



TECHNOLOGY in Action

Complete

Eleventh Edition

EVANS MARTIN POATSY



Technology in Action

COMPLETE

11TH EDITION

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Technology in Action

COMPLETE

11TH EDITION

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Dedication

For my wife, Patricia, whose patience, understanding, and support continue to make this work possible . . . especially when I stay up past midnight writing! And to my parents, Jackie and Dean, who taught me the best way to achieve your goals is to constantly strive to improve yourself through education.

Alan Evans

For all the teachers, mentors, and gurus who have popped in and out of my life.

Kendall Martin

For my husband, Ted, who unselfishly continues to take on more than his fair share to support me throughout this process, and for my children, Laura, Carolyn, and Teddy, whose encouragement and love have been inspiring.

Mary Anne Poatsy



What's New

Technology in Action, 11th Edition

We are delighted for you to explore the Eleventh Edition of *Technology in Action*!

*Explore, discover, and experience technology with the immersive and adaptive **Technology in Action**—the book that uses technology to teach technology!*

Technology in Action is a learning system that pushes the envelope of what is possible in technology, and what is helpful in teaching. It is a system that fits the way students are learning today and uses rich companion media to engage students in and out of the classroom while providing essential training on computer concepts.

What's New

- All content has been updated as needed to ensure coverage of the most current technology and end-of-chapter exercises have been updated throughout the book.

COMPLETELY UPDATED AND ENHANCED media offerings including:

- **Sound Bytes:** These multimedia lessons help demystify computer concepts with audio and video presentations. All of the Sound Bytes have been updated to provide timely and accurate information.
- **Active Helpdesk Calls:** These highly interactive, engaging activities provide students with a realistic experience of how help is delivered via phone, live chat, FAQ searches, and so on. Students play the role of the staff answering technology questions using these various approaches.
 - A virtual supervisor provides support to the student throughout calls.
 - Assessment questions after each call provide instructors with a tool to gauge and track students' progress.

- MyITLab • **Enhanced eBook:** The Enhanced eBook in MyITLab provides a continuous digital learning in a completely interactive environment that allows students to use technology as they learn. They don't have to stop reading to go find the activities such as Helpdesks,

Sound Bytes, and Replay Videos—they just click on them and immediately experience the activity.

- MyITLab • **TechTown:** This fully interactive scenario-based simulation game lets students create their own avatar and interact in a series of knowledge and puzzle-based scenarios. As they work and play, they explore the core topics of computer concepts—from what a computer is to software, hardware, networking, the Internet, social media, and more!

- MyITLab • **NEW! Adaptive Dynamic Study Modules,** created specifically for *Technology in Action*, 11th Edition, provide students with personalized review based on their strengths and weaknesses.

- **UPDATED! Replay videos:** The *Replay* videos provide an author-narrated video review of each *Chapter Part* in an easy-to-use format students can view on their phones, tablets, or computers!
- **With Tech Bytes Weekly, every week is new!** This weekly newsfeed provides two timely articles to save instructors the prep time required for adding interesting and relevant news items to their weekly lectures. Tech Bytes Weekly also features valuable links and other resources, including discussion questions and course activities.
- **Jeopardy! Game and Crossword Puzzles:** These assets give students a fun way to challenge their knowledge.

In addition to these changes, all chapters have been updated with new images, current topics, and state-of-the-art technology coverage. Some of the chapter changes are listed here:

Chapter 1: Using Technology to Change the World

- Throughout the chapter, text, figures, and photos have been updated.

Chapter 2: Looking at Computers: Understanding the Parts

- Throughout the chapter, text, figures, and photos have been updated.
- Gesture technology is now covered in the “How Cool Is This?” feature.

- The Keyboard section has been redesigned to reflect the shift from physical keyboards to touch screens.
- Enhanced coverage of transparent OLED displays has been added.
- Coverage of cloud storage solutions has been augmented to reflect student needs and trends.
- The “Try This: What’s Inside My Computer?” activity has been updated to reflect Windows 8.1 changes.

Chapter 3: Using the Internet: Making the Most of the Web’s Resources

- Throughout the chapter, text, figures, and photos have been updated.
- NEW “How Cool Is This?” feature has been added on the Screenleap.com screen sharing app.
- NEW Bits & Bytes on HTML5 vs Flash, Maxthon, and Outlook.com.
- Streaming audio and streaming video have been condensed to discuss streaming media in general.

Technology in Focus: The History of the PC

- This Tech in Focus has been updated throughout.

Chapter 4: Application Software: Programs That Let You Work and Play

- Throughout the chapter, text, figures, and photos have been updated.
- NEW “How Cool Is This?” feature has been added on eye-tracking software.
- “Trends in IT: Mobile Commerce: What Have You Bought with Your Phone Lately?” has been updated.
- All screen images of Microsoft Office applications have been updated to Office 2013; and discussion of new features of Office 2013 have been included in the text.
- “Bits & Bytes: Alternatives to PowerPoint” has been revised to include additional alternatives.
- NEW “Bits & Bytes: Mirror, Mirror . . .” has been added, replacing PDF Bits & Bytes on video file formats for portable media players from the previous edition.
- Media Management Software has been removed, with important pieces of the information mentioned in other places in the chapter.

Chapter 5: System Software: The Operating System, Utility Programs, and File Management

- Throughout the chapter, text, figures, and photos have been updated.

- Content throughout has been updated to include coverage of Windows 8.1 and OS X Mavericks.
- NEW “How Cool Is This?” feature has been added on Google Chrome syncing.
- NEW Ethics in IT feature has been added—“The Great Debate: Is Mac OS X Safer than Windows?”
- NEW “Try This: Organizing Tiles on the Start Screen in Windows 8” activity has been added.
- “The Windows Interface” section has been revised and updated to reflect changes in Windows 8.1.
- NEW “Bits & Bytes: Save Files to the Cloud Right from Your Apps” has been added.

Technology in Focus: Information Technology Ethics

- This Tech in Focus has been updated throughout.
- The “Using Computers to Support Ethical Conduct” section has been updated to cover Google Crisis Response.

Chapter 6: Understanding and Assessing Hardware: Evaluating Your System

- Throughout the chapter, text has been updated to match current hardware standards, and figures and photos have been updated.
- NEW “How Cool Is This?” feature has been added on the Arduino microcontroller project.
- NEW “Bits & Bytes: The Haswell Boost” has been added replacing the “Bits and Bytes: Not Much Power at All.”
- All references to operating system utilities have been updated to reflect changes in Windows 8.1.
- Summary table figures have been redesigned for increased clarity.
- Emphasis has been shifted from desktop computers toward mobile devices.

Chapter 7: Networking: Connecting Computing Devices

- Throughout the chapter, text, figures, and photos have been updated.
- NEW “How Cool Is This?” feature has been added on Karma WiFi.
- A new “Bits & Bytes: Mesh Networks—An Emerging Alternative” has been added, replacing “Wake Up Your Mac Remotely.”
- NEW Bits & Bytes: “Connecting to Wireless Networks on the Road? Beware of ‘Evil Twins!’” moved to this

chapter from Chapter 9, and replaces “Blazingly Fast Wireless Connections on the Horizon.”

- The content from the removed “Bits & Bytes: Blazingly Fast Wireless Connections on the Horizon” has been incorporated into the chapter content.

Technology in Focus: Under the Hood

- This Tech in Focus has been updated throughout, with many new photos.
- The “Bits and Bytes: Today’s Supercomputers: The Fastest of the Fast” has been updated to reflect the newest supercomputers.
- NEW “Bits and Bytes: Forget CPUs: SoC Is the Future for Mobile Devices!” has been added.

Chapter 8: Digital Devices and Media: Managing a Digital Lifestyle

- Throughout the chapter, text, figures, and photos have been updated.
- NEW “How Cool Is This?” feature has been added on 3D printing.
- NEW “Bits & Bytes: Talking to Yourself” has been added.
- NEW “Bits & Bytes: Want to Read That Voicemail?” has been added, replacing Bits & Bytes on Billshrink.
- NEW “Bits & Bytes: The Fabulous Phablet” has been added.

Chapter 9: Securing Your System: Protecting Your Digital Data and Devices

- Throughout the chapter, text, figures, and photos have been updated.
- Screenshots throughout have been updated to reflect Windows 8.1.
- NEW “Bits & Bytes: I Received a Data Breach Letter . . . Now What?” has been added.
- The Biometric Authentication Devices section has been updated for the new iPhone 5 features.
- NEW “Bits & Bytes: Can’t Remember Passwords? Try a Passphrase Instead!” has been added.

Technology in Focus: Careers in IT

- This Tech in Focus has been updated throughout.

Chapter 10: Behind the Scenes: Software Programming

- Throughout the chapter, text, figures, and photos have been updated.

- NEW “How Cool Is This?” feature has been added on the Open Data initiatives of major cities.
- NEW “Bits and Bytes: Competitive Coding” detailing collegiate and civic hackathons has been added, replacing “Bits and Bytes: My Algorithm Can Beat Your Algorithm.”
- NEW “Bits & Bytes: Coding for Zombies” has been added, featuring Rails for Zombies from Code Academy.
- NEW “Bits & Bytes: The Best Résumé” has been added, replacing “Bits & Bytes: Want to Learn? Work for Free,” and details the use of gitHub as a resume component.

Chapter 11: Behind the Scenes: Databases and Information Systems

- Throughout the chapter, text has been updated, and figures, screenshots, and photos have been updated to reflect changes in Microsoft Access 2013.
- NEW “How Cool Is This?” feature has been added on the DrawAFriend app.
- “Ethics in IT: Data, Data Everywhere—But Is It Protected?” section has been updated with a new example.

Chapter 12: Behind the Scenes: Networking and Security in the Business World

- Throughout the chapter, text, figures, and photos have been updated.
- NEW “How Cool Is This?” feature has been added on secure social collaboration tools.
- NEW “Bits & Bytes: Go Green with Mobile Apps” has been added.
- NEW “Bits & Bytes: US Military Brings Its Own Network . . . By Plane!” has been added.

Chapter 13: Behind the Scenes: How the Internet Works

- Throughout the chapter, text, figures, and photos have been updated.
- NEW “Bits & Bytes: Server in the Cloud” has been added, highlighting Google App Engine.
- The “Bits & Bytes: Gmail Features You Should Know About” has been updated.
- NEW “How Cool Is This?” feature on MOOC courses for learning has been added.



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Letter from the Authors

Our 11th Edition—A Letter from the Authors



Why We Wrote This Book

The pace of technological change is ever increasing. In education, we have seen this impact us more than ever in the past year—MOOCs, touch-screen mobile delivery, and Hangouts are now fixed parts of our environment.

Even the most agile of learners and educators need support in keeping up with this pace of change. In the 11th edition of *Technology in Action*, we have responded with mobile device media, interactive ebook technology, and updated video

supports. We continue to strive to make *Technology in Action* a learning system that pushes the envelope of what is possible in technology, and what is helpful in teaching. In short: we have worked hard to build a text that fits the way students are learning now.

Our combined almost 50 years of teaching computer concepts have coincided with sweeping innovations in computing technology that have affected every facet of society. From iPads to Web 2.0, computers are more than ever a fixture of our daily lives—and the lives of our students. But although today's students have a much greater comfort level with their digital environment than previous generations, their knowledge of the machines they use every day is still limited.

Part of the student-centered focus of our book has to do with making the material truly engaging to students. From the beginning, we have written *Technology in Action* to focus on what matters most to today's student. Instead of a history lesson on the microchip, we focus on tasks students can accomplish with their computing devices and skills they can apply immediately in the workplace, the classroom, and at home.

We strive to keep the text as current as publishing timelines allow, and we are constantly looking for the next technology trend or gadget. We have augmented the text with weekly technology updates to help you keep your classroom on top of the latest breaking developments and continue to include a number of multimedia components to enrich the classroom and student learning experience. The result is a learning system that sparks student interest by focusing on the material they want to learn (such as how to integrate computing devices into a home network) while teaching the material they need to learn (such as how networks work). The sequence of topics is carefully set up to mirror the typical student learning experience.

As they read through this text, your students will progress through stages of increasing difficulty:

1. Thinking about how technology offers them the power to change their society and their world
2. Examining why it's important to be computer fluent
3. Understanding the basic components of computing devices
4. Connecting to and exploring the Internet
5. Exploring software
6. Learning the operating system and personalizing their computer

7. Evaluating and upgrading computing devices
8. Understanding home networking options and keeping computing devices safe from hackers
9. Going mobile with smartphones, netbooks, tablets, and laptops
10. Going behind the scenes, looking at technology in greater detail

We continue to structure the book in a “spiraling” manner, intentionally introducing on a basic level in the earlier chapters concepts that students traditionally have trouble with and then later expanding on those concepts in more detail when students have become more comfortable with them. Thus, the focus of the early chapters is on practical uses for the computer, with real-world examples to help the students place computing in a familiar context.

For example, we introduce basic hardware components in Chapter 2, and then we go into increasingly greater detail on some hardware components in Chapter 6 and in the “Under the Hood” Technology in Focus feature. The Behind the Scenes chapters venture deeper into the realm of computing through in-depth explanations of how programming, networks, the Internet, and databases work. They are specifically designed to keep more experienced students engaged and to challenge them with interesting research assignments.

Throughout the years we have also developed a comprehensive multimedia program to reinforce the material taught in the text and to support both classroom lectures and distance learning:

- The **Helpdesk training content**, created specifically for *Technology in Action*, enables students to take on the role of a helpdesk operator and work through common questions asked by computer users. These have been updated this edition to reflect the way in which users access help today.
- Exciting **Sound Byte multimedia**—fully updated and integrated with the text—expand student mastery of complex topics.
- The **Tech Bytes Weekly updates** deliver the latest technology news stories to you for use in your classroom. Each is accompanied by specific discussion topics and activities to expand on what is within the textbook materials.

This book is designed to reach the students of the twenty-first century and prepare them for the role they can take in their own community and the world. It has been an honor to work with you over the past 11 years to present and explain new technologies to students, and to show them the rapidly growing importance of technology in our world.

Visual Walk-Through

Topic Sequence

Concepts are covered in a progressive manner between chapters to mirror the typical student learning experience.

CHAPTER 2

storing data and INFORMATION

Because RAM is volatile storage, it can't be used to store information indefinitely. To save your data and information permanently, you need to save it to a nonvolatile storage device, such as a hard drive, cloud storage location, DVD, or flash drive.

Hard Drives

Are there different kinds of hard drives? The hard drive (HDD), or hard disk, is your computer's primary device for permanent storage of software and documents. This hard drive is a nonvolatile storage device. An internal hard drive resides within the system unit and usually holds all permanently stored programs and data. Today's internal hard drives (see Figure 2-28) have capacities of as much as 8 TB or more. External hard drives offer similar storage capacities but reside outside the system unit and connect to the computer via a port. The most common type of hard drive has removable spinning platters, a moving arm with a read/write head—that can fall and lead to devastating disk failure. However, the solid-state drive (SSD) has recently become a popular option for portable and laptop storage. SSDs have no moving parts, so they're more efficient, run with no noise, emit little heat, and require little power. In addition, they're less likely to fall after being bumped or dropped. Permanent storage devices are located in your desktop or laptop computer in a space called a **drive bay**. There are two kinds of drive bays:

1. **Internal drive bays** cannot be seen or accessed from outside the system unit. Generally, internal drive bays are reserved for internal hard drives.
2. **External drive bays** can be seen and accessed from outside the system unit. External drive bays house CD and DVD drives, for example. On desktop computers, sometimes there are empty external drive bays that can be used to install additional drives. These extra spaces are covered by a bezel on the front panel. Laptop computers generally do not give you the ability to add additional drives. Such expansion is done by attaching an external drive to the computer through a USB port.

Cloud Storage
How can I easily access my files if I constantly switch between devices? You may find yourself using multiple devices, such as a

smartphone, laptop, and a tablet, at different times during the day. Inevitably, you'll find you need access to a current version of a file that is stored on a device other than the one you're using. If your devices are connected to the Internet, cloud storage provides a convenient option.

Cloud storage refers to using a service that keeps your files safely on the Internet (the "cloud") rather than storing your files solely on a local device. Using a cloud storage service requires that you install software on your device. A popular web-based application for storing files on the cloud is Dropbox. Dropbox supports computers running Windows, OS X, and Linux as well as many smartphones and tablets. After installing the Dropbox software on your devices, any files you save in the Dropbox folder are accessible to all your other devices via the Internet. You can also share folders in Dropbox with other Dropbox users, making it ideal for group projects.

For example, when you save a history term paper to Dropbox on your laptop, the Dropbox software also copies the paper up into a computer attached to the web. Now when you grab your smartphone and head off to class, you can access the paper created on your laptop through the Internet connection on your smartphone and make changes to it if necessary. Dropbox storage capacity is limited to between 2 GB and 8 GB for free accounts. Other cloud storage alternatives include Microsoft OneDrive which provides 7 GB of free space, and Apple Cloud and Google Drive, which each offer 5 GB of free storage.

Portable Storage Options

How can I take my files with me without relying on cloud storage? For large portable storage needs, there are portable external hard drives, which are small enough to fit in your pocket and have storage capacities of 4 TB or larger. These devices are lightweight and enclosed in a protective case. They attach to your computer via a USB port (see Figure 2-29).



FIGURE 2-29 **Result:** portable external hard drive enable you to take a significant amount of data and programs on the road with you. (Image: iStockphoto.com)

CHAPTER 6

ACTIVE HELPDESK Evaluating Your CPU and RAM

In this Active Helpdesk call, you'll play the role of a helpdesk staffer. Staffing calls about what the CPU does and how to evaluate its performance. You'll also field calls about how memory works and how to evaluate how much memory a computer needs.

SOUND BYTE Installing RAM

In this Sound Byte, you'll learn how to select the appropriate type of memory to purchase, how to order memory online, and how to install it yourself. As you'll discover, the procedure is a simple one and can add great performance benefits to your system.

How much RAM do I need? At a minimum, your system needs enough RAM to run the OS. Running the 64-bit version of Windows 8.1 requires a minimum of 4 GB of RAM. However, because you run many applications at one time than just the OS, you'll want to have more RAM than just what's needed for the OS. For example, Figure 6-12 shows how much RAM is recommended for the OS, a web browser, and some software.

It's a good idea to have more than the minimum amount of RAM you need now so you can use more programs in the future. Remember, too, that "required" means those are the minimum values recommended by manufacturers, having more RAM often helps programs run more efficiently. New systems today ship with at least 4 GB of RAM, and high-end systems can come with 24 GB. The rule of thumb: When buying a new computer, buy as much RAM as you can afford.



FIGURE 6-13 **Result:** RAM is a computer's equalizer and relatively inexpensive. On a laptop, you often gain access through a panel on the bottom. (Image: iStockphoto.com)

FIGURE 6-12 Sample RAM Allocation

APPLICATION	RAM RECOMMENDED
Windows 8.1 (64 bit)	2 GB
Microsoft Office Professional 2013	2 GB
Internet Explorer 11	2 GB
Firefox 31	1 GB
Adobe Photoshop Elements 11	2 GB
Total RAM recommended to run all programs simultaneously	9 GB

Adding RAM

Is there a limit to how much RAM I can add to my computer? The motherboard is designed with a specific number of slots into which the memory cards fit, and each slot has a limit on the amount of RAM it can hold. To determine your specific system limits, check the system manufacturer's website. In addition, the OS running on your machine imposes its own RAM limit. For example, the maximum amount of RAM for the 32-bit version of Windows 8.1 is 4 GB, whereas the maximum memory you can install using the 64-bit version of Windows 8.1 Pro is 192 GB.

Is it difficult or expensive to add RAM? Adding RAM is fairly easy (see Figure 6-13). Be sure that you purchase a memory module that's compatible with your computer. Also be sure to follow the installation instructions that come with the RAM module. Typically, you simply line up the notches and gently push the memory module in place. RAM is a relatively inexpensive system upgrade. The cost of RAM does fluctuate in the marketplace as much as 200% over time, though, so if you're considering adding RAM, you should watch the price of memory in online and print advertisements.

Technology in Focus

Under the Hood

Some people are drawn to understanding things in detail; others are happy just to have things work. If you use a computer, you may not have been tempted to "look under the hood." However, if you can understand the hardware inside a computer, you'll have some real advantages:

- You won't have to pay a technician to fix or upgrade your computer. You'll be able to fine-tune it yourself, and you'll be able to make your investment in your computer last longer.
- You'll be able to evaluate new advances in technology. For example, what's the impact of a new type of memory or a new processor?
- If you're a programmer, you'll be able to write more efficient and faster programs.

And if you're preparing for a career in information technology, understanding computer hardware is critical for you. In the Technology in Focus feature, we'll build on what you've learned about computer hardware in other chapters and go "under the hood" to look at the components of your system unit in more detail. Let's begin by looking at the building blocks: computers, switches.

Switches

How does a computer process the data you input? A computer system can be viewed as an enormous collection of on/off switches. These simple on/off switches are combined in different ways to perform addition and subtraction and to move data around the system.

Electrical Switches

To process data into information, computers need to work in a language they understand. Computers understand only two states of existence: on and off. Inside a computer, these two possibilities, or states, are defined using the two numbers 1 and 0 that are represented by these numbers is called **binary language** because just two numbers are used. Everything a computer does, such as processing data or printing a report, is broken down into a series of 0s and 1s. **Electrical switches** are the devices inside the computer that are responsible for these two states of 1 and 0, signifying "on" and "off." You use switches to turn the lights every day. The light switch in your kitchen either is ON, allowing current to flow to the light bulb, or it's OFF, another switch you use each day.



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Hardware First Introduced

Chapter 2 is the first time students read about introductory hardware. It's covered at the beginning level because this is students' experience level at this point of the book.

Hardware Taught in More Depth in Additional Chapters

In later chapters, students read about hardware in greater depth because they're more experienced and comfortable working with their computers.

Technology in Focus

Four special features that teach key uses of technology today.

Multimedia Cues

Visual integration of multimedia.

How Cool Is This?

Highlights the latest and greatest websites, gadgets, and multimedia.

I

Using Technology to Change the World

How Will You Put Technology in Action?

Technology on the World Stage

OBJECTIVE

1. How can becoming proficient with technology help you understand and participate in important issues in the world at large? (pp. 4-6)

Technology and Our Society

OBJECTIVE

2. How can knowledge of technology help you influence the direction our society takes? (pp. 9-10)

How Will Technology Improve Your Life?

Technology at Home

OBJECTIVES

3. What does it mean to be computer literate? (pp. 14-15)

4. How does being computer literate make you a better computer user and consumer? (pp. 14-15)

Sound Byte: Questions to Ask Before You Buy a Computer

Technology and Your Career

OBJECTIVE

5. How can becoming computer literate help you in a career? (pp. 16-22)

HOW COOL IS THIS?

Want to make a difference with technology? The good news is that it has never been easier. Technology is always there and ready for us to become agents of change in our communities and in the world! For example, in London, over 20,000 school-age children are joining **Appes for Good**, a program that links students, educators, and local experts to create students in designing and building apps to help solve problems they see around them. In the United States, the **Verizon Innovative App Challenge** offered schools across the United States prize money for student teams to design apps to address the needs of their communities. In Philadelphia, people met for a weekend-long civic hacking event called **Random Hacks of Kindness**. They created apps to keep track of libraries in any government, to map the location of murals in the city, and to help organize people to dig out fire hydrants after snowstorms. What kind of good can you do with technology? www.verizon.com/innovative-app-challenge

Student Textbook

ethics in IT

The Digital Divide and the Mobile Bridge



FIGURE 1.5 Can we bridge the digital divide through mobile devices? Should we? ©2013/ISTOCKphoto.com

The digital divide, the gap between those with easy access to technology and those with little to no access (see Figure 1.5), is a problem that leads to complex social issues. For those who lack access to the Internet and computers, it is difficult to develop computer skills, which are very often critical to future success. Less familiarity with the Internet can also lead to a lower level of civic, engaged citizenship. So how should we attack the problem of the digital divide in the United States?

Recent studies from the University of Michigan show that without Internet access at home, teens from low-income households (family income under \$30,000 a year) are more likely than their wealthier counterparts to use their cell phones to go online. So the widening penetration of cell phones might be the answer to ending the digital divide. Or is it?

Going online using a cell phone plan is the most expensive of all options, and data transfer speeds are often slow. So teens with the least money are likely paying the most to get the slowest online experience. And they are more likely paying for it themselves, as opposed to teens from wealthier households in which, according to the same University of Michigan study, the teens are more likely to be in family plans paid for by someone else.

In addition, text cell phone usage is limited to managing online social networks, playing games, or listening to music. Computer tasks and skills that could lead to economic advancement, like filling out job applications or running a business, are not yet handled easily on mobile devices. So by not having free Internet access available, is our society placing those groups least able to afford access at an unfair disadvantage?

Will the increasing penetration of smartphones and faster cellular Internet access eliminate the digital divide in the United States? Should our government intervene and make sure there is sufficient free Internet access for all? Is it ethical to deprive the poorer segment of our society of a needed commodity? Answering challenging questions like these is part of being an informed citizen.

Ethics in IT 7

Ethics in IT

Boxes examine the ethical dilemmas involved with technology.

trends in IT

Innovations in Printing

With the advent of the computer, many speculated that ours would become a paperless society. Instead of saving printed documents and other output as was done prior to the PC, information would be saved in a digital state: hard drives replacing filing cabinets, online photo buckets replacing photo albums and scrapbooks, and e-books replacing our favorite texts. Hard drive capacities do enable us to save more content, and online storage systems enable us to save pictures and other files in the "cloud." Additionally, e-book readers have increased in popularity. But has this push toward digital content helped to make the printer obsolete? Surprisingly, no. People still have a deep-rooted need to see, feel, smell, taste, or use their digital images or information in a physical form. New technologies that push the boundaries of printing, such as printing from the cloud and 3-D printing, are being developed and refined.

Cloud Printing

To print a document from a desktop or laptop computer, you must have a printer associated with your computer. Usually this is not a problem because at home, at school, or in the office, there is generally one printer, and all the PCs connected to it have the software and cables or wireless capabilities needed to use it. But what happens if you want to print something from your smartphone or tablet? Common solutions have been to e-mail the document to yourself or transfer the document to a web-based storage service such as Dropbox so that a printer-connected computer could access it. Another solution is Google Cloud Print, a service that lets you configure your printers so you can access them from mobile devices.

Google Cloud Print uses cloud-ready printers (see Figure 2.45) that are now available from manufacturers such as HP, Kodak, and Epson. These printers connect directly to the Internet and register themselves with Google Cloud Print without needing to be connected to a computer. Once a printer is registered with Cloud Print, printing jobs can be sent to it from mobile devices (such as tablets and smartphones) using the Internet. Conventional printers that you already own can



FIGURE 2.45 Cloud-ready printers only need an Internet connection to be accessed from any mobile device.

64 Chapter 2 Looking at Computers: Understanding the Parts

Trends in IT

Boxes explore hot topics in computing.

DIG DEEPER Making Reality Even More Real

We're comfortable with carrying around digital data in our pockets. But the advent of wearable computing is now allowing us to integrate digital information directly into our reality, both to aid more detail and at times to remove unwanted visual effects. How does this happen?

Augmented reality combines our normal sense of the world around us with an additional layer of digital information. The extra information can be displayed on a separate device, such as an augmented reality app on a smartphone. For example, city transit apps overlay images that give you directions to the nearest subway lines on top of your actual view of the street (see Figure 1.16).

But having to carry and position a separate device is clunky. Google Glass is a project that augments reality using a "third eye," a separate camera mounted to the side of a lightweight headset (see Figure 1.17). You can record images and videos by simply saying, "Take a picture." When you say "Glass, how long is the Brooklyn Bridge?" Glass communicates wirelessly with your phone and answers a request to the Internet. The retrieved information is formatted and then sent to a projector. Instead of the projector you're used to seeing in your classroom, this projector is so small it fits into the armband of the glasses. The output beam




FIGURE 1.17 Google Glass is a tool that adds digital information directly into your view of the world, but how?

from the projector bounces off a glass prism that is aligned so that the beam is sent directly to the retina of your eye, as shown in Figure 1.18. (This is why Google Glass is not available for those who wear glasses now. To adjust the prism so that the projector's beam goes through the person's

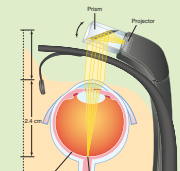


FIGURE 1.18 Google Glass eliminates the need for a separate head-held device by projecting an image directly on the retina of your eye. ©New Scientist. Open inside New Scientist.

FIGURE 1.16 Augmented reality apps use your phone's camera to present the world with extra information superimposed. ©Shutterstock/Imagoeasy

20 Chapter 1 Using Technology to Change the World

Dig Deeper

Boxes cover technical topics in depth to challenge advanced students.

BITS & BYTES

Putting Your Computer to Work . . . While You Sleep

Complex scientific research, such as human genome exploration, requires vast computing power. Software has been developed to let individual computing devices (including tablets and smartphones) in a grid to combine their work together. This effectively creates a cheap supercomputer that many big-data-proc research organizations use to research problems that will benefit the greater good, and your computer can help. Visit the World Community Grid (www.worldcommunitygrid.org) and download its software. Once installed on your device, it allows your computer to work on research during the many times when your CPU is idle (or at least not working to its full potential). Your computing device can participate in exciting research projects on new drugs, sustainable water, and cancer. So tell your computer to get to work!




FIGURE 2.4 Help solve complex problems by adding your computer to the World Community Grid. www.worldcommunitygrid.org

Bits & Bytes

Help make the topics immediately relevant to students' lives.

Check Your Understanding

Multiple Choice, True-False, and Critical Thinking

Try This

Hands-on activity found between Parts 1 and 2 of each chapter.

check your understanding //

For a quick review to see what you've learned so far, answer the following questions. Visit pearsonhighered.com/techaction to check your answers.

multiple choice

- Which is NOT a technology that has been used to solve accidents during times of crisis?
 - Ubiquitous
 - social networking
 - QR codes
 - e-mail
- Cognitive surplus means that we now find many people with
 - more money than five times.
 - limited access to the Internet.
 - excess time and few tools for collaboration.
 - tablets devices.
- Collaborative consumption is when people get together to
 - find the best prices on products.
 - exchange services or services and goods they have purchased.
 - fight diseases of the respiratory tract.
 - increase the use of a single product by sharing access to it.

true–false

- The move toward access versus ownership is a sign of collaborative consumption.
- Project Einstein uses the power of supercomputing to create a simulation of Albert Einstein.

critical thinking

- What Occupies Your Mind?** What we think about is influenced by the information fed to our mind all day long. Web 2.0 has created numerous channels for people to offer their own views (e.g., open-source software, free music, books, and articles). How has this affected your thinking? Have you considered things to share with the online world? How it changed the value you put on music, books, and art?

Do you think that the ubiquitous software has been used for a wide range of applications? What kind of events in your world would benefit from this mapping software? Think of a few ways that having real-time collection and mapping of information would make life easier at your school, office in your town, or just more fun.
- Ubiquitous Means "Witness"** We say that the ubiquitous software has been used for a wide range of applications. What kind of events in your world would benefit from this mapping software? Think of a few ways that having real-time collection and mapping of information would make life easier at your school, office in your town, or just more fun.


Continue >>>

Check Your Understanding 11

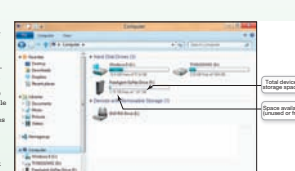
TRY THIS What's Inside My Computer?

Understanding what capabilities your current computer has is one of the first steps toward computer literacy. In this exercise, you'll learn how to explore the components of your Windows computer.


Step 1 To gather information about the storage devices on your computer, on the Start screen, click **File Explorer** (generally called Windows Explorer) to switch to the Desktop and display File Explorer. In the navigation pane, click **Computer** to display information about your computer's drives.



Step 2 The File Explorer Computer screen displays information about internet storage devices (such as in-network drives), optional storage devices (such as DVD drives), and portable storage devices (such as flash drives and external hard drives). The total amount of available storage space, as well as the amount of space actually free (formatted), on the device is shown.

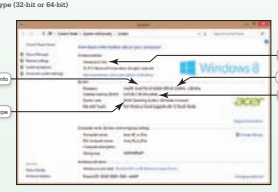


Step 3 To display the System screen, click on the Computer tab on the File Explorer Ribbon, and then click the **Properties** button.



Step 4 You can gather quite a bit of information from the System screen, such as:

- Version of Windows
- Type of processor
- Speed of the processor
- Amount of RAM installed
- System type (32-bit or 64-bit)



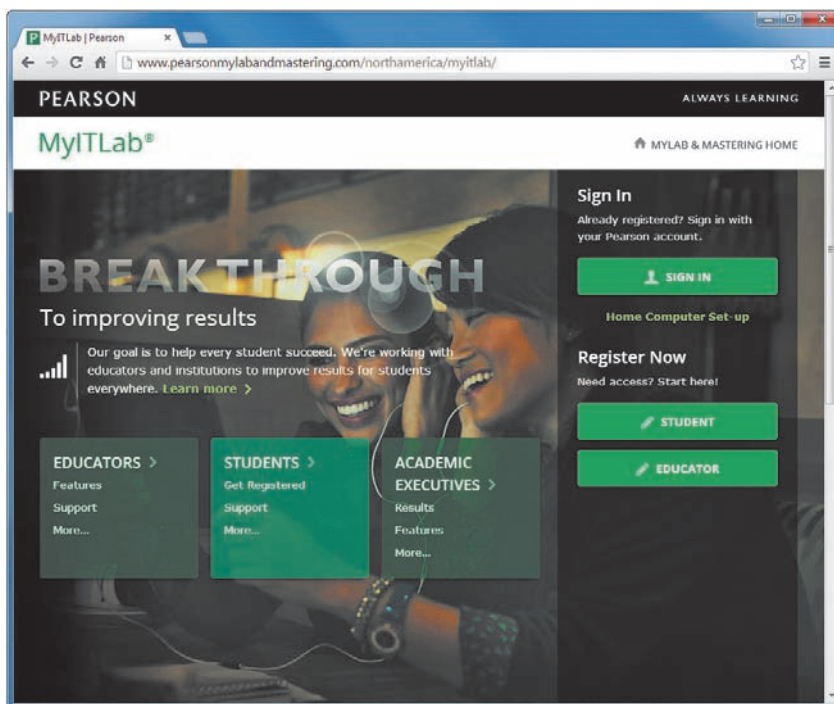
50 Chapter 2 Looking at Computers: Understanding the Parts

Try This 51

MyITLab and Companion Media

MyITLab for *Technology in Action* with the Enhanced eBook personalizes learning to help your students better prepare and learn—resulting in more dynamic experiences in the classroom and improved performance in the course. Specific features include:

- **Adaptive Learning:** A way to enable personalized learning at scale. Not every student learns the same way and at the same rate. MyITLab with Adaptive Learning continuously assesses student performance and activity in real time, and, using data and analytics, personalizes content to reinforce concepts that target each student's strengths and weaknesses.
- **NEW! Adaptive Dynamic Study Modules,** created specifically for *Technology in Action*, 11th Edition, provide students with personalized review based on their strengths and weaknesses.
- **A powerful homework and test manager:** MyITLab lets you create, import, and manage online homework assignments, quizzes, and tests that are automatically graded. The bottom line: MyITLab means less time grading and more time teaching.
- **Comprehensive online course content:** Filled with a wealth of content that is tightly integrated with your textbook, MyITLab lets you easily add, remove, or modify existing instructional material. You can also add your own course materials to suit the needs of your students or department. In short, MyITLab lets you teach exactly as you'd like.
- **Robust Gradebook tracking:** The online Gradebook automatically tracks your students' results on tests, homework, and practice exercises and gives you control over managing results and calculating grades. And, it lets you measure and document your students' learning outcomes.
- **Easily scalable and shareable content:** MyITLab enables you to manage multiple class sections, and lets other instructors copy your settings so a standardized syllabus can be maintained across your department.



Companion Website

Includes an interactive study guide, online end-of-chapter material, additional Internet exercises, and much more.

The following media is available in MyITLab, and selected items are also on the companion website.

Note: To access the premium content, including Helpdesks, Sound Bytes, and Replay Videos from the companion site, students need to use the access code printed on the card in the front of the book.



pearsonhighered.com/techinaction

MyITLab • Enhanced eBook: The Enhanced eBook in MyITLab provides a continuous digital learning in a completely interactive environment that allows students to use technology as they learn. They don't have to stop reading to go find the activities such as Helpdesks, Sound Bytes, and Replay Videos—they just click on them and immediately experience the activity.

MyITLab • TechTown: This fully interactive scenario-based, simulation game lets students create

their own avatar and interact in a series of knowledge and puzzle-based scenarios. As they work and play, they explore the core topics of computer concepts—from what a computer is to software, hardware, networking, the Internet, social media, and more!

- MyITLab • NEW! Adaptive Dynamic Study Modules,** created specifically for *Technology in Action*, 11th Edition, provide students with personalized review based on their strengths and weaknesses.
 - **Sound Bytes:** These multimedia lessons help demystify computer concepts with audio and video presentations. All of the Sound Bytes have been updated to provide timely and accurate information.
 - **COMPLETELY UPDATED AND ENHANCED! Active Helpdesk Calls:** These highly interactive, engaging activities now provide students with a realistic experience of how help is delivered via phone, live chat, FAQ searches, and so on. Students play the role of the staff answering technology questions using these various approaches.
 - A virtual supervisor provides support to the student throughout calls.
 - Assessment questions after each call provide instructors with a tool to gauge and track students' progress.
 - **UPDATED! Replay videos:** The *Replay* videos provide an author-narrated video review of each *Chapter Part* in an easy-to-use format students can view on their phones, tablets, or computers!
 - **With Tech Bytes Weekly, every week is new!** This weekly newsfeed provides two timely articles to save instructors the prep time required for adding interesting and relevant news items to their weekly lectures. Tech Bytes Weekly also features valuable links and other resources, including discussion questions and course activities.
 - **Jeopardy! Game and Crossword Puzzles:** These assets give students a fun way to challenge their knowledge.

Transcript button
Used to turn transcript on or off

Sound Bytes
Multimedia lessons with video, audio, or animation and corresponding labs featuring multiple-choice quizzing.

Navigational tool

Audio lead students through

Video or animation teaches key concepts

Active Helpdesk
Interactive training that puts the student in the role of a helpdesk staffer fielding questions from callers.

Supervisor available to assist students.

Features textbook page references within each call and assessment at the end of each call.

Related Sound Bytes are referenced.

Audio on or off.

Annotated Instructor Edition

Provided with each chapter are two divider pages like the ones outlined below.

FRONT OF CHAPTER TAB

On the front side of each chapter tab, you'll find the following categories:

IN THE CLASSROOM: Activities you can use in a classroom or in online classes, including:

- PowerPoint Presentations
- Discussion Exercises
- Active Helpdesk Calls
- Sound Bytes

HOMEWORK: Activities used out of class for assessment or preparation for the next chapter, including:

- Web Resource Projects
- Active Helpdesk Calls
- Sound Byte Labs

ASSESSMENT:

- Blackboard
- WebCT
- TestGen
- myitlab
- Student Text Test Bank
- Sound Byte Test Bank
- Help Desk Test Bank

The back side of each chapter tab includes the relevant Try This exercise.

ETHICS TAB

On the Ethics tab, you will find the following:

OPPOSING VIEWPOINTS TABLE: Outlines ethics topics that you can use to debate in the classroom.

KEYWORDS: Provides you with additional words with which to search the Internet for more information related to the ethics topic.

Chapter 3

Using the Internet: Making the Most of the Web's Resources

In the Classroom	
	PowerPoint Presentation (located on the IRC) <small>Chapter 3 Consider using the PowerPoint presentation as a lecture guide, viewing it throughout the entire class. You can also customize it with additional art images from the IRC.</small>
	Audio PowerPoint Presentation (located on the IRC) <small>Can be used for online courses. Audio content expands on topics covered in the presentation.</small>
	Clicker PowerPoint Presentations (located on the IRC) <small>Ready interactive PowerPoint presentations</small>
	Discussion Exercise <small>Evaluating Websites After reviewing the online tutorial at www.widener.edu/about/campus_resources/wolfram_library/evaluate or http://library.acadiau.ca/tutorials/webevaluation, show students three examples of good websites and three examples of bad websites. Ask them to explain what makes the sites good or bad based on the material in the tutorial.</small>
	Active Helpdesk Call (located on the Companion Website) <small>Using Subject Directories and Search Engines This Helpdesk Call presents a topic that students usually find they've mastered, so they're often surprised to see how much they don't know. As you use the Helpdesk Call, have a browser open so that you can expand on what's discussed in the call.</small>
Homework	
	Chapter Assessment <small>Chapter Assessment Check Your Understanding with Multiple Choice Questions, True-False Questions, and Critical Thinking Questions, Chapter Summary and Key Terms, Making the Transition Projects, Team Time Projects, Ethics Projects</small>
	Writing Exercise (textbook p. 109) <small>Making the Transition to ... the Workplace Exercise 1: Online Resume Resources Have your students work through this exercise and discuss their results in class.</small>
	Preparing for the Next Technology in Focus <small>Writing Exercise Computer Survey Have students conduct a survey of their parents or other family members as to the first computer each person remembers using. Have them ask such questions as: What were the features they most remember, and why? How much did the system cost? How big was the monitor? How much memory did it include? Which of these technologies are now considered to be legacy technologies?</small>
Assessment	
	Test Bank (located on the IRC) <small>To test student comprehension, use the Test Bank questions for Chapter 3 general content. You can include questions from the Helpdesk and Sound Byte Test Banks, as well. This week, design the quiz as a timed, one-attempt quiz with some essay questions included.</small>

ethics in Action

How Important Is It to Use Ethical Search Engine Optimization Strategies?

If you take the time to build a website, you want customers to find it. Since many people find websites by using search engines, you want your website to rise to the top when searches are conducted. Search Engine Optimization (SEO) is using certain techniques and technologies that make search engines rank your site high on their results list when customers or potential customers do a search for your kind of business. Increasing your search engine rankings is not that easy, so most companies incorporate some search engine optimization strategies as a way to help bring customers in through the Internet. Some practices are more ethical than others. Do ethics matter with SEO strategies?

Conduct a debate or discussion using the opposing viewpoints in the table below. Keywords have been supplied to help you search the Internet for more information on the topic.

Proponents of SEO Strategies Argue	Opponents of SEO Strategies Argue
Exploiting SEO strategies can attract more users to your website.	Instilling practices such as stuffing lots of key words into the site's content may turn off users of the site once they do arrive there.
As long as the strategy meets the "intent" of the search engine guidelines, it's okay to push the boundaries.	Poorly executed SEO strategies can lead to long-term harm to a business's online presence by reducing overall traffic flow.
Just get people to the site by any means at all then you can deliver an ethical representation of your product.	Manipulating small quirks in search engine strategies shifts the efforts of your company from a basic focus on quality.

search:

engine optimization, white hat SEO, black hat SEO, grey hat SEO, SEO code of ethics

Instructor Resources

Instructor Resources

Online Instructor Resources Include:

- PowerPoint Presentations
- New Interactive Clicker PowerPoints*
- Student Text Test Bank
- Sound Byte Test Bank
- Help Desk Test Bank
- End of Chapter Answer Keys
- Rubrics
- Web Resources
- Image Library
- Sample Syllabi
- Additional Web Projects
- What's New in 11e
- Transition Guide
- TestGen

*NEW! Interactive, clicker PowerPoints allow faculty to obtain real-time responses to open-ended or critical thinking questions, determine which areas require further explanation, and then automatically group students for further discussion and problem solving.



**Technology In Action
Complete, 11/E**
Alan Evans
Kendall Martin
Mary Anne Poatsy

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1

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Technology on the World Stage

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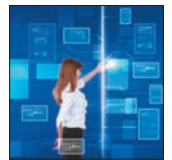
 **Sound Byte:** Questions to Ask Before You Buy a Computer



Technology and Your Career

OBJECTIVE

5. How can becoming computer literate help you in a career? (pp. 16–22)



For all media in this chapter go to pearsonhighered.com/techinaction or MyITLab.

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HOW COOL IS THIS?



Want to **make a difference with technology**? The good news is that it has never been easier. Technology is allowing more and more of us to become agents of change in our communities and in the world. For example, in London, over 20,000 school-age children are joining **Apps for Good**, a program that links students, educators, and local experts to guide students in designing and building apps to help solve problems they see around them. In the United States, the **Verizon Innovative App Challenge** offered schools across the United States prize money for student teams to design apps to address the needs of their communities. In Philadelphia, people met for a weekend-long civic hacking event called **Random Hacks of Kindness**. They created apps to keep track of lobbyists in city government, to map the location of murals in the city, and to help organize people to dig out fire hydrants after snowstorms. What kind of good can you do with technology? *(Bloomberg/Getty Images; www.rhok.org)*



Scan here for more info

How Will You Put Technology in Action?

Ask yourself: Why are you in this class? Maybe it's a requirement for your degree, or maybe you want to improve your computer skills. But let's step back and look at the bigger picture.

Technology today is not just a means for career advancement or merely a skill set needed to survive in society. It's a tool that enables us all to make an impact beyond our own lives. We've all seen the movies that dangle the dream in front of us of being the girl or guy who saves the world—and gets to drive a nice car while doing it! Whether it's *Transformers* or *Spider-Man*, we are drawn to heroes because we want our work and our lives to mean something and to benefit others.

Technology can be your ticket to doing just that, to influencing and participating in projects that will change the world. We'd like to ask you to think about how your talents and skills in technology will let you contribute on a larger scale, beyond the benefits they will bring to you personally.



technology on the WORLD STAGE

Recent political and global issues are showing that technology is accelerating change around the world and galvanizing groups of people in new ways. Let's look at a few examples.

Political Issues

Social Networking Tools. At the end of 2010, a series of revolutions took place across the Arab and North African regions fueled by social networking tools like Facebook and Twitter. The “Arab Spring” highlighted how **social networking** tools enable the gathering of groups of people to connect and exchange ideas, and they brought together people facing repression and censorship in many countries in the region.

In fact, politicians worldwide have begun to incorporate social networking as part of their political strategy (see Figure 1.1). In the United States, politicians like Barack Obama have Twitter and Facebook accounts that they use to communicate with their constituents. In Italy, Beppe Grillo drew the largest vote in a recent election for a single party using mainly Facebook and Twitter in place of television and newspaper ads. In India, the finance minister took his public discussion about budget not to the airwaves but to a Google+ Hangout session. Yatterbox, a British social media website, follows the social media activities of members of the House of Commons, the Scottish Parliament, and the Northern Ireland Assembly. UK politicians post over two million social media updates a year.

An advantage of social media is that others can immediately connect and engage in a two-way conversation. During the debate in the British Parliament on the legalization of gay marriage, for example, lawmakers were leaving chambers to tweet updates. The public had a chance to try to influence how the vote went through real-time feedback using social media. Social networking tools are therefore providing a level of instant connection and information distribution that is reshaping the world. What can you do with social networking tools that will change the future of your community?



FIGURE 1.1 German Chancellor Angela Merkel is one of many politicians using a Google+ Hangout to reach out to her constituents. Has technology ushered in a new, more participatory style of democracy? (Steffen Kugler/picture-alliance/dpa/AP Images)

Crisis-Mapping Tool. Another example of the interaction of technology and society is the software tool Ushahidi. Following a disputed election in Kenya, violence broke out all over the country. Nairobi lawyer Ory Okolloh tried to get word of the violence out to the world through her blog, but she couldn't keep up with the volume of reports. But two programmers saw her request for help and in a few days created Ushahidi (Swahili for “testimony”). It is a **crisis-mapping tool** that collects information from e-mails, text messages, blog posts, and Twitter tweets and then maps them, instantly making the information publicly available. The developers then made Ushahidi a free platform anyone in the world can use (see Figure 1.2). So when earthquakes rocked Haiti, Ushahidi instantly told rescuers where injured people were located. When a tsunami brought Japan to the brink of a nuclear catastrophe, Ushahidi let anyone with a mobile phone find locations with clean water and food.

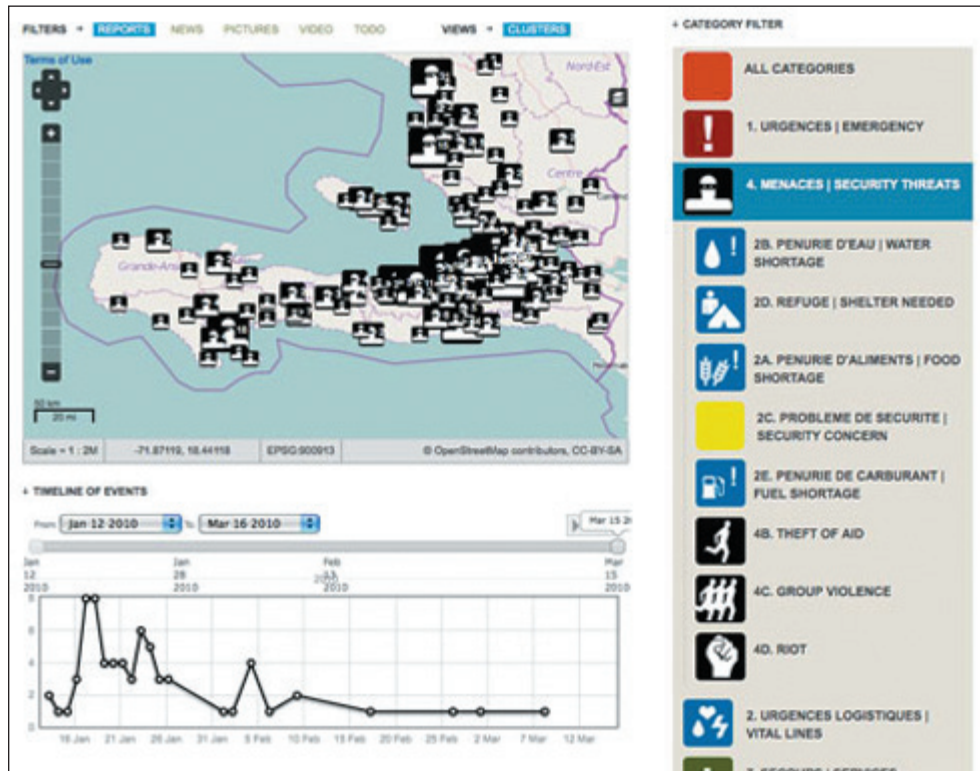


FIGURE 1.2 During a natural disaster in Haiti, Ushahidi crisis-mapping software helped identify areas of violence, helped people locate food and water, and directed rescuers to those in need. (Courtesy of Ushahidi)

Chile, Palestine, Somalia, and the Democratic Republic of Congo have all used this crisis-mapping software to save lives in times of political upheaval. In what other ways could technology help us face times of crisis?

Other Global Issues

Political crises are not the only arena in which technology is enabling global change.

Health Care. Infectious diseases account for about one-fifth of all deaths worldwide. Researchers say the odds of a flu pandemic occurring in the next century are nearly 100%. Could technology help us develop and deliver vaccines in a way that saves lives? With newer scientific visualization tools, scientists are developing antibodies for flu viruses and even HIV, viruses that are difficult to target because they continually change shape. Computationally intense modeling software is helping researchers increase the pace of vaccine production, saving lives.

Retinal prosthetics are another example of global health concerns being addressed with technology. Macular degeneration and retinitis pigmentosa are two diseases that destroy the retina; they account for the majority of blindness in developing nations. Sheila Nirenberg of Cornell University is working on a microchip that can replace the function of the retina, translating incoming light into the electrical pulses the brain

needs for vision. These biomedical chips could restore quality vision to the blind.

The Environment. What if every cell phone in the world had built-in atmospheric sensors? Then millions of points of air and water quality data from around the world could be constantly acquired. Tagged with geographical information, the data could alert scientists to new trends in our environment. And what if phone sensors could monitor for flu viruses? We could protect ourselves from pandemics by identifying outbreaks very early. Ideas like these are being explored by University of California—Los Angeles researcher Dr. Deborah Estrin, the director at the Center for Embedded Networked Sensing. Can you think of other ways you could use your cell phone to improve society?

The Digital Divide. There is a great gap in the levels of Internet access and the availability of technical tools in different regions of the world. The term coined for this difference in ease of access to technology is the **digital divide**. One danger of a digital divide is that it prevents us from using all the minds on the planet to solve the planet's problems. But this challenge created by technology is also being answered by technology.

The Next Einstein Initiative (NEI) is a plan to focus resources on the talented mathematical minds of Africa (see Figure 1.3). By expanding the African Institute for Mathematical Sciences (AIMS) across the continent, the future of Africa can be

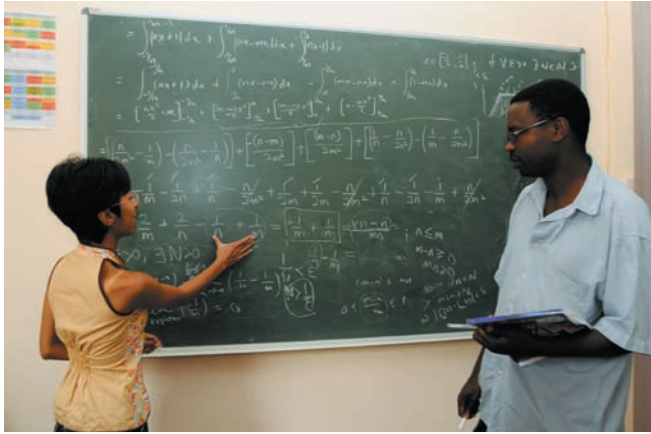




FIGURE 1.3 The Next Einstein Initiative is rallying the support of the world to identify mathematical genius. (AIMS – Next Einstein Initiative)

profoundly changed. Cambridge professor Neil Turok founded AIMS to bring together the brightest young minds across Africa with the best lecturers in the world. The NEI has won funding from Google’s Project 10¹⁰⁰, an initiative to award \$10 million to a set of five projects selected by open public voting. By capturing the enthusiasm of the world with presentations distributed through TED (ted.com) and Project 10¹⁰⁰, there is now a push to create 15 additional AIMS centers across Africa.

Figure 1.4 shows additional examples of people putting technology into action to impact the world. How will you join them? ■

FIGURE 1.4

Technology in Action: Taking on Global Problems

PERSON/ ORGANIZATION	GLOBAL PROBLEM	TECHNOLOGY USED	ACTION	FIND OUT MORE . . .
Peter Gabriel/ The Witness Project 	Human rights abuses	Video cameras	Provides video documentation of human rights abuses; the project contributed to the arrest of warlords in the Democratic Republic of Congo for the recruitment of child soldiers	The Witness Project: witness.org
Johnny Lee/Google	The digital divide prevents many from taking advantage of modern learning devices like smartboards	Nintendo Wii remote and open source software	Enables users to create a smartboard for \$50; the smartboard can record and store lecture content and is touch sensitive	Johnny Lee’s blog: procrastineering.blogspot.com
United Nations World Food Programme (WFP)	One in seven people in the world do not get enough food to eat	GIS (geographical information systems) and mobile devices	The WFP can analyze the location and need for food, positioning food where it will help the most	World Food Programme: wfp.org
Hod Lipson and Evan Malone/The Fab@Home Project	Cost and access barriers prevent people from having basic devices, gears, and parts	3-D printers and open source software	Printers enable users to fabricate 3-D objects such as electrical parts	Fab@Home: fabathome.org
Massachusetts Institute of Technology (MIT) Center for Future Civic Media 	Disposal of so many display devices into landfills	Software that allows multiple displays to connect and be reused	The software enables users to create one huge display device from a set of smaller units, thereby keeping monitors out of landfills	Junkyard Jumbotron: jumbotron.media.mit.edu

(AP Photo/Charles Sykes; Photo by Rick Borovoy; Junkyard Jumbotron Software by Rick Borovoy and Brian Kneip, Center for Civic Media, MIT; Photo subject: Chris Csikszentmihalyi)



FIGURE 1.5 Can we bridge the digital divide through mobile devices? Should we? (EIGHTFISH/Alamy)

The digital divide, the gap between those with easy access to technology and those with little to no access (see Figure 1.5), is a problem that leads to complex social issues. For those who lack access to the Internet and computers, it is difficult to develop computer skills, which are very often critical to future success. Less familiarity with the Internet can also lead to a lower level of active, engaged citizenship. So how should we attack the problem of the digital divide in the United States?

Recent studies from the University of Michigan show that without Internet access at home, teens from low-income households (family income under \$30,000 a year) are more likely than their wealthier counterparts to use their cell phones to go online. So the widening penetration of cell phones might be the answer to ending the digital divide. Or is it?

Going online using a cell phone plan is the most expensive of all options, and data transfer speeds are often slow. So teens with the least money are likely paying the most to get the slowest online experience. And they are more likely paying for it

themselves, as opposed to teens from wealthier households in which, according to the same University of Michigan study, the teens are more likely to be on family plans paid for by someone else.

In addition, teen cell phone usage is limited to managing online social networks, playing games, or listening to music. Computer tasks and skills that could lead to economic advancement, like filling out job applications or running a business, are not yet handled easily on mobile devices. So by not having free Internet access available, is our society placing those groups least able to afford access at an unfair disadvantage?

Will the increasing penetration of smartphones and faster cellular Internet access eliminate the digital divide in the United States? Should our government intervene and make sure there is sufficient free Internet access for all? Is it ethical to deprive the poorer segment of our society of a needed commodity? Answering challenging questions like these is part of being an informed citizen.



technology and OUR SOCIETY

Technology is also allowing us to redefine very fundamental parts of our social makeup—how we think, how we connect with each other, and how we purchase and consume products.

Technology Impacts How We Think

What We Think About. What do you think about in your free time? In the late twentieth century, a common trend was to think about what to buy next—or perhaps what to watch or listen to next. Information and products were being served up at an amazing rate, and the pattern of consumption became a habit. As more and more web applications began to appear that allowed each individual to become a “creator” of the web, a new kind of Internet came into being. It was nicknamed **Web 2.0**, and it had a set of new features and functionality that allowed users to contribute content easily and to be easily connected to each other. Now everyone could collaborate internationally at the click of a mouse.

Web 2.0 has fostered a dramatic shift across the world from simply consuming to having the ability to volunteer and collaborate on projects. In his book *Cognitive Surplus: Creativity and Generosity in a Connected Age*, author Clay Shirky created the term **cognitive surplus** to mean the combination of leisure time and the tools to be creative. The world’s population has an estimated one trillion hours a year of free time. When coupled with the available media tools and the easy connectivity of Web 2.0, and with generosity and a need to

share, projects like Ushahidi and the Witness Project (see Figure 1.4) emerge.

But why would anyone bother to work on projects like these in their free time? Modern theories of motivation show that what pushes people to apply their free time in altruistic causes, for no money, is the excitement of autonomy, mastery, and purpose (see Figure 1.6):

- **Autonomy:** the freedom to work without constant direction and control.
- **Mastery:** the feeling of confidence and excitement from seeing your own skills progress.
- **Purpose:** the understanding that you are working for something larger than yourself.

Together, these three factors play into how we are fundamentally wired and can produce incredibly motivated behavior. The combination of motivation, technology, and a cognitive surplus is leading to powerful projects that are changing the world.

Technology Impacts How We Connect

Connecting Through Music. In many societies, people connect intimately in gatherings and local celebrations through shared experiences. Technology like classical composer and conductor Eric Whitacre’s Virtual Choir has added breadth to this aspect of our lives. Whitacre began the idea of a virtual choir by posting to YouTube a video of himself conducting one of his works, “Lux Aurumque.” The idea was that listeners would follow his lead and, as they heard the piano track, each would record their part of the piece as either a soprano, an alto, a tenor, or a bass. The submitted videos were edited together, the audio was aligned, and the first piece from the Virtual Choir was released, with 50 recorded voices. A blog connects the members of the choir and builds a real sense of community between members. A glance at the Virtual Choir Map (ericwhitacre.com/the-virtual-choir/map) shows the physical location of each voice (see Figure 1.7).

Connecting Through

Business. One of the most profound ways we can connect with each other is to support other people’s dreams.



FIGURE 1.6 Our understanding of human motivation can play a role in our use of technology to impact society.



FIGURE 1.7 The Virtual Choir 4 performance of “Fly to Paradise” included over 5,900 singers from 101 countries. (Eric Whitacre’s Virtual Choir 4 - Fly to Paradise. Courtesy of Music Productions, Ltd.)

Kickstarter (kickstarter.com) helps us connect in this way by allowing people to post their ideas for community projects, games, and inventions and to ask for funding directly. Donors are given rewards for different levels of pledges, such as a signed edition of a book or a special color of a product. This style of generating capital to start a business is known as **crowdfunding**, asking for small donations from a large number of people, often using the Internet.

Technology Impacts How We Consume

Technology is changing all aspects of how we purchase and consume goods—from strategies for convincing you to purchase a certain product to the mechanics of how you buy and own things.



Marketing. New strategies in marketing are counting on the fact that most people have a cell phone with a camera and Internet access. A technology called **QR (quick response) codes** lets any piece of print host a link to

online information and video content. From your smartphone, simply run your QR app and hold the phone near the QR image anywhere you see it—like the one you see here and on page 3 page of this chapter. Your phone scans the QR image and then takes you to a website, video, schedule, or Facebook page for more information about the product.

Studies show 82% of shoppers go to the Internet on their cell phone before they make a purchase. They are often using so-called location-aware price comparison tools. Apps like ShopSavvy and RedLaser scan the bar code of the item and then compare prices with those of nearby stores and with the

best prices available online. Techy shoppers can then get “mobile coupons” (or *mobicoupons*) delivered to their cell phones thanks to sites like Zavers and Cellfire. The future promises specialized coupons created just for you based on your location and past buying preferences.

Marketers also have to be aware of the phenomenon of **crowdsourcing**—checking in with the voice of the crowd. Consumers are using apps like MobileVoice to check people’s verdicts on the quality of items. Forward-thinking companies are using this input to improve their products and services. AT&T, for example, has an app that lets customers report locations of coverage gaps.

Access Versus Ownership. Even the idea of ownership is evolving thanks to new technologies. Items like cars and bikes can become “subscriptions” instead of large one-time purchases. For example, Zipcar allows hundreds of thousands of people to use shared cars, and Call a Bike is a popular bike-renting program in Germany. With Zipcar, a phone call or online reservation activates your personal Zipcard. This card allows you to automatically open the door of the car you have reserved, and away you drive. GPS technology is used to track where the car is, whether it has been dropped off at the right location, and how far it has been driven. In Germany, racks of Call a Bikes are located at major street corners in large cities. Simply call the phone number printed on the bike and it texts you a code to unlock the bike. When you’re done riding the bike, simply relock it and you’re billed automatically. The New York City version of this program, Citi Bike, saw riders cover over 700,000 miles in the first three weeks of the program (see Figure 1.8).

These subscription-style business models are spreading now to smaller goods. Swap.com helps people trade