

Sixth Edition

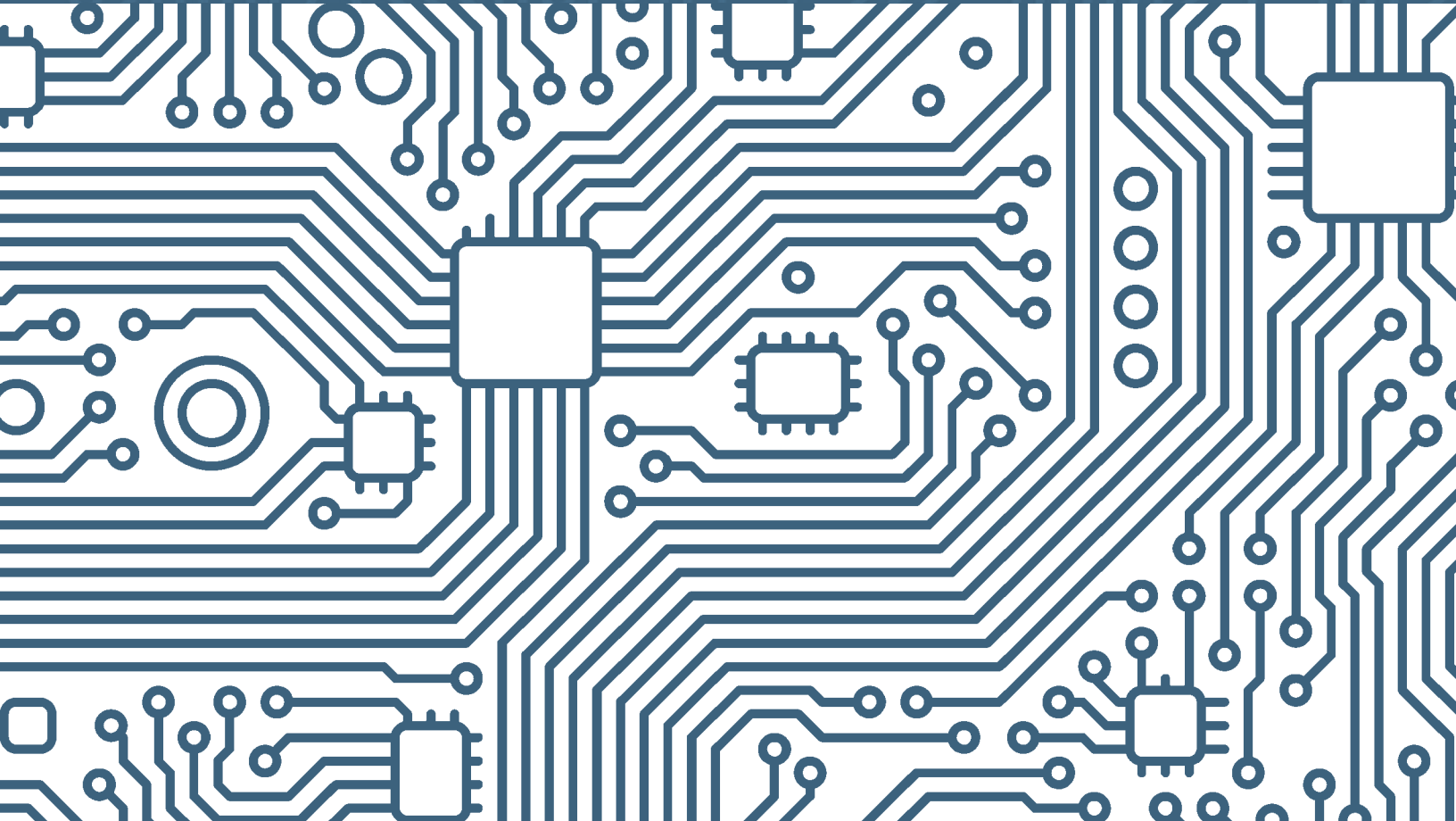
# Understanding Computers

in a Changing Society

Deborah Morley

6th Edition

# UNDERSTANDING COMPUTERS IN A CHANGING SOCIETY



**DEBORAH MORLEY**



Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

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**Understanding Computers in a Changing Society,  
6th Edition**  
Deborah Morley

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# PREFACE

**In today's technology-oriented society, computers and technology impact virtually everyone's life.** *Understanding Computers in a Changing Society, 6<sup>th</sup> Edition* is designed to ensure that students are current and informed in order to thrive in our technology-oriented, global society. With this new edition, students not only learn about relevant cutting-edge technology trends, but they also gain a better understanding of technology in general and the important issues surrounding technology today. This information gives students the knowledge they need to succeed in today's world.

This nontechnical, introductory text explains in straightforward terms the importance of learning about computers and other computing devices, the various types of devices and their components, the principles by which computers work, the practical applications of computers and related technologies, the ways in which the world is being changed by these technologies, and the associated risks and other potential implications of computers and related technologies. The goal of this text is to provide readers with a solid knowledge of computing fundamentals, an understanding of the impact of our technology-oriented society, and a framework for using this knowledge effectively in their lives.

## KEY FEATURES

Just like its previous editions, *Understanding Computers in a Changing Society, 6<sup>th</sup> Edition* provides current and comprehensive coverage of important topics. Flexible organization and an engaging presentation, combined with a variety of learning tools associated with each chapter, help students master the important computing concepts they will encounter in school, on the job, and in their personal lives.

### Currency and Accuracy

The state-of-the-art content of this book reflects the latest technologies, trends, and classroom needs. To reflect the importance of mobile computing today, the entire text has an increased emphasis on smartphones, media tablets, mobile apps, and the issues that surround them, such as mobile security. All topics and figures have been updated for currency and, to ensure the content is as accurate and up to date as possible, numerous **Industry Expert Reviewers** provided feedback and suggestions for improvements to the content in their areas of expertise. Throughout the writing and production stages, enhancements were continually made to ensure that the final product is as current and accurate as possible.

### Comprehensiveness and Depth

Accommodating a wide range of teaching styles, *Understanding Computers in a Changing Society, 6<sup>th</sup> Edition* provides comprehensive coverage of traditional topics while also covering relevant, up-to-the-minute new technologies and important societal issues. This edition has an increased emphasis on mobile computing, cloud applications, and social media and includes the following new topics:

- ▶ New hardware developments, including smartphones, media tablets, smart watches, Google Glass, hybrid notebook-tablet computers, tiny PCs like the

Raspberry Pi and Chromecast, GPUs, immersion cooling systems, tablet and smartphone docks, personal 3D printers, projector phones, self-driving cars, self-healing devices, perceptual computing, gesture input, touch mice, eye tracking tablets, tablet storage devices, DNA data storage, and 4K (Ultra HD) Blu-ray Discs.

- New software developments and issues, including Windows 8, the Google Play store, mobile app builders, and the impact of cloud computing.
- New mobile applications, including Bring Your Own Device (BYOD), mobile ticketing, mobile data caps, group messaging, geofencing, Google Now, and mobile ergonomics.
- New networking technologies, including new and emerging Wi-Fi standards, the Internet of Things (IoT), Bluetooth Smart, software defined networking (SDN), and new Wi-Fi-enabled products such as smart thermostats, scales, and Wi-Fi locks.
- New security risks, including BYOD security issues, social media hacks, and scareware, ransomware, and chageware.
- New security precautions, including digital tattoos and other emerging biometric systems, soft and hard tokens for OTPs/two-factor authentication, 3D Secure online purchase verification, wireless tethers for mobile devices, and proximity devices and apps to automatically lock and unlock a computer.
- New Web applications, including cloud printing, Internet monitors, virtual currency, social commerce, and social media integration.

## Readability

We remember more about a subject if it is made interesting and exciting, as well as presented in a straightforward manner. This book is written in a conversational, down-to-earth style—one designed to be accurate without being intimidating. Concepts are explained clearly and simply, without the use of overly technical terminology. More complex concepts are explained in an understandable manner and with realistic examples from everyday life.

## Chapter Learning Tools

1. **Outline, Learning Objectives, and Overview:** For each chapter, an **Outline** of the major topics covered, a list of student **Learning Objectives**, and a **Chapter Overview** help instructors put the subject matter of the chapter in perspective and let students know what they will be reading about.
2. **Boldfaced Key Terms and Running Glossary:** Important terms appear in boldface type as they are introduced in the chapter. These terms are defined at the bottom of the page on which they appear and in the end-of-text glossary.
3. **Chapter Boxes:** In each chapter, a **Trend** box provides students with a look at current and upcoming technology trends; an **Inside the Industry** box provides insight into some of the practices and issues related to the computer industry; a **How It Works** box explains in detail how a technology or product works; and a **Technology and You** box takes a look at how computers and technology are used in everyday life.
4. **Ask the Expert Boxes:** In each chapter, three **Ask the Expert** boxes feature a question about a computing concept, a trend, or how computers

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TREND

**Personal Computing**

In the 2002 *Electronic Arts* *Midnight Report*, Tom Clavin changed the images on his display by gesturing with his hands. While it was fun in the moment, it is not just about a novelty. One of the trends of personal computing when users control their devices with three-dimensional (3D) gestures, voice commands, and hand movement control is with traditional input devices like the keyboard and mouse.

Gesture input has not been used in various forms for several years with devices such as the Nintendo Wii, Xbox Kinect, and the Apple iPhone and it helps screen consumer gaming and advertising applications. It is also an important component of the Windows 8 operating system. But the gesture input systems of the future are expected to be much more sophisticated and combined with other types of input to allow users to more naturally control their computers and to allow devices to adapt to each individual's needs. For example, a computer or phone could offer to turn the page on a tablet displaying a recipe if the hands of the person cooking are covered with flour.

One recent step in this direction is the Leap 3D System shown in the accompanying photograph. It is an "off-the-shelf" box that connects to a computer via a USB port and controls



an eight-inch-tall 3D interactive space track which users can manage, pinch, stretch, open in the air, and move objects around as if they were using a touch screen, except that they are not actually touching the screen. And, unlike other 3D gesture-based input devices, such as the Leap 3D System, which has been added to public tablets and touch screen devices, the Leap 3D System, and enabling input to be performed from a single distance such as there is a steady chair or through a glass interface window.

The digital camera capabilities built into most smartphones today allow for several types of emerging input applications. For instance, they allow gesture input, as well as the use of conventional (1D) keyboard and mouse input applications to control and display useful information. **Free-dimensional (2D) handsets**—such as the QIP (Qualcomm) and the iPhone—can display data with a variety of small square-based information both horizontally and vertically and can build significantly more data than conventional two-dimensional handsets.

**2D UNDERSTANDING COMPUTERS IN A CHANGING SOCIETY**



Content from a website is displayed in the image space in real time.

Display a hand using a Leap 3D System.

**Free-dimensional (3D) handsets** are used to control and display information on top of a

**ASK THE EXPERT**

**Josh Tinker, Product Planning Manager, Samsung Technology**

**Should my next computer have a magnetic hard drive or an SSD?**

Your storage options for a new PC include traditional hard drive (HDD), solid-state drive (SSD), or a hybrid solid-state hybrid drive (SSHD). Selecting what is right for you is a trade-off between price, performance, and capacity.

SSDs have increased PC performance and very good shock resistance, but are low capacity and pricey.

HDDs have the lowest cost and high capacity but have average performance.

SSHDs have SSD-like performance and high capacity, but have a small price premium.

**Emerging Storage Devices**

Improvements in magnetic disk technology are continuing to increase the data that can be stored on hard drives. Additionally, the magnetic particles on a hard disk have been made increasingly smaller, and production of hard disks is trending to use an increasingly smaller diameter (referred to as increasing capacity and reliability) over time. Hard drives make use of perpendicular magnetic recording (PMR), in which the bits are placed upright in relation to the disk's surface, rather than parallel with a horizontal layer. For instance, PMR currently allows a recording density up to 1 terabyte per square inch (TB/in<sup>2</sup>), which results in increased hard drive work capacities up to about a TB of storage for a 3.5-inch



## NEW and Updated Expert Insight Features

In the exciting **Expert Insight** feature located at the end of the first seven chapters, industry experts provide students with personal insights on topics presented in the book, including their personal experiences with technology, key points to remember, and advice for students. The experts, professionals from these major companies—**D-Link, Logitech, Microsoft, McAfee, eBay, ACM/Google, and Dell**—provide a unique perspective on the book’s content and how the topics discussed in the text impact their lives and their industry, what it means for the future, and more!

## Student and Instructor Support Materials

*Understanding Computers in a Changing Society, 6th Edition* is available with a complete package of support materials

for instructors and students. Included in the package are **CourseMate**, the **Instructor Companion Site**, and, if access to SAM has been purchased, **SAM Computer Concepts** material is available.

## CourseMate

The *Understanding Computers in a Changing Society, 6th Edition* includes **CourseMate**, which helps you make the grade. CourseMate includes:

- **Key Term Matching and Flashcards**—allow students to test their knowledge of selected chapter key terms.
- **Interactive Quiz**—allows students to test their retention of chapter concepts.
- **Global Technology Watch**—provides additional reading on the latest technology topics.
- **Beat the Clock**—allows students to test how ready they are for upcoming exams.
- **Crossword Puzzles**—incorporate the key terms from each chapter into an online interactive crossword puzzle.
- **Online Videos**—include several videos per chapter related to the topics in that chapter, as well as practical “How To” information related to chapter topics.
- **Further Exploration**—includes links to additional information about content covered in each chapter.
- **Interactive eBook**—includes highlighting, note taking, and search capabilities.
- **Engagement Tracker**—monitors student engagement in the course.
- **Additional Resources**—include additional resources that can be viewed or printed, such as **Expert Insights**; an **Online Study Guide, Online Summary, and Online Glossary** for each chapter; a **Guide to Buying a PC** and a **Computer History Timeline**; and more information about **Numbering Systems** and **Coding Charts**.

(Go to [cengagebrain.com](http://cengagebrain.com) to access these resources.)

## Instructor Companion Site

Everything you need for your course in one place! This collection of book-specific lecture and class tools is available online via [www.cengage.com/login](http://www.cengage.com/login). Access and download PowerPoint presentations, images, Instructor’s Manual, videos, and more.



### Electronic Instructor’s Manual

The **Instructor’s Manual** is written to provide instructors with practical suggestions for enhancing classroom presentations. The Instructor’s Manual provides: **Lecture Notes**, **Teacher Tips**, **Quick Quizzes**, **Classroom Activities**, **Discussion Questions**, **Key Terms**, a **Chapter Quiz**, and more!

### Cengage Learning Testing Powered by Cognero

**Cengage Learning Testing Powered by Cognero** is a flexible, online system that allows you to:

- Author, edit, and manage test bank content from multiple Cengage Learning solutions
- Create multiple test versions in an instant
- Deliver tests from your LMS, your classroom, or wherever you want

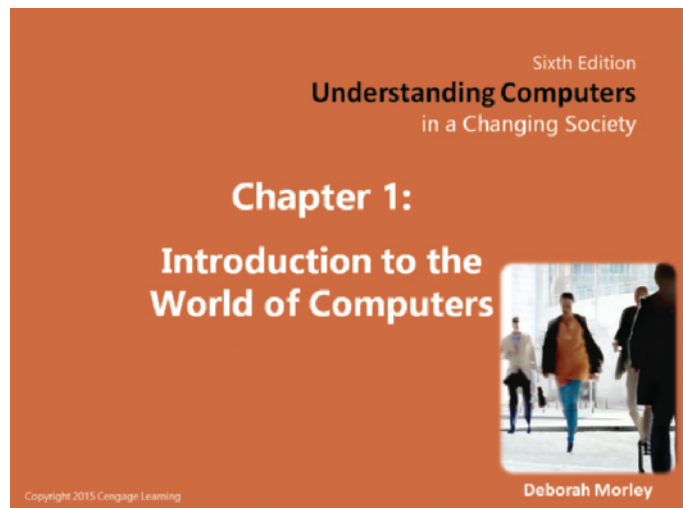
### PowerPoint Presentations

This book has **Microsoft PowerPoint presentations** available for each chapter. These are included as a teaching aid for classroom presentation, to make available to students on a network for chapter review, or to be printed for classroom distribution. Instructors can customize these presentations to cover any additional topics they introduce to the class. **Figure Files** for all figures in the textbook are also available online.

### SAM: Skills Assessment Manager

**SAM 2013** is designed to help bring students from the classroom to the real world. It allows students to train and test on important computer skills in an active, hands-on environment. SAM’s easy-to-use system includes powerful interactive exams, training, and projects on the most commonly used Microsoft Office applications. SAM simulates the Office 2013 application environment, allowing students to demonstrate their knowledge and think through the skills by performing real-world tasks such as bolding text or setting up slide transitions. Add in live-in-the-application projects and students are on their way to truly learning and applying skills to business-centric documents.

Designed to be used with the New Perspectives Series, SAM includes handy page references, so students can print helpful study guides that match the New Perspectives Series textbooks used in class. For instructors, SAM also includes robust scheduling and reporting features.



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I would like to extend a special thank you to all of the industry professionals who provided their expertise for the **Expert Insight** features:

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I sincerely hope you find this book interesting, informative, and enjoyable to read.

**Deborah Morley**



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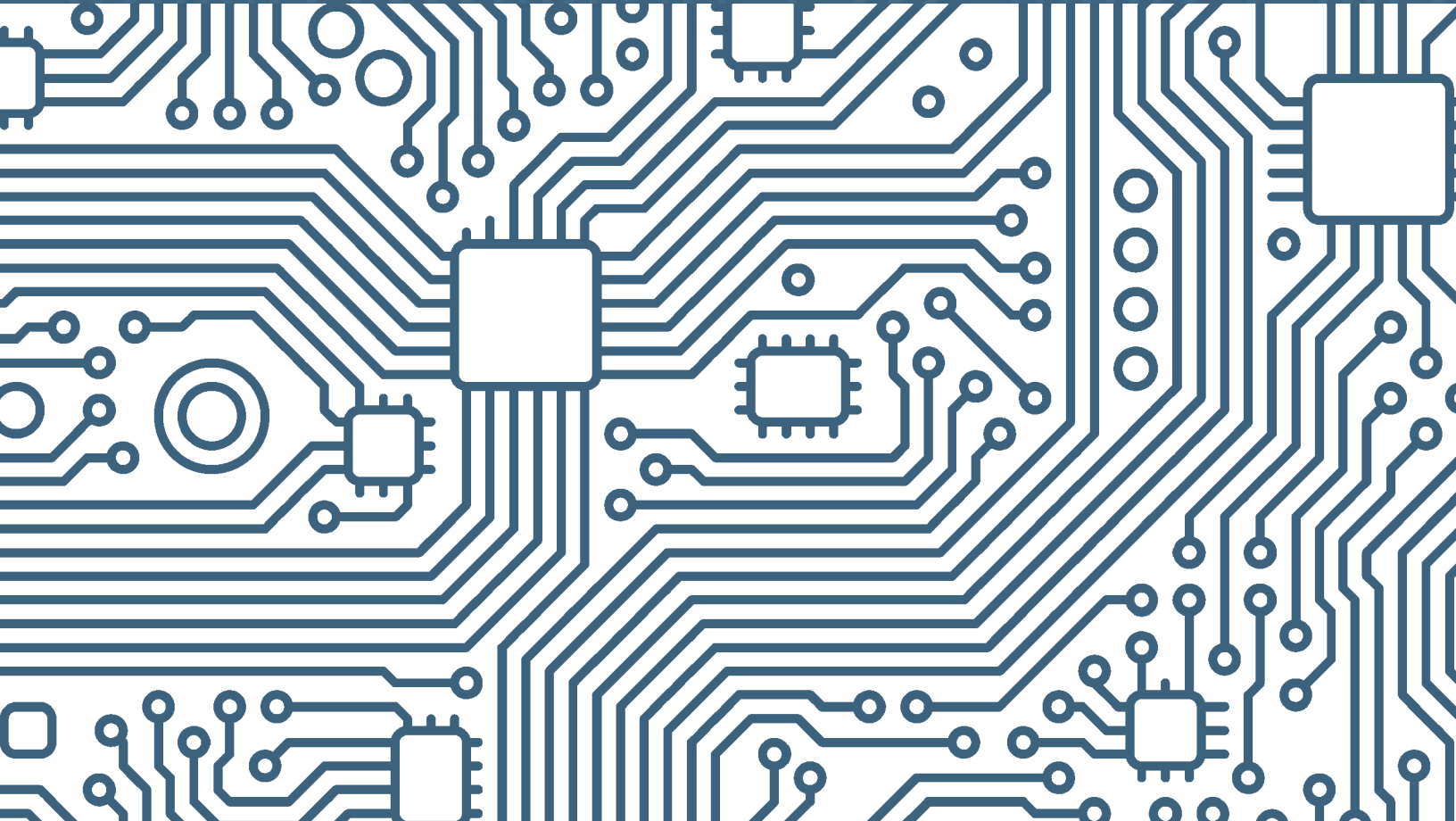
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6th Edition

# UNDERSTANDING COMPUTERS

## IN A CHANGING SOCIETY



# chapter 1

## Introduction to the World of Computers

After completing this chapter, you will be able to do the following:

1. Explain why it is essential to learn about computers today and discuss several ways computers are integrated into our business and personal lives.
2. Define a computer and describe its primary operations.
3. List some important milestones in computer evolution.
4. Identify the major parts of a personal computer, including input, processing, output, storage, and communications hardware.
5. Define software and understand how it is used to instruct the computer what to do.
6. List the six basic types of computers, giving at least one example of each type of computer and stating what that computer might be used for.
7. Explain what a network, the Internet, and the World Wide Web are, as well as how computers, people, and Web pages are identified on the Internet.
8. Describe how to access a Web page and navigate through a Web site.
9. Discuss the societal impact of computers, including some benefits and risks related to their prominence in our society.

## outline

### Overview

#### Computers in Your Life

- Why Learn About Computers?
- Computers in the Home
- Computers in Education
- Computers on the Job
- Computers on the Go

#### What Is a Computer and What Does It Do?

- Data vs. Information
- Computers Then and Now
- Hardware
- Software
- Computer Users and Professionals

#### Computers to Fit Every Need

- Embedded Computers
- Mobile Devices
- Personal Computers (PCs)
- Servers
- Mainframe Computers
- Supercomputers

#### Computer Networks and the Internet

- What Are the Internet and the World Wide Web?
- Accessing a Network or the Internet
- Surfing the Web
- Searching the Web
- E-Mail

#### Computers and Society

- Benefits of a Computer-Oriented Society
- Risks of a Computer-Oriented Society
- Differences in Online Communications
- The Anonymity Factor
- Information Integrity





## OVERVIEW

Computers and other forms of technology impact our daily lives in a multitude of ways. We encounter computers in stores, restaurants, and other retail establishments. We use computers and the Internet regularly to obtain information, experience online entertainment, buy products and services, and communicate with others. Many of us carry a mobile phone or other mobile device with us at all times so we can remain in touch with others on a continual basis and can access Internet information as we need it. We also use these devices to pay for purchases, play online games with others, watch TV and movies, and much, much more.

Businesses also use computers extensively, such as to maintain employee and customer records, manage inventories, maintain online stores and other Web sites, process sales, control robots and other machines in factories, and provide business executives with the up-to-date information they need to make decisions. The government uses computers to support our nation's defense systems, for space exploration, for storing and organizing vital information about citizens, for law enforcement and military purposes, and for other important tasks. In short, computers and computing technology are used in an endless number of ways.

*Understanding Computers in a Changing Society* is a guide to computers and related technology, how they are being used in the world today, and their impact on our society. It will provide you with an introduction to computer concepts and terminology and give you a solid foundation for future computer-related courses. It will also provide you with the basic knowledge you need to understand and use computers in school, on the job, and in your personal life, as well as give you an understanding of the various societal issues related to technology, such as security and privacy issues, ethical considerations, and environmental concerns.

Chapter 1 is designed to help you understand what computers are, how they work, and how people use them. It introduces the important terms and concepts that you will encounter throughout this text and in discussions about computers with others, as well as includes an overview of the history of computers. It also takes a brief look at how to use a computer to perform basic tasks and to access resources on the Internet and the World Wide Web in order to provide you with the knowledge, skills, and tools you need to complete the projects and online activities that accompany this textbook. The chapter closes with an overview of the societal impact of computers. ■

## COMPUTERS IN YOUR LIFE

Computers today are used in virtually every aspect of most individuals' lives—at home, at school, at work, and while on the go. The next few sections provide an overview of the importance of computers and some of the most common computer-related activities that individuals may encounter every day.

### Why Learn About Computers?

Fifty years ago, computers were used primarily by researchers and scientists. Today, computers are an integral part of our lives. Experts call this trend *pervasive computing*, in which few aspects of daily life remain untouched by computers and computing technology. With pervasive computing—also referred to as *ubiquitous computing*—computers are

#### TIP

Most of the computer concepts introduced in this chapter are discussed in more detail in subsequent chapters of this text.



found virtually everywhere and computing technology is integrated into an ever-increasing number of devices to give those devices additional functionality, such as enabling them to communicate with other devices on an ongoing basis. Because of the prominence of computers in our society, it is important to understand what a computer is, a little about how a computer works, and the implications of living in a computer-oriented society.

Prior to about 1980, computers were large and expensive, and few people had access to them. Most computers used in organizations were equipped to do little more than carry out high-volume processing tasks, such as issuing bills and keeping track of inventories. The average person did not need to know how to use a computer for his or her job, and it was uncommon to have a computer at home. Furthermore, the use of computers generally required a lot of technical knowledge and the use of the *Internet* was reserved primarily for researchers and educational institutions. Because there were few good reasons or opportunities for learning how to use computers, the average person was unfamiliar with them.

Beginning in the early 1980s, things began to change. *Microcomputers*—inexpensive *personal computers* that you will read about later in this chapter—were invented and computer use increased dramatically. The creation of the *World Wide Web* (WWW) in the late 1980s and the graphical *Web browser* in the early 1990s started the trend of individuals buying and using computers for personal use. Today, *portable computers* and *mobile phones* have brought personal computing to a whole new level—nearly 90% of all U.S. households have a computer or mobile phone, and most individuals use some type of computer on the job. Whether you become a teacher, attorney, doctor, engineer, restaurant manager, salesperson, professional athlete, musician, executive, or skilled tradesperson, you will likely use a computer to obtain and evaluate information, to facilitate necessary on-the-job tasks, and to communicate with others. Today's computers are very useful tools for these purposes; they are also taking on new roles in our society, such as delivering entertainment on demand. In fact, computers and the traditional communications and entertainment devices that we use every day—such as telephones, televisions, gaming devices, and home entertainment systems—are *converging* into single units with multiple capabilities. For instance, you can check your *e-mail* (electronic messages), watch videos, and view other Internet content on your living room TV; you can make telephone calls via your personal computer; and you can view Internet content and watch TV on your *smartphone* or other *mobile device* (see Figure 1-1). As a result of this *convergence* trend, the computer is no longer an isolated productivity tool; instead, it is an integral part of our daily lives.

Just as you can learn to drive a car without knowing much about car engines, you can learn to use a computer without understanding the technical details of how a computer works. However, a little knowledge gives you a big advantage. Knowing something about cars can help you make wise purchasing decisions and save money on repairs. Likewise, knowing something about computers can help you buy the right one for your needs, get the most efficient use out of it, be able to properly *upgrade* it as your needs change, and have a much higher level of comfort and confidence along the way. Therefore, basic **computer literacy**—knowing about and understanding computers and their uses—is an essential skill today for everyone.



### TIP

More than half of all U.S. mobile phone users today are *smartphone* users; that is, their mobile phones include Internet capabilities and the ability to run mobile programs or *apps*.



### FIGURE 1-1

#### Convergence.

Many devices today include computing or Internet capabilities.



Courtesy Netflix

#### TELEVISIONS

Can be used to access Web pages, e-mail, streaming movies, and other Internet content, in addition to viewing TV content.



Used with permission from Microsoft Corporation

#### SMARTPHONES

Can be used to access Internet content, play music and games, take photos, watch TV shows, and more, in addition to making phone calls.

> **Computer literacy.** The knowledge and understanding of basic computer fundamentals.

## Computers in the Home

Home computing has increased dramatically over the last few years as computers and Internet access have become less expensive and as a vast array of online consumer activities have become available. Use of the Internet at home to look up information, exchange e-mail, shop, watch TV and videos, download music and movies, research products, pay bills and manage bank accounts, check news and weather, store and organize *digital photos*, play games, make vacation plans, and so forth is now the norm for many individuals (see Figure 1-2). Many individuals also use a computer at home for work-related tasks, such as to review work-related documents or check work e-mail from home.

As the Internet, wireless technology, and devices such as computers, televisions, mobile phones, *digital video recorders (DVRs)*, and *gaming consoles* continue to converge, the computer is also becoming a central part of home entertainment. *Wireless networking* allows the use of computers in virtually any location and both online and offline content to be sent wirelessly from one device to another. Both voice and video telephone calls can be made over your Internet connection, and your TV can display Internet content.

Computing technologies also make it possible to have *smart appliances*—traditional appliances (such as refrigerators, thermostats, or ovens) with some type of built-in computer or communications technology that allows them to be controlled by the user via a smartphone or the Internet, to access and display Internet information, or to perform other computer-related functions. *Smart homes*—homes in which household tasks (such as watering the lawn, turning the air conditioning on or off, making coffee, monitoring the security of the home and grounds, and managing home entertainment content) are controlled by a main computer in the home or by the homeowner remotely via a smartphone—have arrived, and they are expected to be the norm in less than a decade. Some believe that one primary focus of smart appliances and smart homes will be energy conservation—for instance, the ability to perform tasks (such as running the dishwasher and watering the lawn) during nonpeak energy periods and to potentially transfer waste heat from one appliance (such as an oven) to another appliance (such as a dishwasher) as needed.

## Computers in Education

Today's youth can definitely be called the *computing generation*. From *handheld gaming devices* to mobile phones to computers at school and home, most children and teens today have been exposed to computers and related technology all their lives. Although the amount of computer use varies from school to school and from grade level to grade level, most students today have access to computers at school—and some schools have completely integrated computers into the curriculum, such as by adopting *e-book* (electronic) textbooks that run on school-owned portable computers, or allowing students to bring in devices to use in class (referred to as *BYOD* or *Bring Your Own Device*). Many schools (particularly college campuses) today also have *wireless hotspots* that allow students to connect their personal computers or mobile devices wirelessly to the Internet from anywhere on campus. Today, students at all levels are typically required to use a computer to some extent as part of their normal coursework—such as for preparing papers, practicing skills, doing Internet research, accessing Internet content (for instance, class *Web pages* or their campus *YouTube* channel), or delivering presentations—and some colleges require a computer for enrollment.

Computers are also used to facilitate *distance learning*—an alternative to traditional classroom learning in which students participate, typically at their own pace, from their current location (via their computers and Internet connections) instead of physically going to class. Consequently, distance learning gives students greater flexibility to schedule class time around



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### REFERENCE

Retrieving information, obtaining news, viewing recipes, shopping online, and exchanging e-mail are popular home computer activities.



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### PRODUCTIVITY

Home computers are frequently used for editing and managing digital photos and home videos, creating and editing work-related documents, paying bills, and other productivity tasks.



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### ENTERTAINMENT

Home computers and gaming consoles are becoming a central hub for entertainment, such as the delivery of photos, videos, music, games, TV shows, instant messages, and social networking updates.

**FIGURE 1-2**  
Computer use at home.





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**COMPUTER LABS AND CLASSROOMS**

Many schools today have computers and Internet access available in the classroom and/or a computer lab for student use.



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**CAMPUS WIRELESS HOTSPOTS**

Many students can access the Internet from anywhere on campus to do research, check e-mail, and more, via a campus hotspot.



Denver Makle, 7th Army JIMTC

**DISTANCE LEARNING**

With distance learning, students—such as these U.S. Army soldiers—can take classes from home or wherever they happen to be at the moment.

**FIGURE 1-3**  
Computer use in education.

their personal, family, and work commitments, as well as allows individuals located in very rural areas or stationed at military posts overseas to take courses when they are not able to attend classes physically. Some examples of computer use in education are shown in Figure 1-3.

**FIGURE 1-4**  
Computer use on the job.

**Computers on the Job**

Although computers have been used on the job for years, their role is continually evolving. Computers were originally used as research tools for computer experts and scientists and

then as productivity tools for office workers. Today, computers are used by all types of employees in all types of businesses—including corporate executives, retail store clerks, traveling sales professionals, artists and musicians, engineers, police officers, insurance adjusters, delivery workers, doctors and nurses, auto mechanics and repair personnel, and professional athletes. In essence, the computer has become a universal tool for on-the-job decision making, productivity, and communications (see Figure 1-4). Computers are also used extensively for access control at many businesses and organizations, such as *authentication systems* that allow only authorized individuals to enter an office building, punch in or out of work, or access the company network via an access card or a fingerprint or hand scan, as shown in Figure 1-4 and discussed in detail in Chapter 4. In addition to jobs that require the use of computers by employees, many new jobs have been created simply because computers exist, such as jobs in electronics manufacturing, online retailing, Internet applications, and technology-related computer support.



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**DECISION MAKING**

Many individuals today use a computer to help them make on-the-job decisions.



© Monkey Business Images/Shutterstock.com

**PRODUCTIVITY**

Many individuals today use a computer to perform on-the-job tasks efficiently and accurately.



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**OFF-SITE COMMUNICATIONS**

Many individuals use portable computers or mobile devices to record data, access data, or communicate with others when they are out of the office.



Courtesy Ingersoll Rand

**AUTHENTICATION**

Many individuals are required to use authentication systems to punch in and out of work, access facilities, or log on to company computers.

# TECHNOLOGY AND YOU

## Restaurant iPad Ordering Systems

You may have used your iPad or other device to place a pickup order at your local eatery; you may also have had a server use an iPad to take your order at a restaurant. Nice innovations, but guess what's next? Placing your order yourself at a restaurant using an iPad.

This new trend of using iPads and *e-menus* to have customers place their orders in restaurants is growing rapidly. In addition to enabling customers to place their orders at their convenience without waiting for a server, it also allows the restaurant to provide more resources to customers (such as photographs of menu items, pairing suggestions for appetizers and drinks, and so forth). The overall goal is to allow customers to control their dining experience from the time they are seated until they choose to pay the check. And, yes, they pay via the iPad as well (see the credit card reader at the top right of the iPad shown in the accompanying photo).

iPad ordering systems work especially well for restaurants that offer customized menu items. For example, Stacked, one of the first large-scale adopters of restaurant iPad ordering systems, offers typical American food (such as pizza, burgers, and salads) at its Southern California restaurants but everything on the menu is customizable—customers choose from a wide variety of ingredients, toppings, and sauces. The iPad systems enable customers to build their selections, adding or removing ingredients, until they are satisfied with the order (the price adjusts as they change their selections). This allows customers to build their orders at a comfortable pace without having to remember them until a server arrives, or having to make that many decisions with a server waiting.

More than 7,000 e-menu-enabled iPads are also arriving at airport restaurants in three airports in North America. They will be used not only for placing orders but also for providing travelers with free access to Facebook, Twitter, e-mail, games, news, and flight updates while they wait (for security purposes, all personal information is wiped from the device as soon as the home button is pressed).

The two biggest risks for restaurants introducing iPad ordering systems is customer acceptance (most offer assistance from servers if the customer desires to help alleviate any customer concerns about using the devices) and technology issues. To avoid network or Internet outage issues, some restaurants are implementing redundant systems, such as multiple routers that can be used if the main router goes down or a 4G Internet connection that the system can use to access the Internet via a cellular connection if the main Internet source goes down.



Courtesy of Square, Inc.

Computers are also used extensively by military personnel for communications and navigational purposes, as well as to control missiles and other weapons, identify terrorists and other potential enemies, and perform other necessary national security tasks. To update their computer skills, many employees in all lines of work periodically take computer training classes or enroll in computer certification programs.

## Computers on the Go

In addition to using computers in the home, at school, and on the job, most people encounter and use all types of computers in other aspects of day-to-day life. For example, it is common for consumers to use *consumer kiosks* (small self-service computer-based stations that provide information or other services to the public, including those used for ATM transactions, bridal registries, ticketing systems, and more), *point-of-sale (POS) systems* (such as those found at most retail stores to check customers out—see the Technology and You box for a look at how you may soon be using iPads to order at restaurants), and *self-checkout systems* (which allow retail store customers to scan their purchases and pay





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### PORTABLE DEVICES

Many people today carry a portable computer or smartphone with them at all times or when they travel in order to remain in touch with others and to access Internet resources.



Courtesy RedBox

### CONSUMER KIOSKS

Electronic kiosks are widely available to view conference or gift registry information, print photographs, order products or services, and more.

for them without a salesclerk) while in retail stores and other public locations. Individuals may also need to use a computer-based consumer authentication system to gain access to a local health club, theme park, or other membership-based facility (see Figure 1-5).

In addition, many individuals carry a *portable computer* or *mobile device* with them on a regular basis to remain electronically in touch with others and to access information (such as stock quotes, driving directions, airline flight updates, movie times, news headlines, and more) as needed while on the go. These portable devices are also commonly used to watch TV, download and listen to music, access *Facebook* pages and other *social networking sites*, and perform other mobile entertainment options. Smartphones can also be used to pay for products and services (refer again to Figure 1-5), as well as remotely deposit checks, transfer money to others, pay bills electronically, and perform other *mobile banking* applications. *GPS (global positioning system)* capabilities are frequently built into smartphones, cars, and other devices to provide individuals with driving directions and other navigational aids while traveling or hiking.



Courtesy Intel

### MOBILE PAYMENT SYSTEMS

Allow individuals to pay for purchases using a smartphone or other device.



Courtesy Ingersoll Rand

### CONSUMER AUTHENTICATION SYSTEMS

Allow only authorized members, such as theme park annual pass holders as shown here, access to facilities.

**FIGURE 1-5**  
Computer use while on the go.

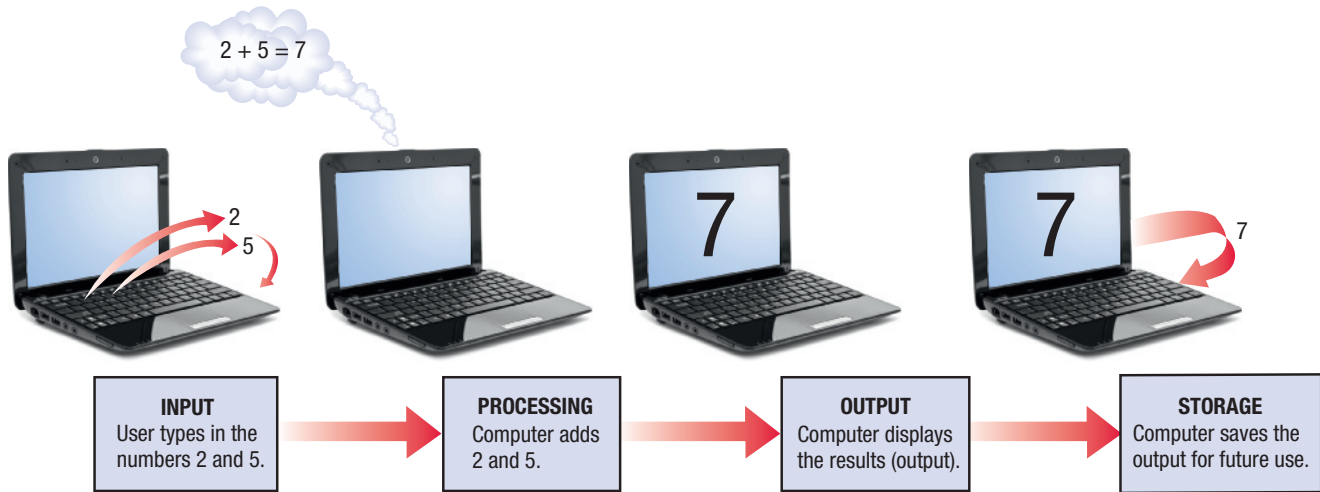
## WHAT IS A COMPUTER AND WHAT DOES IT DO?

A **computer** can be defined as a programmable, electronic device that accepts data, performs operations on that data, presents the results, and stores the data or results as needed. The fact that a computer is *programmable* means that a computer will do whatever the instructions—called the *program*—tell it to do. The programs used with a computer determine the tasks the computer is able to perform.

The four operations described in this definition are more technically referred to as *input*, *processing*, *output*, and *storage*. These four primary operations of a computer can be defined as follows:

- **Input**—entering data into the computer.
- **Processing**—performing operations on the data.

➤ **Computer.** A programmable, electronic device that accepts data input, performs processing operations on that data, and outputs and stores the results. ➤ **Input.** The process of entering data into a computer; can also refer to the data itself. ➤ **Processing.** Performing operations on data that has been input into a computer to convert that input to output.



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**FIGURE 1-6**  
The information processing cycle.

- **Output**—presenting the results.
- **Storage**—saving data, programs, or output for future use.

For example, assume that you have a computer that has been programmed to add two numbers. As shown in Figure 1-6, input occurs when data (in this example, the numbers 2 and 5) is entered into the computer, processing takes place when the computer program adds those two numbers, and output happens when the sum of 7 is displayed on the computer screen. The storage operation occurs any time the data, a change to a program, or the output is saved for future use.

For an additional example, look at a supermarket *barcode reader* to see how it fits this definition of a computer. First, the grocery item being purchased is passed over the barcode reader—input. Next, the description and price of the item are looked up—processing. Then, the item description and price are displayed on the cash register and printed on the receipt—output. Finally, the inventory, ordering, and sales records are updated—storage.

This progression of input, processing, output, and storage is sometimes referred to as the *IPOS cycle* or the *information processing cycle*. In addition to these four primary computer operations, today's computers almost always perform **communications** functions, such as sending or retrieving data via the Internet, accessing information located in a shared company database, or exchanging data or e-mail messages with others. Therefore, communications—technically an input or output operation, depending on which direction the information is going—is often considered the fifth primary computer operation.

## Data vs. Information

As just discussed, a user inputs **data** into a computer, and then the computer processes it. Almost any kind of fact or set of facts can become computer data, such as the words in a letter to a friend, the numbers in a monthly budget, the images in a photograph, the notes in a song, or the facts stored in an employee record. When data is processed into a meaningful form, it becomes **information**.

- **Output.** The process of presenting the results of processing; can also refer to the results themselves.
- **Storage.** The operation of saving data, programs, or output for future use.
- **Communications.** The transmission of data from one device to another.
- **Data.** Raw, unorganized facts.
- **Information.** Data that has been processed into a meaningful form.