

USING INFORMATION TECHNOLOGY

*A Practical Introduction to
Computers & Communications*

11e

*Brian K. Williams
Stacey C. Sawyer*



USING INFORMATION Technology

Eleventh
Edition

*A Practical Introduction
to Computers & Communications*

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USING INFORMATION TECHNOLOGY, ELEVENTH EDITION

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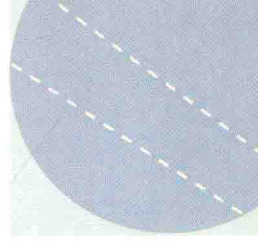
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To the Instructor



INTRODUCTION: Not Just a Revision, a Reimagining

The tumultuous changes in the landscape of information technology over the last two years have led us to make extensive modifications in this edition of *Using Information Technology*—to do **not just a revision but a remaking and reimagining** of this introductory computer concepts book.

In addition, because of the rise in distractions, stresses, and information overload on students, we have made every effort **to increase the readability, teachability, and memorability** of our material—using more storytelling, more headings, more mnemonic aids.

CONTENT CHANGES IN THIS EDITION: Addressing New Paradigms

Throughout its 18-year history, *Using Information Technology* has been written and substantially **revised around historic paradigm changes**—in the *First Edition* the impact of digital convergence, or the fusion of computers and communications; in the *Fourth Edition* the new priorities of cyberspace imposed by the Internet and World Wide Web; in the *Seventh Edition* the ascendancy of the “Always On” generation of students, who are at ease with but not always knowledgeable about digital technology.

In this *Eleventh Edition*, we address the following history-altering developments:

- **The explosion of mobile computing:** In the United States there are now more smartphones, tablets, laptops, and other such portable devices than there are people.
- **The rise of “the cloud”:** Moving data storage and processing from desktops and laptops to online servers is changing the economics and availability of computing power.
- **The boom in Big Data:** The growth in servers, software sophistication, and data collection methods results in 2.5 quintillion bytes of data being created every day.
- **The evolution of artificial intelligence:** Supercomputers, mammoth databases, and powerhouse software make AI a force that’s sure to alter nearly every field of human endeavor.
- **The acceleration in computer threats:** Every day the efforts of black-hat hackers, virus writers, and cyberwar makers threaten to sabotage our major institutions.
- **The shrinking of privacy:** Search companies, mobile carriers, and retailers track our Internet patterns, cellphone usage, and shopping habits to learn more and more about us.
- **The increase in government surveillance:** Cyberspying by U.S. agencies, as well as by foreign governments, challenges individual and institutional freedom and security.

The extensive content changes for this edition are described beginning on p. xx.

PRESENTATION CHANGES IN THIS EDITION: Making the Material Easier to Learn

To help students realize the valuable education they have paid for, we have done our best to make this text **practical, readable, and current** by presenting information in ways that *motivate, entertain, and get quickly to the point* by using **the following new features**:

- **We teach concepts by referring to what students already know:** Most students come to this book **already knowledgeable about mobile technology**. In this edition, then, we introduce new concepts by building on the student's existing knowledge.
- **We present compelling examples through storytelling:** Most people seem to learn more from stories than from having facts thrown at them. This edition offers a **new feature called TECH TALES**, which provide “*mini-cases*,” business related and otherwise, to illustrate concepts.
- **We expand the use of headings:** Our approach is to have frequent headings as organizers. In this edition, **each chapter is divided into two units, UNIT A and UNIT B, to help students get a better grasp of the material**. We've also added more subheadings throughout.
- **We open each chapter with an overview—a CHAPTER FORECAST:** Every chapter opens with a short summary, to give the student a clear vision of the road ahead.

MOTIVATING THE UNMOTIVATED & TEACHING TO A DISPARITY OF BACKGROUNDS

As authors, we find information technology tremendously exciting, but we recognize that many students take the course reluctantly. And we also recognize that many students come to the subject with attitudes ranging from complete apathy and unfamiliarity to a high degree of experience and technical understanding.

To address the problem of **motivating the unmotivated and teaching to a disparity of backgrounds**, *Using Information Technology* offers unequalled treatment of the following:

1. Practicality
2. Readability
3. Currentness
4. Three-level critical thinking system

We explain these features on the following pages.

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 features:

- Experience Box
- Practical Action Box
- Survival Tips

Experience Box

Appearing at the end of each chapter, the Experience Box has 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,” “Getting Help from Tech Support,” “How to Buy a Laptop,” and “How the Rise of the Robots Will Affect Future Employment.”

Practical Action Box

This box consists of optional material on practical matters.

Examples: “How to Be a Successful Online Student,” “Evaluating & Sourcing Information Found on the Web,” “Tips for Avoiding Spyware,” “Utility Programs: Specialized Programs to Make Computing Easier,” “Social Networking: The Downside,” “Help in Building Your Web Page,” “Storing Your Stuff: How Long Will Digitized Data Last?,” “Starting Over with Your Hard Drive: Erasing, Reformatting, & Reloading,” “Telecommuting & Telework: The Virtual Workplace,” “The Consequences of Choice Overload,” “Online Viewing & Sharing of Digital Photos,” and “Is the Boss Watching You? Trust in the Workplace.”



PRACTICAL ACTION

How to Be a Successful Online Student

- 1. Familiarize yourself with the computer and software.**
Be comfortable with the computer, Internet, email, web browser, and search engine software. Use tutorials to become familiar with the software used by your online school.
Take advantage of technology. Learn the various ways of communicating on the web. Blogging, podcasting, video conferencing, and chatting (discussed later

time. You may feel that taking an online course will free up your time for other tasks. If you are feeling overwhelmed by other responsibilities, such as work or family obligations, then perhaps you had better postpone your involvement. Online courses require as much and often more personal preparation time than on-campus courses. Remember everything that you would not

Survival Tips

In the margins throughout we present utilitarian **Survival Tips** to aid students' explorations of the infotech world.

Examples: “Broadband: Riskier for Security,” “Connection Speeds,” “Finding Things on a Web Page or in a Web Document,” “Urban Legends & Lies on the Internet,” “Social-Networking Privacy,” “Control Those Cookies!” “New Software & Compatibility,” “What RAM for Your PC?,” “ATMs & Fraud/Safety,” “Firewalls,” “E-Book Cautions,” “Alleviating Info-Mania,” “Fraud Baiters,” and “What Happens to Your Smartphone Data?”

Survival Tip

New Software & Compatibility

Pay attention to compatibility requirements when you obtain new software. The system requirements for running the software will be listed on the box or included with the downloaded information. When it is time to update the software, you can usually do that by paying a small upgrade fee to the software manufacturer and then downloading the new version and/or obtaining a new CD/DVD.

FEATURE 2: Emphasis on Readability & Reinforcement for Learning

We offer the following features for reinforcing student learning:

Interesting Writing—Based on Good Scholarship

Where is it written that textbooks have to be boring? Can't a text have personality?

Actually, 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. In this edition, we have added **Tech Tales, stories or mini-cases, to illustrate concepts**. We also employ a number of journalistic devices—colorful anecdotes, short biographical sketches, and interesting observations—to make the material as engaging as possible. In addition we use real anecdotes and examples rather than fictionalized ones.

Finally, **unlike most computer concepts books, we provide references for our sources—see the endnotes in the back of the book**. Many of these are from the year preceding publication. We see no reason why introductory computer books shouldn't practice good scholarship by revealing their information sources. And we see no reason why good scholarship can't go along with good writing—scholarship need not mean stuffiness.

Key Terms AND Definitions Emphasized

To help readers avoid confusion about important terms and what they actually mean, we print each key term in **red bold** and its definition in **black boldface**. *Example:* “**Data** consists of raw facts and figures that are processed into information.”

Material in Easily Manageable 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.

“Terms & Explanations” Displayed in Easily Reviewable Form

To help students review the technical terms and vocabulary used in computing, we have created at the end of every chapter a section titled “Terms & Explanations,” which not only gives the meaning of every key term introduced in the chapter but also explains why it is important. See, for example, pages 239, 296, and 359.

Emphasis throughout on Ethics

See Ethics examples on pages 38, 81, 96, 146, 236, 264, 344, and 353.

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 icon shown at left. *Example:* We discuss such all-important questions as online plagiarism, privacy, computer crime, and netiquette.

Emphasis throughout on Security

See Security icons on pages 38, 96, 120, 229, 230, 263, 271, 275, 315, 334, 343, 347, 353, and 357.

In the post 9-11 era, security concerns are of gravest importance. Although we devote several pages (in Chapters 2, 6, and 9) to security matters, we also reinforce student awareness by **highlighting with page-margin Security icons instances of security-related material throughout the book**. *Example:* In one case, we use the special icon shown at left to highlight the advice that one should pretend that every email message one sends “is a postcard that can be read by anyone.”

“More Info!” Icons Help Students Find Their Own Answers to Questions

In addition, our “More Info!” feature encourages students to get actively involved in the material.

Examples: “Finding Wi-Fi Hot Spots,” “Do You Need to Know HTML to Build a Web-site?,” “Blog Search Engines,” “Some Online Communities,” “Links to Security Software,” and “Where to Learn More about Freeware & Shareware.”

Eight Timelines to Provide Historical Perspective

See timelines beginning on pages 16, 50, 164, 194, 254, 304, 416, and 532.

Some instructors like to see coverage of the history of computing. Not wishing to add greatly to the length of the book, we decided on a **student-friendly approach: the presentation of eight pictorial timelines showing the most significant historical IT events**. These timelines, which occur in most chapters, appear along the bottom page area. (See the example at the bottom of this page.) Each timeline repeats certain “benchmark”

ethics

SECURITY

more info!

GPS & Cellphone Tracking

Cellphone companies may be tracking your every move and compiling information about you . . .

www.bloomberg.com/news/2013-06-06/carriers-sell-users-tracking-data-in-5-5-billion-market.html

1984
Apple
Macintosh;
first
personal
laser
printer

1990
Laptops
become
very
popular

1994
Apple and IBM
introduce PCs
with full-motion
video built
in; wireless data
transmission for
small portable
computers; first
web browser
invented

1998
PayPal is
founded

2000
The “Y2K”
nonproblem;
the first U.S.
presidential
webcast

2001
Dell computers
becomes the
largest PC maker

2002
Friendster

2003
Facebook;
MySpace



events to keep students oriented, but **each one is modified to feature the landmark discoveries and inventions appropriate to the different chapter material.** *Examples:* In Chapter 3 on software, the timeline features innovations in operating systems. In Chapter 6 on communications, the timeline highlights innovations in data transmission.

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: *Accelerated Graphics Port (ACP) bus, air mouse, AMOS, Apple iCloud, apps, Big Data, Bootcamp, booting from the cloud, Bring Your Own Device (BYOD) policy, bug bounty, business-to-consumer (B2C) commerce, Chrome, Chrome OS, Chromebook, cloud-based apps, computational AI, condensed keyboards, consumer-to-consumer (C2C) commerce, conventional AI, convertible tablets, cyberattacks, Dashboard, data centers, Detrx keyboard, distributed denial of service, drones, email bombs, embedded Linux OS, EMV cards, eSATA ports, ethical hackers, ExpressCards, FireWire bus, FISA court, Google Apps, Google Glass, heuristics, hybrid tablets/PCs, Instagram, iPhone 5, iPhone iOS, KALC keyboard, Kinect, Leap Motion, LTE telecommunication standards, machine learning, massive open online courses (MOOCs), mesh networks, metadata, Microsoft Xbox One, Mountain Lion, Mozilla Firefox OS, multi-touch screens, National Security Agency (NSA), Nintendo Wii U, octa-core processors, online dating, passphrases, personal browser, Pinterest, Pokki, power-line network, predictive search apps, robots grouped by application, robots grouped by locomotion, Privacy and Civil Liberties Oversight Board, self-driving cars, selfies, semantic markup, showrooming, slate tablets, Snapkeys Si, Sony PlayStation 4, Spotlight, Surface tablet, T3 lines, T4 lines, T5 lines, texting, threaded discussion, tree networks, trolls, wearable technology, Web 1.0, Web 3.0, Web app, WiMax, Windows 7, Windows 8, Windows Phone 8, Windows RT, Windows Server 2012, and wireless Internet service provider (WISP).*

Material has also been updated on the following: *Android, artificial intelligence (AI), cellphone malware, cloud computing, cyberwarfare, data collection on consumers by business, e-readers, gesture interface, government spying, image-capture devices, image-compression technology, improved digital cameras, Internet usage, Mac OS X, malware, metadata mining, mobile-payment services, nanotechnology, online (distance) learning, passwords, privacy, 3-D printers, and tablets.*

A complete update of the chapter-by-chapter changes from the previous edition begins on p. xx.

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

This feature has been well received. More instructors are 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 system, 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 It 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. **Our web exercises are also intended to spur discussion in classroom and other contexts.**

Examples: “Using Text Messaging in Emergencies,” “What’s Wrong with Using Supermarket Loyalty Cards?,” and “Are You in the Homeland Security Database?”

RESOURCES FOR INSTRUCTORS

Online Learning Center

The **Online Learning Center** (www.mhhe.com/uit11e) is designed to provide students with additional learning opportunities and instructors with additional teaching tools. For instructors, the website includes PowerPoint presentations for each chapter. For the convenience of instructors, all the following resources are available for download.

To help maintain high quality in the supplements, the textbook authors have personally updated the Instructor’s Manual, Testbank, and PowerPoint presentation.

Instructor’s Manual

The electronic Instructor’s Manual, which is available as part of the Instructor’s Resource Kit, helps instructors create effective lectures. The Instructor’s Manual is easy to navigate and simple to understand. Each chapter contains a chapter overview, lecture outline, teaching tips, additional information, and answers to end-of-chapter questions and exercises.

Testbank

The format of the Testbank allows instructors to effectively pinpoint areas of content within each chapter on which to test students. The test questions include learning difficulty level, answers, and text page numbers, as well as the learning objective head under which the question content falls and the level of Bloom’s Taxonomy that applies to the question.

EZ Test

McGraw-Hill’s EZ Test is a flexible and easy-to-use electronic testing program. The program allows instructors to create tests from book-specific items. It accommodates a wide range of question types, and instructors may add their own questions. Multiple versions of the test can be created and any test can be exported for use with course management systems such as WebCT, BlackBoard, or PageOut. EZ Test Online is a new service and gives you a place to easily administer your EZ Test–created exams and quizzes online. The program is available for Windows and Macintosh environments.

PowerPoint Presentation

The PowerPoint presentation includes material that expands on main topics from the text, allowing instructors to create engaging classroom sessions. Each chapter’s presentation includes helpful illustrations that emphasize important concepts.

CHAPTER-BY-CHAPTER CHANGES FROM THE PREVIOUS EDITION

1. Introduction to Information Technology: The Future Now

UNIT 1A: THE MOBILE WORLD, INFORMATION TECHNOLOGY, & YOUR LIFE.
Chapter introduction and Section 1.1 repurposed to stress importance of mobile computing. Smartphones, tablet computers, and social networks introduced. Concept of database introduced. Material updated on high-paying salaries and attractiveness of IT

careers. **New material added:** “Starting Up Your Own Venture,” social media in job hunting, and technology in your personal life, including online dating sites. Obsolete chart deleted on technology areas that people devote their time to. Subsections deleted on leisure and on college students and the e-world.

UNIT 1B: THE BASICS OF INFORMATION TECHNOLOGY. Former Section 1.1, “The Practical User,” now Section 1.3. Material updated on fastest supercomputers. **New material added on mobile devices, Big Data, machine learning, algorithms, and over-view of artificial intelligence.**

Tech Tales added: “The Rise of Mobile Computing: The Getting-Smarter Smartphone,” “Technology in Education: Adjusting Instructor Presentations to the Students,” “New Telemedicine: The Doctor Will See You Now—Right Now,” “What Apps Do You Really Need?,” and “Artificial Intelligence: The Use of Algorithms to Create a Hit Song.”

2. The Internet & the World Wide Web: Exploring Cyberspace

UNIT 2A: THE INTERNET & THE WEB. **New material on T4, T5 lines, username and password, desktop browsers.** Chrome added to bookmarks discussion. **New material on wikis and Wikipedia added under smart web searching.** Obsolete material deleted about desktop search engines.

UNIT 2B: THE RICHES & RISKS OF INTERNET USE. Reorganization of material and **new material added** on email, instant messaging, and other ways of communicating over the Internet and on discussion groups and FTP. Obsolete material deleted on listservs. **New material added to e-commerce discussion, B2C, C2C, showroooming.** Under Web 2.0, **new material on Web 1.0 and other data.** Practical Action box, “Social Networking: The Downside,” repurposed and **new material added.** **New section added: “Malware: The Viciousness of Viruses,” with introduction of antivirus software.** **New section added, “Passwords,” with practical suggestions.**

Tech Tales added: “How a World-Shaking Technology Came About: Tim Berners-Lee Invents the World Wide Web,” “The Continuing Development of Browsers: The War for Smartphones & Tablets,” “Web Imaging & Aerial Mapping: Google Earth,” “Animation: Making of ‘Fetch,’ a Mobile Game,” “The Rise of the Blogosphere: ‘Writing Out Loud,’” “Changing Retail Practices: The Fight against ‘Showrooming,’” and “How Difficult It Is to Keep Your Emails & Texts Private.”

3. Software: Tools for Productivity & Creativity

UNIT 3A: SYSTEM SOFTWARE: THE POWER BEHIND THE POWER. Obsolete introductory material replaced with discussion of cloud computing and Google Apps. Immediate distinction made between application and system software. **Subsection added, “Bootng from the Cloud.”** Under Mac OS, **material added about OS X Lion.** Under Microsoft Windows, **material added on different types of Windows 8, as well as 8.1.** Excess material on Linux deleted. **Embedded operating systems discussion expanded on smartphone OSs.** Panel 3.19 added on market share of top smartphone OSs.

UNIT 3B: APPLICATION SOFTWARE: GETTING STARTED. Discussion of sources of software reorganized for clarity. **New material and subhead added, “Web Application” software.** Discussion of types of files moved from end of chapter to here under “3.6 Data Files & Program Files.” Section on importing and exporting moved to later in this section. Section on compression moved here from end of chapter. New Section 3.10, “Software Suites & Integrated Packages,” with material moved from later in chapter on software suites and integrated suites and **new material added on productivity suites.**

Tech Tales added: “The War for Dominance in Mobile Operating Systems,” “New Technology to Replace the Mouse: The Gesture Interface,” “China Adopts Linux as Its National Standard,” “Software Evolution: 40 Years of Blasting Space Aliens—The Incredible Growth in Videogames,” and “Free Software for Cash-Strapped Students.”

4. Hardware: The CPU & Storage—The Source of Computing Power

UNIT 4A: PROCESSING: THE SYSTEM UNIT, MICROPROCESSORS, & MAIN MEMORY. Obsolete introduction replaced with material about sales plummeting on PCs

compared to mobile devices. Obsolete illustration material deleted on making of a chip. Material reorganized under “Miniaturization Leads to Mobility.” **New section “The System Unit,” with new material about desktop PC, laptop, notebook, tablet, and handheld system units.** Obsolete material on advertisement for a PC deleted. Material reorganized for better comprehension under heading, “4.3 Inside the System Unit: Power Supply, Motherboard, & Microprocessors.” Under multicore processors, **material added on octa-core processors. Material added on processors for data centers.** Recast material on processing speed into section, “The System Clock & Processing Speeds.” Old material on MIPS, flops, and milliseconds deleted. Old head about more on the system unit retitled “The Central Processing Unit & the Machine Cycle,” and material resequenced so word size discussed later. New section created, “4.5 Memory,” and material reorganized and added to. **Material added on MRAM;** material deleted on SDRAM and DDR-SDRAM. Material deleted on interleaving, bursting, pipelining, superscalar architecture, and hyperthreading. Old head about ports and cables retitled “4.6 Expansion Cards, Bus Lines, & Ports,” with **new material added.**

UNIT 4B: SECONDARY STORAGE. Obsolete coverage of magnetic tape deleted. **New material added on perpendicular recording technology.** Material on flash memory and solid-state memory moved ahead of smart cards, and term flash memory drive replaced by USB flash drive. **LaserCard added** under discussion of smartcards. Obsolete material on optical memory cards deleted. Section on online secondary storage recast as “**Cloud Storage**” and **new material added.** Under “4.8 Future Developments in Processing & Storage,” obsolete introductory material deleted, and **new material added** throughout. Obsolete material deleted on higher-density disks, and **new material added on image-compression technology.**

Tech Tales added: “Vacuum Tubes Still Beat People Power,” “The Fabulous Fab—What Does It Take to Support a Chip Manufacturing Plant?,” “Where Are Data Centers Located?,” “The World’s DVD Zones,” and “Nanotechnology, the Movie.”

5. Hardware: Input & Output—Taking Charge of Computing & Communications

UNIT 5A: INPUT HARDWARE. Obsolete material on ATMs and kiosks deleted. **New material added on wearable technology,** including Google’s Glass. Under “5.1 Keyboards,” **new terms introduced—enhanced keyboards, Ketrix, Snapkey Si, CALC. Tactile keyboards distinguished from touch screen, wired from wireless** (infrared, radio frequency). In discussion of terminals, Internet terminals deleted and ATMs, POS terminals, and **mobile data terminals added.** Under “5.2 Pointing Devices,” **wireless mouse and air mouse added.** Under variations of the mouse, touch screen deleted and pointing stick added; touch screen made a separate category. New heading created, “5.3 Source Data-Entry Devices,” including scanners, bar-code readers, RFID tags, mark recognition and character recognition devices, audio-input devices, speech-recognition systems, webcams and video-input cards, digital cameras, sensors, and biometric input devices. Discussion of RFID moved to follow bar-code discussion. Obsolete material on fax machines deleted. **New section added, “Image-Capture Devices,”** with discussion of digital cameras and webcams. Audio-input devices now follows image-capture discussion. Heading on human-biology input devices now reads “Biometric-Input Devices.” Futuristic material moved from end of chapter to new section, “5.4 The Future of Input,” and **new material added under input from remote locations, on source data automation, speech recognition, touch and gesture recognition, pattern-recognition and biometric devices, and brain-wave devices; material added on designs that imitate the physical world.**

UNIT 5B: OUTPUT HARDWARE. Obsolete introductory material deleted. Under “5.5 Softcopy Output: Display Screens,” features of screens are described first, including size and aspect ratio, screen clarity with refresh rate, then types of screens, including flat-panel displays (both passive and active matrix), **new material on plasma display, and CRT; new material on multiple screens.** New section heading, “5.6 Hardcopy Output: Printers.” New section heading, “5.8 The Future of Output,” which includes the principal heads “More Unusual Forms of Output,” **with added material;** “More Data Used in Output,” including **coverage of Big Data;** and “More Realistic Output,” **with new coverage on microreplication, printers using reduced ink, more realistic animation, and latest on**

three-dimensional printing. New material added on health and ergonomics. Some obsolete material deleted and **new material added to Experience Box**, “Good Habits: Protecting Your Computer System, Your Data, & Your Health.”

Tech Tales added: “Loren Brichter, Popularizer of ‘Pull to Refresh’ & the ‘Cell Swipe,’” “RFID Tags for Security,” “‘Know What I’m Sayin’?’, The Uses of Speech-Recognition Systems,” “Sensors Get Data We Never Had Before,” “Input & Output Together: Paving the Way for the Self-Driving Car,” “Dreams of 3-D Printing,” “Painful Technology for College Students,” and “Can Cellphones Cause Cancer?”

6. Communications, Networks, & Cyberthreats: The Wired & Wireless World

UNIT 6A: NETWORKS & WIRED & WIRELESS MEDIA. Obsolete introductory material deleted. Four ways of accessing the Internet identified: telephone modem, high-speed phone lines, cable modem, and wireless modem. Disadvantages of networks deleted for space reasons. Under LANS, **wireless LAN (WLAN) added as one type of LAN.** Discussion reduced of home area network, home automation network, garden area network, and personal area networks, now made examples of LANs. Material reorganized to contrast client-server and peer to peer. Material reorganized as “Intranets, Extranets, VPNs, & Firewalls”; material on firewalls moved here from late in chapter. Under “Switches,” definition modified and material reduced. Under “Network Topologies,” material on **tree network and mesh network topologies added.** Ethernet redefined and description edited for clarity. Under “6.3 Wired Communications Media,” subheads added on “Phone Line Network” (instead of HomePNA) and “Power Line Network” (instead of HomePlug). Under discussion of 4G, **material added on LTE.** Technical discussion of Wi-Fi reduced for readability and Wi-Fi standards summarized in a table (Panel 6.16); **WiMax added.** Practical Action box moved from end of section, “Virtual Meetings: Linking Up Electronically.”

UNIT 6B: CYBERTHREATS, SECURITY, & PRIVACY ISSUES. Unit considerably **expanded to cover new issues.** Material added on BYOD (bring your own device) policy. Practical Action box deleted, “WikiLeaks & DDoS.” Section 6.5 retitled and **new material added, “6.5 Cyberintruders: Trolls, Spies, Hackers, & Thieves.” Cyberattacks introduced and defined.** Discussion of hackers moved here from later in the chapter, with new subheads, “Malicious Hackers,” “Benign Hackers,” and “Benevolent Hackers.” Material on “Thieves” moved here from Chapter 9. Section formerly on cyberthreats reorganized and now titled “Section 6.6 Cyberattacks & Malware,” with subheads “Denial-of-Service Attacks,” “Viruses,” “Worms,” “Trojan Horses,” “Rootkits & Backdoors,” “Blended Threats,” “Zombies,” “Ransomware,” “Time, Logic, & Email Bombs,” and “Phone Malware.” Former section on how malware is spread and Practical Action box “Ways to Minimize Virus Attacks” material relocated to Chapter 2. Practical Action box “How to Deal with Passwords” deleted and material relocated to Chapter 2. New section created with material from Chapter 8, “6.7 Concerns about Theft,” with principal headings “The Threat to Privacy” and “Identity Theft.” **Definition of privacy added** and subheads “Name Migration,” “Résumé Rustling & Online Snooping,” “Government Prying & Spying.” Under identity theft appears material from Chapter 8. Experience Box added, “Guarding Your Privacy & Preventing Your Identity from Getting Stolen,” using old material from Chapter 8.

Tech Tales added: “Recording Music: From Analog Life to Digital Life,” “‘Gotcha, Thief!’ & Other Uses of GPS,” “Microsoft Pays ‘Bug Bounties’ to White-Hat Hackers,” “Too-Good-to-Be-True Deals Online,” “The Love Bug & Other Viruses,” “Famous Worms: Klez, Conficker, & Stuxnet,” and “The Weird Experience of Identity Theft.”

7. Personal Technology: The Future Is You

UNIT 7A: PERSONAL DEVICES FOR IMPROVING PRODUCTIVITY AT SCHOOL & WORK. Chapter sections resequenced: “7.1 Convergence, Portability, & Personalization,” “7.2 Smartphones,” “7.3 Tablets & E-Readers,” “7.4 Portable Media Players.” Obsolete introductory material deleted and replaced. In-text material converted to Practical Action box, “The Consequences of Choice Overload.” Material on multitasking moved to Section 7.3. Under “7.2 Smartphones: More Than Talk,” principal headings are “How Do

Cellphones & Smartphones Differ?” with **new material**; “How a Mobile Phone Works,” and “Using Mobile Phones in College.” **New material on mobile phone OSs, apps, display areas, keyboards and voice commands, output, and GPS technology.** Obsolete material deleted on email, Internet access, QR codes, radio, and music. **New material on benefits and drawbacks of mobile phones in college.** Under “7.3 Tablets & E-Readers,” two technologies discussed in one section, with **new material on tablet types and OSs.** Earlier material on multitasking from first section made into Practical Action box, “Multitasking—Good for Productivity?” **New material added** to discussion of how an e-reader works and drawbacks of e-readers. Under “7.4 Portable Media Players,” **new material distinguishing among uses of music players, media players, and smartphones.** Under portable media players, subheads reorganized: “Storage Methods” (flash memory drive and hard-disk drive), “Sampling Rate,” “Transferring Files,” “Battery Life,” “Display Screens,” “Other Features,” and “MP3 in Your Car.”

UNIT 7B: PERSONAL DEVICES FOR ENRICHING LEISURE & LIFE. Chapter sections resequenced: “7.5 Digital Cameras,” “7.6 High-Tech Radio,” “7.7 Digital Television,” “7.8 Videogame Systems.” Under digital cameras, discussion of storage expanded. **Material added** to Practical Action box, “Online Viewing & Sharing of Digital Photos.” Under societal effects of digital cameras, subheads and **new material added** about photos no longer just of special events and whether photo gazing gives skewed impressions of others. Under “7.8 Videogame Systems,” **new material added.** Some **new material added** to Experience Box, “The ‘Always On’ Generation.”

Tech Tales added: “The Ruggedized Tablet for Splashes & Spills,” “The Rise of the Selfie: What Does It Mean?,” “Pandora’s Music Genome Project,” and “Using Your Xbox to Order Pizza.”

8. The Era of Big Data: Databases, Information Systems, & Artificial Intelligence

UNIT 8A: FILES & DATABASES. Obsolete introductory material deleted. **New material added about Big Data.** Under discussion of data dictionary, **metadata added and defined.** Under discussion of data mining, some obsolete in-text examples deleted.

UNIT 8B: BIG DATA, INFORMATION SYSTEMS, & ARTIFICIAL INTELLIGENCE. Unit considerably expanded to cover new issues. **New introductory material to distinguish between data mining and Big Data.** Old section, “8.5 Databases & the Digital Economy,” repurposed as “8.5 The Evolving World of Big Data,” with **new material added.** Old material on e-commerce either moved to Chapter 2 or deleted. **New principal head added, “Three Implications of Big Data,” with new material.** **New principal head added, “The Uses of Big Data,” with new material** and subsection heads, “Big Data in Medicine: Using Varieties of Old & New Data,” “Smarter Junk Mail: Refining Measurement,” “Netflix’s Original TV Programming: Making Better Management Decisions.” **Artificial intelligence redefined and new material and principal head added, “Conventional AI versus Computational Intelligence,”** with subheads, “Conventional AI: Based on Machine Learning” and “Computational Intelligence: Based on Heuristics,” with **machine learning and heuristics defined and discussed.** Discussion of material from later in the chapter moved here under principal head “Weak AI versus Strong AI.” Main areas of AI reorganized and discussed in following order: expert systems, natural language processing, intelligent agents, pattern recognition, virtual reality and simulation devices, robotics, fuzzy logic, and neural networks, followed by discussion of artificial life. Under discussion of robotics, **new material and subheads added, “Robots Grouped by Locomotion System” and “Robots Grouped by Application.”** **New principal section added, “Neural Networks,”** using material formerly part of Panel 8.18, which now contains only genetic algorithms and cyborgs as examples of two other types of AI. Existing text material put beneath new section head, “8.8 Artificial Life, the Turing Test, & the Singularity.” Old section “8.8 Databases: Concerns about Privacy & Identity Theft” deleted, and its material redistributed to Chapters 6 and 9. Old Experience Box, “Preventing Your Identity from Getting Stolen,” deleted, and its contents moved to Chapter 6. **New Experience Box added, “How the Rise of Robotics Will Affect Future Employment,” with new material.**

Tech Tales added: “Databases Everywhere,” “How Amazon.com Used Databases to Become the World’s Largest Online Bookstore,” “The Uses of Data Mining,” “The Brute Force of Weak AI,” “Some Interestingly Named Expert Systems,” “Using Virtual Reality & Simulation for Training, Treatment, & Research,” “All Types of Robots,” “Applying Fuzzy Logic to Elevators,” and “A Scene from the Turing Test.”

9. The Challenges of the Digital Age: Society & Information Technology Today

UNIT 9A: SECURITY, PRIVACY, & SURVEILLANCE CONCERNS. Unit considerably expanded to cover new issues. Old section “9.1 Truth Issues” now section “9.4 Truth Issues” in Unit 9B. In new “9.1 Security Issues,” obsolete introductory material deleted; **new material added on predictive apps in relation to privacy issues**, and principal headings reorganized to combine two sections, on errors and accidents and on natural hazards, as “Errors, Accidents, & Natural Hazards.” Under discussion of theft of hardware, in-text bulleted list converted to Panel 9.2, “Keeping your mobile devices safe.” **New material added to discussion of theft of software.** Material on theft of online music and movies converted to a subsection, “Theft of Intellectual Property,” with **extra material added.** Material in old section on “Taking Over Your PC: Zombies, Botnets, & Blackmail” moved to Chapter 6. Under discussion of crimes of malice, **new material on attacks on infrastructure** added to attacks on power-control systems. Under discussion of attacks on the Internet, old material on border gateway protocol replaced with new material. Material in old section “Computer Criminals” deleted here and moved to Chapter 6. Old section “9.3 Security Safeguards” now Section 9.2. Under discussion of passwords, **new material added on saving passwords in software with encrypted file and in using fingerprint readers for master passwords.** Under discussion of physical traits, material on biometric devices moved here from Chapter 6. Under discussion of encryption, lots of text discussion moved to considerations of surveillance later in the chapter. **New section added, “9.3 Privacy & Surveillance: Data Collectors & Spies,”** beginning with discussion of federal privacy laws, moved here from Chapter 8. Main threats to privacy listed under principal heads “Business & Cyberspying,” “Government & Cyberspying,” and “Spying, Hacking, & Cyberwarfare by Foreign Governments & Groups.” Under “Business & Cyberspying,” **new material under new subheads, “How Businesses Obtain & Use Data about Us” and “Who Owns Your Data & What Are Your Rights?”** Under “Government & Cyberspying,” some old material from Chapter 8 and **new material appears under subheads “Local Police Data Collection,” “A National Identity Card?,” “The National Security Agency: The Rise of the Surveillance State?”** (covering NSA, FBI, FISA court, secret mining of metadata), and **“Drones: Snooping from the Skies.”** Under “Spying, Hacking, & Cyberwarfare by Foreign Governments & Groups,” **mostly new material under subheads “Cyberspying by Foreign—& the U.S.—Governments” and “Cyberattacks & Cyberwarfare.”**

UNIT 9B: OTHER SOCIAL, ECONOMIC, & POLITICAL ISSUES. **New introductory material on technology as disrupter of nearly everything.** New section “9.4 Truth Issues: Manipulating Digital Data” was formerly Section 9.1. New Section “9.5 Quality-of-Life Issues: The Environment, Mental Health, Child Protection, & the Workplace” was formerly Section 9.4. Under discussion of stress, **new material added about effect of mobile devices.** Discussion of online sexual predators reduced and replaced with **new material under new subhead, “Sexting.”**

Tech Tales added: “How Slow Perceptions Lead to Errors: Texting While Driving,” “Glitches in the System: How Electrical & Mechanical Problems Can Make Computers Fail,” “The Risks of Natural Hazards: How Bad Can It Get?,” “Stealing Music & Movies,” “The Nigerian Letter, a Classic Internet Scam,” “Police Use of License Plate Scanners,” “Cyberattacks That Challenge Governments & Corporations,” “Is It Fraudulent to Manipulate Sound?,” “Is It Fraudulent to Manipulate Photos?,” and “Gambling in the New IT World.”

10. Building Systems & Applications: Software Development, Programming, & Languages

UNIT 10A: SYSTEMS DEVELOPMENT & PROGRAMMING. Introductory material replaced by **new material on how learning systems development and programming can be a great career booster.** Under “10.1 Systems Development & the Life Cycle of a Software Project,” **introductory material added on creation of apps. New material:** Developing a businesswide plan to utilize mobile devices is applied to the six phases of systems development.

UNIT 10B: PROGRAMMING LANGUAGES. **New introductory material on software developers being in explosive demand.**

Tech Tales added: “‘Bring Your Own Device’ to Work: Applying Systems Analysis & Design to the BYOD Trend,” “Stumbles on the Road to Progress: When Big Systems Fail,” “Who Decides When Programs Are Okay to Go? The Release Engineer,” and “Student Entrepreneurs Create a New App in Five Days with ‘Premade Programming Lego Blocks.’”

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