. In other words, you will learn how information systems provide the foundation for modern business enterprises.

Our goal is to teach all business majors, especially undergraduates, how to use IT to master their current or future jobs and to help ensure the success of their organization. Our focus is not on merely *learning* the concepts of information technology but rather on *applying* those concepts to perform business processes more efficiently and effectively. We concentrate on placing information systems in the context of business, so that you will more readily grasp the concepts presented in the text.

The theme of this book, *What's in IT for Me?*, is a question asked by most students who take this course. Our book will show you that IT is the backbone of any business, whether you're majoring in Accounting, Finance, Marketing, Human Resources, Operations Management, or MIS.

New to This Edition

The sixth edition contains many exciting additions and changes. These elements make the text more interesting and readable for students of all majors, while still providing the most current information possible in the rapidly changing field of information systems.

Overall

- A new section on Relational Database Operations in Chapter 5 (Data and Knowledge Management).
- Expanded coverage on Big Data in Chapter 5 (Data and Knowledge Management).
- A new section on The Internet of Things in Chapter 8 (Wireless, Mobile Computing, and Mobile Commerce).
- All new or updated chapter-opening and closing cases.
- All new or updated *IT's About Business* boxes in every chapter.

Key Features

We have been guided by the following goals that we believe will enhance the teaching and learning experience.

"What's in IT for Me?" theme

- We show why IT is important by calling attention in each chapter to how that chapter's IT topic relates to students in each major.
  - A feature of this edition is chapter-opening "teasers" that list specific tasks for each major that the chapter will help prepare students to do.
  - Throughout each chapter, icons guide the reader to relevant issues for their specific functional area—Accounting (ACC), Finance (FIN), Marketing (MKT), Operations Management (POM), Management Information Systems (MIS), and Human Resources Management (HRM).
  - Every chapter concludes with a summary of how the concepts relate to each functional area ("What's in IT for Me?").

Active Learning

We recognize the need to actively involve students in problem solving, creative thinking, and capitalizing on opportunities. Therefore, we have included in every chapter a variety of hands-on exercises, activities, and mini-cases, including exercises that require students to use software application tools. Through these activities and an interactive Web site, we enable students to apply the concepts they learn.

Diversified and Unique Examples from Different Industries

Extensive use of vivid examples from large corporations, small businesses, and government and not-for-profit organizations helps to enliven concepts by demonstrating the capabilities of IT, its cost and justification, and innovative ways in which real corporations are using IT in their operations. Each chapter constantly highlights the integral connection between IT and business. This is especially evident in the "IT's About Business" boxes.

Misuse of IS

Like other textbooks, this text presents many examples of IS success. But we also provide numerous examples of IS failures, in the context of lessons that can be learned from such failures. Misuse of IS can be very expensive, as we illustrate.

Innovation and Creativity

In today's rapidly changing environment, creativity and innovation are essential for a business to operate effectively and profitably. Throughout the text we demonstrate how IT facilitates these concepts.

Global Focus

Because an understanding of global competition, partnerships, and trading is essential to success in business, we provide a broad selection of international cases and examples. We discuss how IT facilitates export and import, the management of multinational companies, and electronic trading around the globe.

Focus on Ethics

With corporate scandals appearing daily in the news, ethics and ethical questions have come to the forefront of business people's minds. In addition to a chapter that concentrates on ethics

and privacy (Chapter 3), we have included examples and cases that focus on business ethics throughout the chapters.

Pedagogical Structure

Other pedagogical features provide a structured learning system that reinforces the concepts through features such as chapter-opening organizers, section reviews, frequent applications, and hands-on exercises and activities.

Chapter-opening organizers include the following pedagogical features:

- The *Learning Objectives* provide an overview of the key concepts students should come away with after reading the chapter.
- *Web Resources* highlight ancillary materials available on the book companion site and within *WileyPLUS* for both instructors and students.
- The *Chapter Outline* lists the major chapter headings.
- An opening *case* identifies a business problem faced by an actual company, describes the IT solution applied to the business problem, presents the results of the IT solution, and summarizes what students can learn from the case.
- New "What's in IT for Me?" "teasers" give students a quick hint about skills in their majors for which this chapter will help prepare them.

Study aids are provided throughout each chapter. These include the following:

- *IT's About Business* cases provide real-world applications, with questions that relate to concepts covered in the text. Icons relate these sections to the specific functional areas.
- Highlighted *Examples* interspersed throughout the text illustrate the use (and misuse) of IT by real-world organizations, thus making the conceptual discussion more concrete.
- *Tables* list key points or summarize different concepts.
- End-of-section reviews (*Before You Go On . . .*) prompt students to pause and test their understanding of basic concepts before moving on to the next section.

End-of-chapter study aids provide extensive opportunity for the reader to review and actually "do something" with the concepts they have just studied:

- *What's in IT for Me?* is a unique chapter summary section that demonstrates the relevance of topics for different functional areas (accounting, finance, marketing, production/operations management, and human resources management).
- The *Chapter Summary*, keyed to learning objectives listed at the beginning of the chapter, enables students to review the major concepts covered in the chapter.
- The end-of-chapter *Glossary* facilitates studying by listing and defining all of the key terms introduced in the chapter.
- *Discussion Questions* and *Problem-Solving Activities* provide practice through active learning. These exercises are hands-on opportunities to use the concepts discussed in the chapter.
- A *Case* presents a brief case study organized around a business problem and explains how IT helped to solve it. Questions at the end of the case relate it to concepts discussed in the chapter.

Online Resources

www.wiley.com/college/rainer

This text also facilitates the teaching of an introductory IS course by providing extensive support materials for instructors and students. Go to *www.wiley.com/college/rainer* to access the Student and Instructor Web Sites.

Instructor's Manual

The *Instructor's Manual*, created by Bob Gehling of Auburn University at Montgomery, includes a chapter overview, teaching tips and strategies, answers to all end-of-chapter questions, supplemental mini-cases with essay questions and answers, and experiential exercises that relate to particular topics.

Test Bank

The *Test Bank*, written by Jennifer Gerow of Virginia Military Institute, is a comprehensive resource for test questions. It contains multiple-choice, true/false, short answer, and essay questions for each chapter. The multiple-choice and true/false questions are labeled according to difficulty: easy, medium, or hard.

The test bank is available for use in Respondus' easy-to-use software. Respondus is a powerful tool for creating and managing exams that can be printed to paper or published directly to Blackboard, WebCT, Desire2Learn, eCollege, ANGEL, and other eLearning systems. For more information on Respondus and the Respondus Test Bank Network, please visit *www.respondus.com*.

PowerPoint Presentations

The *PowerPoint Presentations* consist of a series of slides for each chapter of the text that are designed around the text content, incorporating key points from the text and all text illustrations as appropriate.

Wiley Information Systems Hub

http://wileyiscommunity.ning.com/

This is a new online, interactive community designed to support the teaching of the Intro IS course. The Hub will allow IS faculty to explore a centralized and constantly updated set of current articles for use in class, connect with IS colleagues for help and advice about upcoming course topics, and share course materials with other IS faculty. The Community Manager is David Firth of the University of Montana

Weekly Updates

Weekly updates, harvested from around the web by David Firth of the University of Montana, provide you with the latest IT news and issues. These are posted every Monday morning throughout the year at *http://wileyinformationsystemsupdates.com/* and include links to articles and videos as well as discussion questions to assign or use in class.

Image Library

All textbook figures are available for download from the Web site. These figures can easily be added to PowerPoint presentations.

OfficeGrader

OfficeGrader™ is an Access-based VBA macro that enables automatic grading of Office assignments. The macros compare Office files and grade them against a master file. OfficeGrader™ is available for Word, Access, Excel, and PowerPoint for Office 2010 and Office 2013. For more information, contact your Wiley sales representative or visit www.wiley.com/college/microsoft and click on "OfficeGrader."

WileyPlus Learning Space

What is *WileyPLUS Learning Space*? It's a place where students can learn, collaborate, and grow. Through a personalized experience, students create their own study guide while they interact with course content and work on learning activities.

WileyPLUS Learning Space combines adaptive learning functionality with a dynamic new e-textbook for your course—giving you tools to quickly organize learning activities, manage student collaboration, and customize your course so that you have full control over content as well as the amount of interactivity between students.

You can:

- Assign activities and add your own materials
- Guide students through what's important in the e-textbook by easily assigning specific content
- Set up and monitor collaborative learning groups
- Assess student engagement
- Benefit from a sophisticated set of reporting and diagnostic tools that give greater insight into class activity

Learn more at www.wileypluslearningspace.com. If you have questions, please contact your Wiley representative.

Wiley Flex

Wiley provides a wide variety of printed and electronic formats that provide many choices to your students at a range of price points. Contact your Wiley sales representative for more details on any of the below.

Wiley E-Textbook

E-Textbooks are complete digital versions of the text that help students study more efficiently as they:

- Access content online and offline on your desktop, laptop and mobile device
- Search across the entire book content
- Take notes and highlight
- Copy and paste or print key sections

Wiley E-Text: Powered by VitalSource (available for all titles) Ask your sales representative about other available formats.

Wiley Custom

This group's services allow you to:

- Adapt existing Wiley content and combine texts
- Incorporate and publish your own materials
- Collaborate with our team to ensure your satisfaction

Wiley Custom Select

Wiley Custom Select allows you to build your own course materials using selected chapters of any Wiley text and your own material if desired. For more information, contact your Wiley sales representative or visit http://customselect.wiley.com/.

Acknowledgments

Creating, developing, and producing a text for an introduction to information technology course is a formidable undertaking. Along the way, we were fortunate to receive continuous evaluation, criticism, and direction from many colleagues who regularly teach this course. We would like to acknowledge the contributions made by the following individuals.

We would like thank the Wiley team: Lisé Johnson, Executive Editor; Jennifer Manias, Sponsoring Editor; Allison Morris, Product Design Manager; Chris DeJohn, Executive Marketing Manager; and Amanda Dallas, Market Solutions Assistant. We also thank the production team, including Dorothy Sinclair, Senior Content Manager; Jane Lee, Senior Production Editor; and Gaurav Uppal of Thomson Digital. And thanks to Harry Nolan, Design Director; Wendy Lai, Senior Designer; and Billy Ray, Senior Photo Editor. We also would like to thank Robert Weiss for his skillful and thorough editing of the manuscript.

We also acknowledge and appreciate Bob Gehling and Jennifer Gerow for their work on the supplements, and David Firth for his work on the Weekly Updates and the new Faculty Hub. Many thanks also to Alina M. Chircu and Marco Marabelli of Bentley University for developing material that enhances our coverage of business processes and ERP. Finally, we thank all the faculty listed below who have generously shared their varied opinions by reviewing the manuscript and/or completing our user surveys.

Kelly Rainer
Brad Prince

Reviewers

Ahlam Alhweiti, *Southern New Hampshire University*
Barbara Gordon, *Seminole State College of Florida*
Milele Hallingquest, *Iowa State University*
Sandy Keeter, *Southern New Hampshire University*
Nicole Lytle-Kosola, *California State University, San Bernardino*
Joe Parker, *Southern New Hampshire University*
Melissa Ray, *University of Phoenix*
Donna Rex, *York University*
Kevin Scheibe, *Iowa State University*
Kevin Wilhelmsen, *University of Phoenix*
Gaya P. Agrawal, *Rutgers University*
Ihssan Alkadi, *South Louisiana Community College*
Mary Baldwin-Grimes, *Gateway Technical College*
Mary Barnard, *IUPUI*
Nicholas Barnes, *Nichols College*
Lisa Reeves Bertin, *Penn State University Shenango Campus*
Mark Best, *The University of Kansas*
Neelima Bhatnagar, *University of Pittsburgh at Johnstown*
Dan Brandon, *Christian Brothers University*
Fredrick Bsharah, *Cape Cod Community College*
Jessie Brown, *Macquarie City Campus*
Patrick Browning, *The University of Southern Mississippi*
Trini Callava, *University of Miami*
Pam Carter, *North Carolina A&T State University*
Antoinette Cevenini, *Macquarie City Campus*
Lewis Chasalow, *The University of Findlay*
H. Michael Chung, *California State University Long Beach*
Ken Corley, *Appalachian State University*
Jose Cruz, *University of Puerto Rico - Mayaguez*
Barry Cumbie, *University of Southern Mississippi*
Subhasish Dasgupta, *George Washington University*
Lauren Eder, *Rider University*
Greg Foudray, *Salem State University*
Bob Gehling, *Auburn University Montgomery*
Cody Gray, *Portland Community College*
Eileen Griffin, *Canisius College*
Heather Griffo, *Portland Community College*
Joseph Harder, *Indiana State University*
Jeff Harper, *Indiana State University*
Jim Howatt, *Luther College*
Chang-tseh Hsieh, *University of Southern Mississippi*
Scott Hunsinger, *Appalachian State University*
Micki Hyde, *Indiana University of Pennsylvania*
Jinman Kim, *University of Sydney*
Richard Klein, *Florida International University*
Dana Ladd, *University of Findlay*
Faith Lamprey, *Rhode Island College*
Christine Lazaro, *Gateway Technical College*
Mark Lewis, *Alfred University*
Susan Li, *Adelphi University*
Thomas Long, *DePaul University*
James Scott Magruder, *The University of Southern Mississippi*
Kalana Malimage, *Mississippi State University*
Efrem Mallach, *Rhode Island College*
Steven Mandelbaum, *George Washington University*
Nichelle Manuel, *IADT*
Stanley Marcinczyk, *Central Connecticut State University*
Robert Marmelstein, *East Stroudsburg University*
Tom Mattson, *University of Hawaii*
Lee McClain, *Western Washington University*
Rodger Morrison, *Troy University*
Mahdi Nasereddin, *Penn State University*

Bill Neumann, *University of Arizona*
Cynthia Nitsch, *University of San Diego*
Anthony Offor, *Sanford-Brown College*
Jim Ott, *Fontbonne University*
Neal Parker, *Appalachian State University*
Sheila Pearson, *Southern Arkansas University*
Jennifer Percival, *University of Ontario Institute of Technology*
Olga Petkova, *Central Connecticut State University*
Sean Piotrowski, *Rider University*
Robert Plant, *University of Miami*
Carol Pollard, *Appalachian State University*
Simon Poon, *University of Sydney*
Drew Procaccino, *Rider University*
Carl Rebman, *University of San Diego*
Howard D Rees, *Rider University*
Lisa Rich, *Athens State University*
Jim Ryan, *Troy University*
Anselm Sequeira, *University of Southern Mississippi*
Linda Spauldig, *Gateway Technical College*
Suneel Sharma, *GDGWI-Lancaster University*
Troy Strader, *Drake University*
Sharon Tabor, *Boise State University*
Zaiyong Tang, *Salem State University*
Christopher Taylor, *Appalachian State University*
Gary Templeton, *Mississippi State University*
Cheryl Ucakar, *Gateway Technical College*
Michael Waclawiczek, *Salem State University*
Shouhong Wang, *University of Massachusetts Dartmouth*
John Wee, *University of Mississippi*
Brian West, *University of Louisiana at Lafayette*
Paul Wheatcraft, *Portland Community College*
Melody White, *University of North Texas*
Dezhi Wu, *Southern Utah University*
Carol Wysocki, *Columbia Basin College*
Li Richard Ye, *Carlifornia State University, Northridge*
Saad Yousuf, *Gateway Technical College*

Brief Contents

Contents

Chapter

1 Introduction to Information Systems

[LEARNING OBJECTIVES]

1. Identify the reasons why being an informed user of information systems is important in today's world.
2. Describe the various types of computer-based information systems in an organization.
3. Discuss ways in which information technology can affect managers and nonmanagerial workers.
4. Identify positive and negative societal effects of the increased use of information technology.

[CHAPTER OUTLINE]

[WEB RESOURCES]

- Student PowerPoints for note taking

WileyPLUS Learning Space

- E-book
- Author video lecture for each chapter section
- Practice quizzes
- Flash Cards for vocabulary review
- Additional "IT's About Business" cases
- Video interviews with managers
- Lab Manuals for Microsoft Office 2010 and 2013

What's In IT For Me?

This Chapter Will Help Prepare You To...

[AngelList Helps Entrepreneurs Build Companies]

Fundraising is a difficult and time-consuming process that diverts entrepreneurs from building their companies. For decades, entrepreneurs who sought to obtain funding from Silicon Valley's small, wealthy group of angel investors found the process similar to breaking into an exclusive club. (An angel investor is an individual who provides capital for a startup, usually in exchange for convertible debt or ownership equity.) They had to work with their personal networks to set up meetings with financiers and then negotiate privately, with little awareness of fair market value or better opportunities elsewhere.

To assist these individuals, AngelList (*https://angel.co*), founded in 2010 in San Francisco, has created an online forum where founders of early-stage companies—called *startups*—post their ideas and meet investors who fund these often risky ventures. AngelList's mission is to make startup investing transparent and efficient.

How does AngelList work? Basically, startups access the site and create profiles that list information such as their previous financial backers (if any) and the amount of capital they have already raised. They then utilize those profiles to make their "pitch" to hundreds of certified investors—financial firms as well as wealthy individuals and companies. To avoid fraud, AngelList vets its investors by requiring them to provide a track record of their prior investments. At the same time, the company thoroughly researches any startups that it lists on its Web site.

AngelList restricts its services to startups that are trying to obtain funding for the first time. For example, the company handles the regulatory paperwork to help startups complete the relevant forms. One feature on the company's Web site, called "Syndicates," lets investors pool their money under the direction of a single, wealthy investor known as a "lead." Then, whenever the lead decides to back a startup, so do the other investors, or "backers." Leads set their own terms. For example, one lead investor collects up to a 20 percent "carry" fee from his backers, plus a portion of any positive return they receive if the startup is acquired or goes public. AngelList takes a 5 percent cut on any such paydays. In 2014, some $87 million worth of deals were transacted via AngelList's syndicates.

Startups such as the private taxi service Uber (*www.uber.com*) and babysitting-jobs Web site Urbansitter (*www.urbansitter.com*) have used AngelList to make contact with new investors and quickly finalize their funding deals. In another example, Sprig (*www.eatsprig.com*), a San Francisco-based dinner delivery service, raised most of the money it needed for a new kitchen in a single day on AngelList.

At the end of 2013, AngelList added startup job listings to its Web site. In addition, it was lobbying the U.S. government to further relax fundraising restrictions contained in the JOBS Act, the 2012 Federal law that lowered regulatory requirements for startups. The company's goal is for the public—rather than simply accredited investors—to use the site to provide funding for promising startups.

And the bottom line? By early 2015, AngelList featured tens of thousands of businesses, and it had provided entrepreneurs with thousands of introductions to potential investors. Also in early 2015, AngelList expanded its investor syndicates to the United Kingdom.

Sources: Compiled from K. Collins, "AngelList Syndicates to Bring Investment to UK Startups," *Wired*, February 13, 2015; D. Primack, "A Disrupter Shakes Up Angel Investing," *Fortune*, December 1, 2014; B. Stone, "The Social Network for Startups," *Bloomberg BusinessWeek*, January 20–26, 2014; F. Lardinois, "OnTheGo Raises $700K Seed Round from Foundry Group's AngelList Syndicate and Others to Improve Smart Glasses," *TechCrunch*, January 6, 2014; L. Rao, "Kima Ventures Will Allow Startups to Raise $150K Within 15 Days via AngelList," *TechCrunch*, December 4, 2013; N. Hughes, "Will AngelList Help or Hurt Startup Fundraising," *GeekWire*, October 12, 2013; A. Davidson, "Follow the Money: AngelList Has Blown Open Early-Stage Investments," *Wired*, May 17, 2013; P. Sloan, "AngelList Attacks Another Startup Pain Point: Legal Fees," *CNET News*, September 5, 2012; L. Rao, "AngelList Launches Docs to Help Startups Sign and Close Seed Rounds Online with Low Legal Fees," *TechCrunch*, September 5, 2012; *www.angellist.com*, accessed January 20, 2015.

Questions

1. What are the advantages that AngelList offers to entrepreneurs?
2. What are potential disadvantages that entrepreneurs might encounter by using AngelList? (*Hint:* What if you listed your company profile on AngelList and no investor provided funding?)

Introduction

Before we proceed, we need to define **information technology** (IT) and **information systems** (IS). Information technology refers to any computer-based tool that people use to work with information and to support the information and information-processing needs of an organization. An information system collects, processes, stores, analyzes, and disseminates information for a specific purpose.

IT has far-reaching effects on individuals, organizations, and our planet. Although this text is largely devoted to the many ways in which IT has transformed modern organizations, you will also learn about the significant impacts of IT on individuals and societies, the global economy, and our physical environment. In addition, IT is making our world smaller, enabling more and more people to communicate, collaborate, and compete, thereby leveling the digital playing field.

When you graduate, you will either start your own business or work for an organization, whether it is public sector, private sector, for-profit, or not-for-profit. Your organization will have to survive and compete in an environment that has been radically transformed by information technology. This environment is global, massively interconnected, intensely competitive, 24/7/365, real-time, rapidly changing, and information-intensive. To compete successfully, your organization must use IT effectively.

As you read this chapter and this text, keep in mind that the information technologies you will learn about are important to businesses of all sizes. No matter what area of business you major in, what industry you work for, or the size of your company, you will benefit from learning about IT. Who knows? Maybe you will use the tools you learn about in this class to make your great idea a reality by becoming an entrepreneur and starting your own business! In fact, as you see in the chapter opening case, you can use information technology (in the form of AngelList.com) to help you raise the necessary funds to successfully grow your business.

The modern environment is intensely competitive not only for your organization, but for you as well. You must compete with human talent from around the world. Therefore, you will also have to make effective use of IT.

Accordingly, this chapter begins with a discussion of why you should become knowledgeable about IT. It also distinguishes among data, information, and knowledge, and it differentiates computer-based information systems (CBIS) from application programs. Finally, it considers the impacts of information systems on organizations and on society in general.

Why Should I Study Information Systems? 1.1

You are part of the most connected generation in history: You have grown up online; you are, quite literally, never out of touch; you use more information technologies (in the form of digital devices), for more tasks, and are bombarded with more information than any generation in history. The MIT Technology Review refers to you as *Homo conexus*. Information technologies are so deeply embedded in your lives that your daily routines would be almost unrecognizable to a college student just 20 years ago.

Essentially, you practice continuous computing, surrounded by a movable information network. This network is created by constant cooperation between the digital devices you carry (e.g., laptops, tablets, and smartphones), the wired and wireless networks that you access as you move about, and Web-based tools for finding information and communicating and collaborating with other people. Your network enables you to pull information about virtually anything from anywhere, at any time, and to push your own ideas back to the Web, from wherever you are, via a mobile device. Think of everything you do online, often with your smartphone: register for classes; take classes (and not just at your university); access class syllabi, information, PowerPoints, and lectures; research class papers and presentations; conduct banking; pay your bills; research, shop, and buy products from companies or other people; sell your "stuff"; search for, and apply for, jobs; make your travel reservations (hotel, airline, rental car); create your own blog and post your own podcasts and videocasts to it; design your own page on

Facebook; make and upload videos to YouTube; take, edit, and print your own digital photographs; "burn" your own custom-music CDs and DVDs; use RSS feeds to create your personal electronic newspaper; text and tweet your friends and family throughout your day; send Snaps; and many other activities. (Note: If any of these terms are unfamiliar to you, don't worry. You will learn about everything mentioned here in detail later in this text.)

The Informed User—You!

So, the question is: Why you should learn about information systems and information technologies? After all, you can comfortably use a computer (or other electronic devices) to perform many activities, you have been surfing the Web for years, and you feel confident that you can manage any IT application that your organization's MIS department installs.

The answer lies in your becoming an **informed user**; that is, a person knowledgeable about information systems and information technology. There are several reasons why you should be an informed user.

In general, informed users tend to get more value from whatever technologies they use. You will enjoy many benefits from being an informed user of IT.

- First, you will benefit more from your organization's IT applications because you will understand what is "behind" those applications (see Figure 1.1). That is, what you see on your computer screen is brought to you by your MIS department, which is operating "behind" your screen.
- Second, you will be in a position to enhance the quality of your organization's IT applications with your input.
- Third, even as a new graduate, you will quickly be in a position to recommend—and perhaps help select—the IT applications that your organization will use.
- Fourth, being an informed user will keep you abreast of both new information technologies and rapid developments in existing technologies. Remaining "on top of things" will help you to anticipate the impacts that "new and improved" technologies will have on your organization and to make recommendations on the adoption and use of these technologies.

© Slaomir Fajer/iStockphoto

FIGURE 1.1 MIS provides what users see on their computer screens.

- Fifth, you will understand how using IT can improve your organization's performance and teamwork as well as your own productivity.
- Finally, if you have ideas of becoming an entrepreneur, then being an informed user will help you use IT when you start your own business.

Going further, managing the IS function within an organization is no longer the exclusive responsibility of the IS department. Rather, users now play key roles in every step of this process. The overall objective in this text is to provide you with the necessary information to contribute immediately to managing the IS function in your organization. In short, the goal is to help you become a very informed user!

IT Offers Career Opportunities

Because information technology is vital to the operation of modern businesses, it offers many employment opportunities. The demand for traditional IT staff—programmers, business analysts, systems analysts, and designers—is substantial. In addition, many well-paid jobs exist in areas such as the Internet and electronic commerce (e-commerce), mobile commerce (m-commerce), network security, telecommunications, and multimedia design.

The information systems field includes the people in various organizations who design and build information systems, the people who use those systems, and the people responsible for managing those systems. At the top of the list is the chief information officer (CIO).

The CIO is the executive who is in charge of the IS function. In most modern organizations, the CIO works with the chief executive officer (CEO), the chief financial officer (CFO), and other senior executives. Therefore, he or she actively participates in the organization's strategic planning process. In today's digital environment, the IS function has become increasingly strategic within organizations. As a result, although most CIOs still rise from the IS department, a growing number are coming up through the ranks in the business units (e.g., marketing and finance). So, regardless of your major, you could become the CIO of your organization one day. This is another reason to be an informed user of information systems!

Table 1.1 provides a list of IT jobs, along with a description of each one. For further details about careers in IT, see *www.computerworld.com/careertopics/careers* and *www.monster.com*.

Career opportunities in IS are strong and are projected to remain strong over the next 10 years. In fact, *Forbes* listed its "12 top jobs" for 2014, the *U.S. News & World Report and Money* listed their "100 top jobs" for 2014, and *Money* listed its "top jobs" for 2014. Let's take a look at these rankings. (Note that the rankings differ because the magazines used different criteria in their research.) As you can see, jobs suited for MIS majors rank extremely high in all three lists. The magazines with their job rankings are as follows:

***Forbes* (out of 12)**
#1 Software developer
#6 Web developer
#8 Database administrators
#12 Information security analysts

***U.S. News & World Report* (out of 100)**
#3 Software Developer
#7 Computer System Analyst
#8 Information Security Analyst
#11 Web developer
#21 IT manager

Money
#1 Software architect
#8 Database administrator
#11 Clinical applications specialist (IT in healthcare)
#14 User experience designer
#17 IT program manager

Table 1.1 Information Technology Jobs

Position	Job Description
Chief Information Officer	Highest-ranking IS manager; is responsible for all strategic planning in the organization
IS Director	Manages all systems throughout the organization and the day-to-day operations of the entire IS organization
Information Center Manager	Manages IS services such as help desks, hot lines, training, and consulting
Applications Development Manager	Coordinates and manages new systems development projects
Project Manager	Manages a particular new systems development project
Systems Manager	Manages a particular existing system
Operations Manager	Supervises the day-to-day operations of the data and/or computer center
Programming Manager	Coordinates all applications programming efforts
Systems Analyst	Interfaces between users and programmers; determines information requirements and technical specifications for new applications
Business Analyst	Focuses on designing solutions for business problems; interfaces closely with users to demonstrate how IT can be used innovatively
Systems Programmer	Creates the computer code for developing new systems software or maintaining existing systems software
Applications Programmer	Creates the computer code for developing new applications or maintaining existing applications
Emerging Technologies Manager	Forecasts technology trends; evaluates and experiments with new technologies
Network Manager	Coordinates and manages the organization's voice and data networks
Database Administrator	Manages the organization's databases and oversees the use of database-management software
Auditing or Computer Security Manager	Oversees the ethical and legal use of information systems
Webmaster	Manages the organization's World Wide Web site
Web Designer	Creates World Wide Web sites and pages

Going further, the *U.S. News & World Report* picked technology as the #1 career choice for 2014. Not only do IS careers offer strong job growth, but also the pay is excellent. The Bureau of Labor Statistics, an agency within the Department of Labor that is responsible for tracking and analyzing trends relating to the labor market, notes that the median salary in 2014 for "computer and information systems managers" was approximately $121,000, and predicted that the profession would grow by an average of 15 percent per year through 2022.

Managing Information Resources

Managing information systems in modern organizations is a difficult, complex task. Several factors contribute to this complexity. First, information systems have enormous strategic value to organizations. Firms rely on them so heavily that, in some cases, when these systems are

not working (even for a short time), the firm cannot function. (This situation is called "being hostage to information systems.") Second, information systems are very expensive to acquire, operate, and maintain.

A third factor contributing to the difficulty in managing information systems is the evolution of the management information systems (MIS) function within the organization. When businesses first began to use computers in the early 1950s, the MIS department "owned" the only computing resource in the organization, the mainframe. At that time, end users did not interact directly with the mainframe.

In contrast, in the modern organization, computers are located in all departments, and almost all employees use computers in their work. This situation, known as *end user computing*, has led to a partnership between the MIS department and the end users. The MIS department now acts as more of a consultant to end users, viewing them as customers. In fact, the main function of the MIS department is to use IT to solve end users' business problems.

As a result of these developments, the responsibility for managing information resources is now divided between the MIS department and the end users. This arrangement raises several important questions: Which resources are managed by whom? What is the role of the MIS department, its structure, and its place within the organization? What is the appropriate relationship between the MIS department and the end users? Regardless of who is doing what, it is essential that the MIS department and the end users work in close cooperation.

There is no standard way to divide responsibility for developing and maintaining information resources between the MIS department and the end users. Instead, that division depends on several factors: the size and nature of the organization, the amount and type of IT resources, the organization's attitudes toward computing, the attitudes of top management toward computing, the maturity level of the technology, the amount and nature of outsourced IT work, and even the countries in which the company operates. Generally speaking, the MIS department is responsible for corporate-level and shared resources, and the end users are responsible for departmental resources. Table 1.2 identifies both the traditional functions and various new, consultative functions of the MIS department.

So, where do the end users come in? Take a close look at Table 1.2. Under the traditional MIS functions, you will see two functions for which you provide vital input: managing systems development and infrastructure planning. Under the consultative MIS functions, in contrast, you exercise the primary responsibility for each function, while the MIS department acts as your advisor. IT's About Business 1.1 illustrates how the University System of Georgia (USG) manages its IT resources across its 31 member higher education institutions.

Table 1.2 The Changing Role of the Information Systems Department

Traditional Functions of the MIS Department
• Managing systems development and systems project management
◦ As an end user, you will have critical input into the systems development process. You will learn about systems development in Chapter 13.
• Managing computer operations, including the computer center
• Staffing, training, and developing IS skills
• Providing technical services
• Infrastructure planning, development, and control
◦ As an end user, you will provide critical input about the IS infrastructure needs of your department.
New (Consultative) Functions of the MIS Department
• Initiating and designing specific strategic information systems
◦ As an end user, your information needs will often mandate the development of new strategic information systems.
• You will decide which strategic systems you need (because you know your business needs better than the MIS department does), and you will provide input into developing these systems.

Table 1.2 (continued)

- Incorporating the Internet and electronic commerce into the business
  - As an end user, you will be primarily responsible for effectively using the Internet and electronic commerce in your business. You will work with the MIS department to accomplish this task.
- Managing system integration, including the Internet, intranets, and extranets
  - As an end user, your business needs will determine how you want to use the Internet, your corporate intranets, and extranets to accomplish your goals. You will be primarily responsible for advising the MIS department on the most effective use of the Internet, your corporate intranets, and extranets.
- Educating the non-MIS managers about IT
  - Your department will be primarily responsible for advising the MIS department on how best to educate and train your employees about IT.
- Educating the MIS staff about the business
  - Communication between the MIS department and the business units is a two-way street. You will be responsible for educating the MIS staff on your business, its needs, and its goals.
- Partnering with business unit executives
  - Essentially, you will be in a partnership with the MIS department. You will be responsible for seeing that this partnership is one "between equals" and ensuring its success.
- Managing outsourcing
  - Outsourcing is driven by business needs. Therefore, the outsourcing decision resides largely with the business units (i.e., with you). The MIS department, working closely with you, will advise you on technical issues such as communications bandwidth and security.
- Proactively using business and technical knowledge to seed innovative ideas about IT
  - Your business needs will often drive innovative ideas about how to effectively use information systems to accomplish your goals. The best way to bring these innovative uses of IS to life is to partner closely with your MIS department. Such close partnerships have amazing synergies!
- Creating business alliances with business partners
  - The needs of your business unit will drive these alliances, typically along your supply chain. Again, your MIS department will act as your advisor on various issues, including hardware and software compatibility, implementing extranets, communications, and security.

[about business]

1.1 Information Technology Supports Students in Georgia

There are two major drivers for change in U.S. higher education: lowering costs and improving performance. Lowering costs is necessary because the expenses associated with higher education have been rapidly increasing for many years, leading to concerns that higher education is out of reach for low- and increasingly middle-income families. Improving performance is necessary because there is pressure on universities to graduate more students while at the same time maintaining a high-quality educational experience. In essence, colleges and universities are under increasing pressure to accomplish more with less.

To achieve these seemingly contradictory goals, the University System of Georgia (*www.usg.edu*) has employed several cutting-edge information technologies. USG is the organizational body that includes 31 public institutions of higher learning in the state of Georgia. The system, which is governed by the Georgia Board of Regents, establishes goals and dictates general policy to its member institutions.

These policies require universities to deliver learning using new technologies—for example, delivering lectures via video—to stay current. In addition, university IT organizations must

devise innovative strategies to reduce costs and increase efficiencies both within and among universities. This requirement has become vital as state funding shrinks and students struggle under the escalating costs of higher education. To satisfy this requirement, university IT departments have to be flexible and entrepreneurial.

The individual who bears the major responsibility for implementing these policies is Board of Regents Vice Chancellor and CIO Curtis Carver. Significantly, Carver has to collaborate with 31 independent-minded university CIOs. This position requires him to sell services. USG institutions can pursue technology contracts on their own. So, Carver looks for scenarios where three to five universities are planning to purchase the same product and therefore can consolidate their buying or centralize the service. This approach not only reduces costs but also helps alleviate staff shortages in some areas, such as database administration and analytics. The central IT organization's vision statement asserts, "If our customers can choose anyone to provide them IT services, they would choose us." Let's take a look at a specific example of how Carver utilized his strategy to resolve a problem.

The problem involves situations where a class is overbooked at one member university while the same class at other schools has empty seats. To manage such situations, the universities offered a number of such classes across institutions via videoconferencing. However, the registration process posed a serious problem for students.

In addition to constituting a major inconvenience, overbooked classes and waiting lists can cause students to take longer to graduate, adding to their loan debt and delaying their entry into the workforce. Although a few vendors sell software to facilitate cross-institution registration, Carver considered those products too complex and costly. As an alternative, USG system developers wrote custom computer code to handle cross-registration. This software integrated student information systems to create a total headcount of registrants in each course across all USG universities. The system provides an interface for each student that exactly resembles the user interface at his or her home institution. Therefore, if a student at Coastal Georgia University registers for a course at the University of Georgia, the system looks exactly like the Coastal Georgia system, with no need to register or pay fees to another university. Thousands of students now sign up for courses through this cross-registration system, known as the Intra-Georgia Registration Sharing System, or Ingress (not to be confused with the open-source Ingres database).

After the developers had created Ingress, Carver had to convince member universities that this system was really the way to go. University CIOs often have the option to use or not to use a shared service. As of this writing, 22 of the 31 USG universities use or are implementing Ingress. Carver takes the same approach with shared data center services, which the central group offers via a private cloud. The USG has also centralized the operation of its Desire2Learn learning management system, used by 300,000 students statewide. Finally, Carver is exploring whether the USG can sell Ingress to other institutions. We discuss cloud computing in Technology Guide 3.

Sources: Compiled from C. Murphy, "Chiefs of the Year," *InformationWeek*, December 16, 2013; K. Flinders, "Universities Investing in Back-Office IT Systems," *Computer Weekly*, March 2, 2012; "University IT Departments Can Drive Efficiencies and Modernisation," *The Guardian*, June, 2011; "Information Technology in Higher Education: Survey of Chief Information Officers," *The Chronicle of Higher Education*, 2010; www.usg.edu, accessed January 25, 2015.

Questions

1. Describe how the University System of Georgia manages its information resources vis-à-vis the individual universities in the system.
2. What are the advantages of central management of information systems in the University System of Georgia?
3. What are the disadvantages of central management of information systems in the University System of Georgia?

before you go on...

1. Rate yourself as an informed user. (Be honest; this isn't a test!)
2. Explain the benefits of being an informed user of information systems.
3. Discuss the various career opportunities offered in the IT field.

Overview of Computer-Based Information Systems

1.2

Organizations refer to their management information systems functional area by several names, including the MIS Department, the Information Systems (IS) Department, the Information Technology Department, and the Information Services Department. Regardless of the name, however, this functional area deals with the planning for—and the development,