COMPLETE

FIFTH EDITION

WILLIAMS | SAWYER

A PRACTICAL INTRODUCTION TO COMPUTERS & COMMUNICATIONS

USING

Information Technology

Using Information Technology

A Practical Introduction to Computers & Communications

Complete Version

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About the Authors

Who are **Brian Williams and Stacey Sawyer?** We are a married couple living near Lake Tahoe, Nevada, with an avid interest in seeing students become well educated—especially in information technology.

What best describes what we do? We consider ourselves **watchers and listeners.** We spend our time watching what's happening in business and society and on college campuses and listening to the views expressed by instructors, students, and other participants in the computer revolution. We then try to translate those observations into meaningful language that can be best understood by students.

Over the past two decades, we have individually or together **authored more than 20 books** (and over 30 revisions), most of them on computers and information technology. Both of us have **a commitment to helping students succeed in college.** Brian, for instance, has co-authored five books in the college success field: Learning Success, The Commuter Student, The Urban Student, The Successful Distance Learning Student, and The Career Student Handbook. Stacey has an interest in language education and has worked on several college textbooks in English as a Second Language (ESL) and in Spanish, German, French, and Italian. We thus bring to our information-technology books an awareness of the needs of the increasingly diverse student bodies now in our colleges.

Brian has a B.A. and M.A. from Stanford University and has held managerial jobs in education, communications, and publishing. Stacey has a B.A. from Ohio Wesleyan and an M.A. from Middlebury College and the University of Mainz, Germany. She has taught at Ohio State University and managed and consulted for a number of for-profit and nonprofit health, educational, and publishing organizations.

In our spare time, we enjoy travel, music, cooking, and exploring the wilds of the American West.
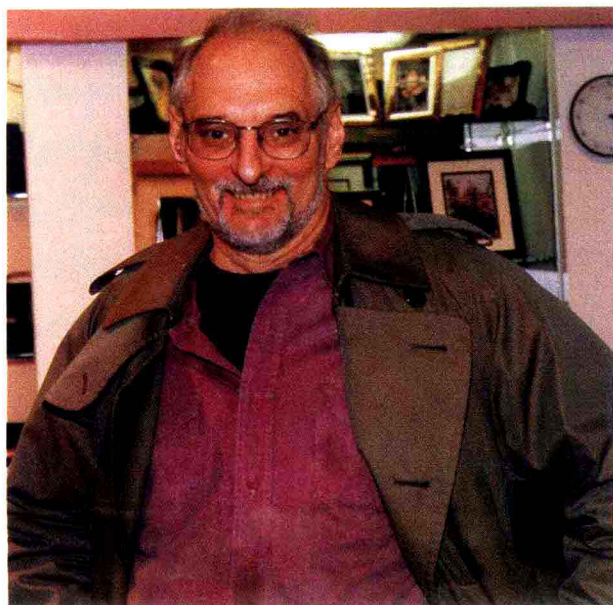
To the Instructor

Introduction

As authors, we are enormously gratified by the continued endorsement of *USING INFORMATION TECHNOLOGY* as a teaching tool for the introductory college course on computers. Over 500,000 students have been introduced to this dynamic and exciting subject through UIT's four earlier editions, and instructors in over 500 schools have selected it for use in their courses.

What are the reasons for this acceptance? One is that UIT was the first textbook to foresee and define the impact of digital convergence—the fusion of computers and communications—as the new and broader foundation for this course. And we have continued to try to pioneer in coverage of new developments. Thus, we are extremely pleased to hear reviewers label UIT as the most up-to-date text published for this course.

The UIT Difference: Motivating the Unmotivated

But there is another important reason, we think, for UIT's frequent adoption. We often ask instructors what their most significant challenge is in teaching this course. One professor at a state university seems to speak for most when she says: "Making the course interesting and challenging." Others echo her with remarks such as "Keeping students interested in the material enough to study" and "Many students take the course because they must, instead of because the material interests them." Another speaks about the need to address a "variety of skill/knowledge levels while keeping the course challenging and interesting."

Our experience with reviews, surveys, and focus groups, then, suggests that **the number one challenge to instructors is *motivating the unmotivated.*** As authors, we find information technology tremendously exciting, but we have long recognized that many students come to the subject with attitudes ranging from, on the one hand, complete apathy and even abject terror to, on the one hand, a high degree of experience and technical understanding (such as those taking the course for a certificate).

We address the problem of motivating the unmotivated by offering unequaled treatment of the following:

1. **Practicality**
2. **Readability**
3. **Currentness**

We explain these features below.

Feature #1: Emphasis on Practicality

This popular feature received overwhelming acceptance by both students and instructors in past editions. **Practical advice,** of the sort found in computer magazines, newspaper technology sections, and general-interest computer books, is expressed not only in the text but also in the following:

- **The Experience Box:** Appearing at the end of each chapter, the Experience Box is optional material that may be assigned at the instructor's discretion. However, students will find the subjects covered are of immediate value. *Examples:* "Web Research, Term Papers, & Plagiarism." "Career Strategies for the Digital Age." "How to Buy a Notebook." "Preventing Your Identity from Getting Stolen."

    New to this edition: "Should You Upgrade to Windows XP or Mac OS X?" ***Also,*** "Virtual Meetings: Linking Up Electronically."

- **Bookmark It! Practical Action Box:** This box consists of optional material on practical matters. *Examples:* "Tips for Managing Your E-Mail." "Choosing an Internet Service Provider." "Succeeding at Distance Learning." "When Software Causes Problems."

- ***New to this edition!* Survival Tips:** In the margins throughout we present utilitarian **Survival Tips** to aid students' explorations of the infotech world. *Examples:* "Broadband: Riskier for Security." "Accessing E-Mail While Traveling Abroad." "Handling the Annoyance of Spam." "Information on Web Radio." "When Your PC Freezes Up." "Don't Trash Those Icons." "XP Installation." "Ready for Linux?" "Need Info on RAM?" "What to Do When Your Floppy Jams." "Backing Up on Zip." "How Do I Use the Prnt Scrn Key?" "Setting Mouse Properties." "Digital Camera Resource." "Coping with Cookies." "Guard Your Social Security Number." "Some Records Have to Be Hardcopy." "Music File Sharing." "Some Websites about Privacy." "Keep Antivirus Software Updated." "Deal with Secure Websites." "Don't Let Your Domain Name Lapse." "Better Financial Information." "Online Government Help." "Oops! Cancel That E-Mail!"

- **Early discussion of Internet:** Many instructors have told us they like having **"e-concepts" treated earlier and more extensively** in this text compared with other books. Accordingly, the Internet and World Wide Web are discussed in Chapter 2 instead of in a later chapter, reflecting their importance in students' daily lives.

- **How to understand a computer ad:** In the hardware chapters (Chapters 5 and 6), we explain important concepts by showing students **how to understand the hardware components in a hypothetical PC ad.**
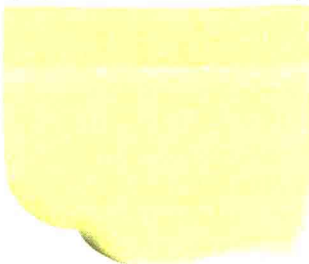
Feature #2: Emphasis on Readability & Reinforcement for Learning

We offer the following features for reinforcing student learning:

- **Interesting writing:** Studies have found that textbooks **written in an imaginative style** significantly improve students' ability to retain information. Both instructors and students have commented on the distinctiveness of the writing in this book. We employ a number of journalistic devices—colorful anecdotes, short biographical sketches, interesting observations in direct quotes—to make the material as interesting as possible. We also use real anecdotes and examples rather than fictionalized ones.

- ***New to this edition!* "Click-along" web connection for student "multitasking" for learning reinforcement:** Today's students often do "multitasking"—many tasks at once, such as studying while talking on the phone, watching TV, or surfing the Web. Educators say because the brain has limits, the distraction in attention often means less learning takes place (although the trend among students may be irreversible). This book addresses this impulse by **harnessing**

multitasking in the service of student motivation and learning. Wherever the Click-along icon (shown at left) appears in the book, readers are invited to use their computers to go to our website *(www.mhhe.com/cit/uit5e/complete/clickalong)* and use their mouse to "click along" while reading the text. Principal uses of the Click-along website include updates, elaboration, examples, more practical advice, and access to the Student Online Learning Center.

Ethics

- **Emphasis throughout on ethics:** Many texts discuss ethics in isolation, usually in one of the final chapters. We believe this topic is too important to be treated last or lightly, and users have agreed. Thus, **we cover ethical matters throughout the book,** as indicated by the special logo shown here in the margin. *Example:* We discuss such all-important questions as copying of Internet files, online plagiarism, privacy, computer crime, and netiquette.

- **Key terms AND definitions emphasized:** To help readers avoid any confusion about which terms are important and what they actually mean, we print each key term in ***bold italic underscore*** and its definition in **boldface.** *Example* (from Chapter 1): "***Data*** **consists of raw facts and figures that are processed into information.**"

- **Material in bite-size portions:** Major ideas are presented in **bite-size form,** with generous use of advance organizers, bulleted lists, and new paragraphing when a new idea is introduced. Most **sentences have been kept short,** the majority not exceeding 22–25 words in length.

- **Key Questions—to help students read with purpose:** We have **crafted the learning objectives as Key Questions** to help readers focus on essentials. Each Key Question appears in two places: on the first page of the chapter and beneath the section head. Key Questions are also tied to the end-of-chapter summary, as we will explain.

- **Concept Checks:** Appearing periodically throughout the text, **Concept Checks** spur students to recall facts and concepts they have just read.

- **Summary:** Each chapter ends with a **Summary** of important terms, with an explanation of **what they are and why they are important.** The terms are accompanied, when appropriate, by a picture. Each concept or term is also given a cross-reference page number that refers the reader to the main discussion within the text. In addition, the term or concept is given a Key Question number corresponding to the appropriate Key Question (learning objective).

Feature #3: Currentness

Reviewers have applauded previous editions of UIT for being more up to date than other texts. For example, we have traditionally ended many chapters with a forward-looking section that offers a preview of technologies to come—some of which are realized even as students are using the book. Among the new topics and terms covered in this edition are: *backside bus, buffer, bursting, Cable Act, CDMA, Child Online Protection Act, Children's Online Privacy Protection Act, Computer Abuse Amendments Act, cordless mice, cyborgs, E-911, 4G wireless, frontside bus, GSM, HomeRF, iDEN, intelligent smart cards, Intel P4 chip, interleaving, Internet help sites, large-format printer, "lights-out factory," Mac OS X, memory bus, M-RAM, National Information Infrastructure Protection Act, No Electronic Theft Act, Office XP, packet loss, page printer, ping time, pipelining, point of presence, RDRAM, SAR, spooling, STS-connection, STS-48 connection, 2G wireless, 2.5G wireless, 3G wireless, TDMA, Telephone Consumer Protection Act, touch-screen voting, video/audio editing software, VRAM, WAP, webcams, WiFi, Windows XP.*

In addition, in this latest edition, **we have taken the feature of current-ness to another level through use of the Click-along feature to offer updates** to new material throughout the life of the book.

Feature #4: Three-Level System to Help Students Think Critically about Information Technology

This is a feature first created for the last edition that we have tried to make even more prominent and useful in this one. More and more instructors seem to have become familiar with Benjamin **Bloom's *Taxonomy of Educational Objectives**, describing a hierarchy of six critical-thinking skills: (a) two lower-order skills—*memorization* and *comprehension*; and (b) four higher-order skills—*application, analysis, synthesis,* and *evaluation.*

Drawing on our experience in writing books to guide students to college success, **we have implemented Bloom's ideas in a three-stage pedagogical approach,** using the following hierarchical approach in the Chapter Review at the end of every chapter:

- Stage 1 learning—memorization: **"I can recognize and recall information."** Using self-test questions, multiple-choice questions, and true/false questions, we enable students to test how well they recall basic terms and concepts.

- Stage 2 learning—comprehension: **"I can recall information in my own terms and explain them to a friend."** Using open-ended short-answer questions, we enable students to re-express terms and concepts in their own words.

- Stage 3 learning—applying, analyzing, synthesizing, evaluating: **"I can apply what I've learned, relate these ideas to other concepts, build on other knowledge, and use all these thinking skills to form a judgment."** In this part of the Chapter Review, we ask students to put the ideas into effect using the activities described. The purpose is to help students take possession of the ideas, make them their own, and apply them realistically to their own ideas.

  New to this edition! **Many new and different Internet activities have been created as Stage 3 learning activities** for this edition of the book.

Resources for Instructors

The instructor supplements for this edition HAVE UNDERGONE A MAJOR REVISION, with a focus on enhancing instructors' ability to understand and utilize all the resources provided for the text.

- Instructor's Manual: The Instructor's Manual now **incorporates all of the resources available to the instructor for each chapter.** With a lecture outline on the left-hand page and available resources pertaining to the topics in the outline on the right-hand page, instructors now have the ability to harness these assets to create effective lectures. It works like a Web page that is easy to navigate and simple to understand because it provides links to appropriate assets elsewhere on the Web or CD-ROM. Each chapter contains an overview of the changes to this edition, a chapter overview, teaching tips, PowerPoint slides with speaker's notes, group projects, Click-alongs, outside projects, Web exercises, text figures, and links to appropriate information and games on the book's website.

- Testbank: The Testbank now has **a new format that allows instructors to effectively pinpoint areas of content within each chapter on**

which to test students. Each chapter starts off with a "Test Table" that provides a convenient guide for finding questions that pertain to chapter objectives and difficulty level. The Test Table also indicates the type of question so that instructors can create exams using the question types of their choice. The test questions are first organized by chapter objectives and then learning level; they include answers, Key Question numbers, learning levels, page references from the text, and rationales. Following each chapter's test bank questions is a Quick Quiz, designed for use when instructors don't have time to tailor an exam.

Diploma by Brownstone: Diploma is the most flexible, powerful, and easy-to-use computer-based testing system available for higher education. The Diploma system allows instructors to create an exam as a printed version, as a LAN-based online version, or as an Internet version. Diploma also includes grade book features, which automate the entire testing process.

- **PowerPoint presentation:** The PowerPoint presentation **includes additional material** that expands upon important topics from the text, allowing instructors to create interesting and engaging classroom presentations. Each chapter of the presentation includes important illustrations, and animations to enable instructors to emphasize important concepts in memorable ways. **Each slide of the presentation is integrated into the Instructor's Manual** so that instructors can quickly and effectively determine which slides they would like to use in their presentations.

- **Figures from the book:** All of the photos, illustrations, screenshots, and tables are available electronically for use in presentations, transparencies, or handouts.

- **Online Learning Center:** *(www.mhhe.com/cit/uit5e)* Designed to provide a wide variety of learning opportunities for students, the website for the fifth edition now includes a Web Summary for each chapter, with all of the key terms linked to relevant exercises, games, web links, and self-quizzes. Additional end-of-chapter exercises, web exercises, group projects, outside projects, Instructor's Manual, and PowerPoint presentations are also available online for instructors to download.

- **Interactive companion CD-ROM:** This free CD-ROM includes a collection of 20 interactive tutorial labs on some of the most popular topics. This CD expands the reach and scope of the text by combining video, interactive exercises, animation, additional content, and actual "lab" tutorials. The CD can be used in class, in the lab, or at home by students and instructors. The labs include the following topics:

Using Information Technology Interactive Companion Labs

Lab	Function	Chapter
Binary Numbers	Explore binary numbers including such topics as binary numbers as switches, how to make a binary number, binary addition, and binary logic.	5
Basic Programming	Learn about the thought processes and tools used to instruct computers to perform our work. This lab includes topics on basic computer tasks (input, processing, and output), variables, constants, assignment, mathematical calculations, and reusing code.	App.
Computer Anatomy	Learn the parts that make up a personal computer, including Input, Output, Storage, and Processing devices.	5 & 6

Using Information Technology Interactive Companion Labs (continued)

Lab	Function	Chapter
Disk Fragmentation	Understand how data and programs are stored and accessed. Includes concepts such as disk storage, blocks, fragmentation, defragmentation, media types, and data storage.	5
E-mail Essentials	Learn the tools, techniques, and etiquette needed to communicate by e-mail.	2 & 7
Multimedia Tools	Learn the basics of creating a simple multimedia presentation by understanding the types of media, virtual reality, interactivity, multimedia applications, and the uses of multimedia.	2 & 3
Workplace Issues	Learn how Ethics, Privacy, Security, and Time Wasters affect you, either as an employer or as an employee.	All
Introduction to Databases	This lab will introduce you to the many concepts involved in making, maintaining, and using a database to store large amounts of related data. You will have the opportunity to design a database, create the database, and use the information you entered to generate useful reports.	8
Programming II	Learn some of the essentials of visual programming, then implement them to build a working program.	N/A
Network Communications	Explore the many types of computer-based communications; how they work and how to use them effectively.	2 & 7
User Interfaces	Learn the basics of user interface elements, key Windows interface features, customizing the Windows interface, key Macintosh interface features, customizing the Macintosh interface, and key Unix (Linux) interface features.	3 & 4
Purchasing Decisions	Explore the factors you should consider when deciding what computer to buy, including software, the differences between PCs and Macs, the myths about CPU power, internal upgrades, and external upgrades.	5
File Organization	Learn about the way files are stored on your hard drive and how you can configure this storage to help you work more efficiently.	8
Word Processing and Spreadsheets	Learn the common features of word processing and spreadsheet programs, the basic features of word processing programs, and the basic features of spreadsheet programs.	3
Internet Overview	Explore features of the Internet including communication, browsing, sharing, and how to get connected.	2
Computer Troubleshooting	Learn how to avoid, repair, and troubleshoot computer problems.	All
Presentation Techniques	Learn the tricks for making effective presentations such as focusing your presentation to reach your audience, creating effective graphics, using sound and video in your presentation, and creating auxiliary materials to help augment your presentation or generate discussions.	3
Photo Editing	Learn how to edit digital photos including such topics as capturing digital images, storing devices, resizing and enhancement, and other manipulation techniques.	3
Programming Overview	Learn how code is written and changed into machine language by compilers or interpreters. Learn the different types of languages including object-oriented, procedural, and declarative.	N/A
SQL Queries	Learn what a relational database is (RDBMS), what a structured language is (SQL), how to use SQL to build a database, and how to use SQL to retrieve data from a database.	8

Digital Solutions to Help You Manage Your Course

PageOut: PageOut is our Course Web Site Development Center and offers a syllabus page, URL, McGraw-Hill Online Learning Center content, online exercises and quizzes, gradebook, discussion board, and an area for student Web pages.

Available free with any McGraw-Hill/Irwin product, PageOut requires no prior knowledge of HTML, no long hours of coding, and a way for course coordinators and professors to provide a full-course website. PageOut offers a series of templates—simply fill them with your course information and click on one of 16 designs. The process takes under an hour and leaves you with a professionally designed website. We'll even get you started with sample websites, or enter your syllabus for you! PageOut is so straightforward and intuitive, it's little wonder why over 12,000 college professors are using it. For more information, visit the PageOut website at *www.pageout.net*

The Online Learning Center can be delivered through any of these platforms:

> **McGraw-Hill Learning Architecture (TopClass)**
> **Blackboard.com**
> **Ecollege.com (formerly Real Education)**
> **WebCT (a product of Universal Learning Technology)**

McGraw-Hill has partnerships with WebCT and Blackboard to make it even easier to take your course online. Now you can have McGraw-Hill content delivered through the leading Internet-based learning tool for higher education. At McGraw-Hill, we have the following service agreements with WebCT and Blackboard:

- **Instructor Advantage:** Instructor Advantage is a special level of service McGraw-Hill offers in conjunction with WebCT designed to help you get up and running with your new course. A team of specialists will be immediately available to ensure everything runs smoothly through the life of your adoption.

- **Instructor Advantage Plus:** Qualified McGraw-Hill adopters will be eligible for an even higher level of service. A certified WebCT or Blackboard specialist will provide a full day of on-site training for you and your staff. You will then have unlimited e-mail and phone support through the life of your adoption. Contact your local McGraw-Hill representative for more details.

SimNet XPert: This is the TOTAL solution for learning and assessment in introductory applications and computer courses. The next generation of computer-based training/learning, SimNet XPert offers several ways for students to learn the skills or concepts being covered. With over 900 Learning Tasks throughout, SimNet XPert covers the concepts you need in multiple ways: (1) reading and interacting (*Teach Me* mode), (2) hearing (*Show Me* mode), and (3) practicing (*Let Me Try* mode).

The Assessment Component, which now uses a significantly deeper simulated interface, has two different pools of questions: one for Pre-Tests or Practice Tests, and one for the actual Exams. And SimNet XPert will also include Live-In-The-Application exams! Experience the future of training and assessment: eXPerience SimNet XPert for yourself!

Powerweb: Powerweb for Information Technology is an exciting online product available for use with *Using Information Technology.* A nominally priced token grants students access through our website to a wealth of resources—all corresponding to the text. Features include an interactive glossary; current events with quizzing, assessment, and measurement options; Web survey; links to related text content; and WWW searching capability via Northern Lights, an academic search engine.

Microsoft Applications Manuals

The following list presents McGraw-Hill/Irwin's Microsoft Applications books that are available for use with *Using Information Technology.* For more information about these books, visit the McGraw-Hill/Irwin Computer and Information Technology Supersite at *www.mhhe.com/it* or call your McGraw-Hill campus representative.

Windows Applications

Advantage Series by Hutchinson/Coulthard	
Office XP	Microsoft Office XP Volume I[1]
	Microsoft Office XP Volume II[2]
	Microsoft Word 2002 (Brief, Intro, Complete)
	Microsoft Excel 2002 (Brief, Intro, Complete)
	Microsoft PowerPoint 2002 (Brief, Intro)
	Microsoft Access 2002 (Brief, Intro, Complete)
	Integrating and Extending Microsoft Office XP (Brief)
	Microsoft FrontPage 2002 (Brief, Intro)
Microsoft Office 2000	Microsoft Office 2000
	Microsoft Word 2000 (Brief, Intro, Complete)
	Microsoft Excel 2000 (Brief, Intro, Complete)
	Microsoft PowerPoint 2000 (Brief, Intro, Complete)
	Microsoft Access 2000 (Brief, Intro, Complete)
	Integrating and Extending Microsoft Office 2000 (Brief)
	Microsoft Outlook 2000 (Brief)
	Microsoft Internet Explorer 5.0 (Brief)
Microsoft Windows	Microsoft Windows XP (Brief, Intro)
	Microsoft Windows 2000 (Brief, Intro)
	Microsoft Windows 98 (Brief, Intro)

Interactive Computing Series by Laudon	
Microsoft Office XP	Microsoft Office XP Volume I[1]
	Microsoft Office XP Volume II[2]
	Microsoft Word 2002 (Brief, Intro)
	Microsoft Excel 2002 (Brief, Intro)
	Microsoft PowerPoint 2002 (Brief, Intro)
	Microsoft Access 2002 (Brief, Intro)
	Microsoft FrontPage 2002 (Brief, Intro)
	Microsoft Internet Explorer 6.0 (Brief)
Microsoft Office 2000	Microsoft Office 2000
	Microsoft Office 2000 Advanced
	Microsoft Word 2000 (Brief, Intro)
	Microsoft Excel 2000 (Brief, Intro)
	Microsoft PowerPoint 2000 (Brief, Intro)
	Microsoft Access 2000 (Brief, Intro)

[1]Volume I contains all the Brief-level books.
[2]Volume II contains all the Intro-level books.

To the Instructor

Interactive Computing Series by Laudon (continued)

	Integrating and Extending Microsoft Office 2000 (Brief)
	Microsoft Outlook 2000 (Brief)
	Microsoft Internet Explorer 5.0 (Brief)
	Netscape Communicator 6.0 (Brief)
Microsoft Windows	Microsoft Windows XP (Brief, Intro)
	Microsoft Windows 2000 (Brief, Intro)
	Microsoft Windows 98 (Brief, Intro)

Acknowledgments

To the Instructor

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Susan Sells, Wichita State University: For pointing out the need for more instructor's resources and for acknowledging the importance of our early coverage of the Internet.

James Sidbury, University of Scranton: For pointing out the need to decrease certain technical aspects and for pointing out the importance of social and ethical issues coverage.

Maureen Smith, Saddleback College: For acknowledging our attempts to reach students through readability and writing style.

Angela Tilaro, Butte College: For her many extremely detailed comments on the final draft of the manuscript, which helped us make quality improvements.

Student's Guide

A One-Minute Course on How to Succeed in This Class

Got one minute to read this section? It could mean the difference between getting an A instead of a B, or a B instead of a C. Or even passing instead of failing.

Here Are the Rules

There are only four rules, and they aren't difficult.

Rule 1. You have to attend every class. (But that alone won't get you an A, as some students think.)

Rule 2. You can't put off studying, then cram the night before a test. This may work in high school, but college isn't high school.

Rule 3. You have to read or repeat material more than once. The important thing isn't reading. It's *re*reading.

Rule 4. You have to learn the secrets to using your textbook. It would be nice if all textbooks were organized the same way, but they aren't. Different texts have different features.

Getting the Most Information in the Least Time from This Book

Let's consider how you can best read *Using Information Technology*.
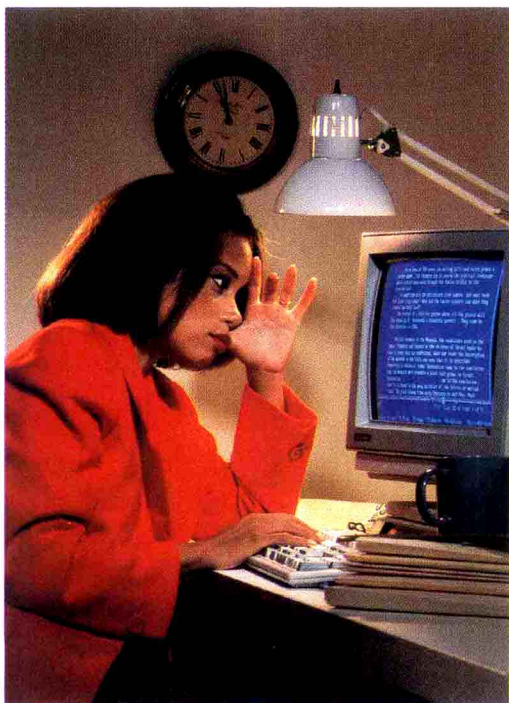

- Check the Key Questions in each section before you read it
- Read the section, trying to answer the Key Question(s)
- Do the Concept Checks
- Go the Extra Mile, if you have time
- Read the Summary at the end of the section
- Answer the questions in the Chapter Review

A look through the next seven pages will show you what the features we discussed look like.

Get an Overview of the Chapter First

Before you set out on a trip to a place you've never been to before, you would probably look at a map so you would get a "big picture" view of the route. Reading is the same way.

Scan the first page of the chapter and look at the **Chapter Outline** and the **Key Questions.**

Search
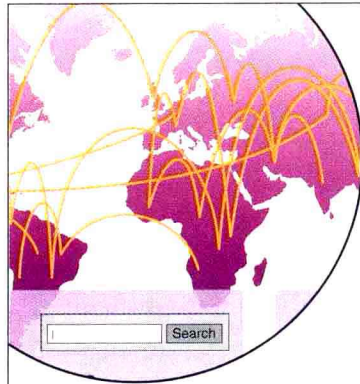
Chapter 2

The Internet & the World Wide Web

Exploring Cyberspace

Key Questions
You should be able to answer the following questions.

2.1 **Choosing Your Internet Access Device & Physical Connection: The Quest for Broadband** What are the means of connecting to the Internet, and how fast are they?

2.2 **Choosing Your Internet Service Provider (ISP)** What is an Internet service provider, and what kinds of services do ISPs provide?

2.3 **Sending & Receiving E-Mail** What are the options for obtaining e-mail software, what are the components of an e-mail address, and what are netiquette and spam?

2.4 **The World Wide Web** What are websites, web pages, browsers, URLs, and search engines?

2.5 **The Online Gold Mine: More Internet Resources, Your Personal Cyberspace, E-Commerce, & the E-conomy** What are FTP, Telnet, newsgroups, real-time chat, and e-commerce?

Chapter Outline

Each chapter begins with an outline of the section headings in the chapter.

Key Questions

Use these Key Questions to help you read with purpose. Key Questions are repeated throughout the text.

Check the Key Question in Each Section before You Read It. Then Read the Section, Trying to Answer the Key Question(s)

Look at the **Key Question** near the section heading. Read this aloud (or beneath your breath) or write it down. Next read the section, trying to answer the Key Question or Key Questions as you go. Make marks in the book if this helps you answer the question. In particular, look at the **key terms and definitions**, which appear in boldface. Look at the **graphics** (artwork and photos), which help to clarify the discussion.

Key Questions

Use these Key Questions presented at the start of each section to help you read with purpose.

Key Terms and Definitions

Throughout the text, key terms and definitions are easily identified by distinctive type.

Graphics

Many concepts and procedures are best explained through the use of artwork and photographs.

6.1 Input & Output

KEY QUESTION
How is input and output hardware used by a computer system?

Recall from Chapter 1 that *input* refers to data entered into a computer for processing—for example, from a keyboard or from a file stored on disk. Input includes program instructions that the CPU receives after commands are issued by the user. Commands can be issued by typing keywords, defined by the application program, or pressing certain keyboard keys. Commands can also be issued by choosing menu options or clicking on icons. Finally, input includes user responses—for example, when you reply to a question posed by the application or the operating system, such as *Are you sure you want to put this file in the Recycle Bin?* Output refers to the results of processing—that is, information sent to the screen or the printer or to be stored on disk, or sent to another computer in a network. Some devices combine both input and output functions, examples being not only ATMs but also combination scanner-printer devices.

In this chapter we focus on the common input and output devices used with a computer. (See ● *Panel 6.1.*) **Input hardware** **consists of devices that translate data into a form the computer can process.** The people-readable form of the data may be words like those on this page, but the computer-readable form consists of binary 0s and 1s, or off and on electrical signals. **Output hardware** **consists of devices that translate information processed by the computer into a form that humans can understand.** The computer-processed information consists of 0s and 1s, which need to be translated into words, numbers, sounds, and pictures.

● **PANEL 6.1**
Common input and output devices

INPUT — OUTPUT

Light pen
Video source
Video capture card
SYSTEM UNIT
Display adapter
Monitor
Sound card
Speakers
Scanner controller card
Scanner (+ bar codes, MICR, OMR, OCR)
Mouse (or trackball, joystick, touchpad)
Ports
Printers (and plotters)
Keyboard
Microphone
Digitizing tablet
Digital camera
(Video cards also output video)

Hardware: Input & Output

221