Chapter

1 The Impact of Technology in a Changing World

For a chapter overview, watch the **Chapter Overview videos**.

PART 1

Technology in Society

Learning Outcome 1.1 **You will be able to discuss the impact of the tools of modern technology on national and global issues.**

Technology in a Global Society 32

Objective 1.1 *Describe various technological tools being used to impact national and global issues.*

Objective 1.2 *Describe various global social issues that are being affected by technology.*

Technology Connects Us with Others 34

Objective 1.3 *Describe how technology is changing how and why we connect and collaborate with others.*

Objective 1.4 *Summarize how technology has impacted the way we choose and consume products and services.*

Helpdesk: Technology Impacts

The Importance of Computer Literacy 36

Objective 1.5 *Characterize computer literacy and explain why it is important to be computer literate.*

Sound Byte: Virtual Computer Tour

PART 2

Emerging Technologies and Ethical Computing

Learning Outcome 1.2 **You will be able to describe emerging technologies, such as artificial intelligence, and how technology creates new ethical debates.**

Artificial Intelligence 41

Objective 1.6 *Describe artificial intelligence systems and explain their main goals.*

Helpdesk: The Impact of Artificial Intelligence

Working with Artificial Intelligence and Other Information Technologies 45

Objective 1.7 *Describe how artificial intelligence and other emerging technologies are important in many careers.*

Ethical Computing 50

Objective 1.8 *Define ethics and describe various ethical systems.*

Objective 1.9 *Describe influences on the development of your personal ethics.*

Objective 1.10 *Present examples of how technology creates ethical challenges.*

Sound Byte: How to Debate Ethical Issues

Sample pages

MyLab IT All media accompanying this chapter can be found here.

Make This A Virtual Assistant on **page 40**

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sample pages

What do you think?

Having a **background in technology and computer science** enables you to be a powerful contributor in many career fields. More universities are realizing this and **creating a new department, CS + X**. What is CS + X? The CS stands for Computer Science, while the **X stands for a second area of study** that blends with computer technology. For example, the X might be Music, with the combined degree including study of the perception of music and use of digital programming to create new instruments. Or the X might be Archaeology, with the curriculum including courses on the computer simulation of human behavior and creating virtual reality models. Universities that are creating CS + X departments argue that **combining computer science with other skills produces students who are better journalists, artists, scientists, and so on**. The possibilities for collaboration between your passions and technology are endless.

Which field would you be most curious about combining with CS?

- *Literature*
- *Statistics*
- *Business*
- *Nursing*
- *Criminal Justice*
- *Anthropology*
- *Art*
- *Other*

See the end of the chapter for a follow-up question.

(Jacob Lund/Shutterstock)

Part 1

For an overview of this part of the chapter, watch **Chapter Overview Video 1.1**.

Technology in Society

Learning Outcome 1.1 **You will be able to discuss the impact of the tools of modern technology on national and global issues.**

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 is a tool that enables us all to make an impact beyond our own lives. We've all seen 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!

Technology can be your ticket to doing just that by influencing and participating in projects that will change the world.

Technology in a Global Society

Recent national 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.

Impact of Tools of Modern Technology

Objective 1.1 *Describe various technological tools being used to impact national and global issues.*

Social Media Tools

Social media platforms like Twitter, Facebook, and Instagram enable people to connect and exchange ideas. These platforms also bring together people facing similar problems to fight for social change. For example, the Twitter hashtag #MeToo began as a way of supporting women facing sexual harassment and assault but evolved to galvanize an international movement. A simple hashtag brought to light an important social issue and was a key means for revealing how widespread the problem was.

Figure 1.1 Social media has changed how we access, distribute, and evaluate information. *(Rudmer Zwerver/Shutterstock)*

How we conduct informed discussion in the age of social media is still developing, however. Bot accounts, automated programs retweeting news stories and quotes, have been used to create discord around controversial topics in many countries—enflaming the gun control debate in the United States or fanning prejudice into violence in Sri Lanka. For these and other reasons, knowing how to use and critically evaluate social media is an important skill needed by all (see Figure 1.1).

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. However, two programmers saw her request for help and in a few days created Ushahidi. It is a

Sample pages

Figure 1.2 Ushahidi crisis-mapping software has been used to identify areas of violence against women in India. *(Pixhall/Alamy Stock Photo)*

crisis-mapping tool that collects information from e-mails, text messages, blog posts, and 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). It has since been used in several international disasters. In what other ways may technology help us face times of crisis?

Global Issues

Objective 1.2 *Describe various global social issues that are being affected by technology.*

Let's look at the different global social issues that are being affected by technology.

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 to save lives? Using 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.

As we learn more about the terrible consequences of concussion injuries, technology is playing a part in providing a solution. Researchers now know that even without an actual concussion, athletes can sustain serious damage from repeated impacts of their brain against the skull. Computer programs have collected sensor data from impacts on the field, which scientists have analyzed and used to create a new kind of helmet. College programs and the NFL now use enhanced helmets, designed to better distribute the impact of collisions.

The Environment

What if every cell phone in the world had built-in atmospheric sensors? Then millions of points of data measuring air and water quality from around the world could be acquired. The data could be tagged with geographical information, alerting scientists to new trends in our environment. Ideas like these are being explored by researchers around the world.

Smart Internet-connected water sprinklers are another technology that is already saving water in California and other dry areas of the country. The sprinkler system checks the weather forecast so it won't use water when rain is coming the next day. The system is showing a 30% reduction in water usage.

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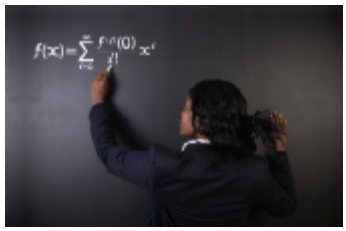

Figure 1.3 The Next Einstein Initiative (NEI) is rallying the support of the world to identify and encourage mathematical genius. *(Alistair Cotton/123RF)*

The Digital Divide

There is a serious gap in the levels of Internet access and the availability of technical tools in different regions of the world. The term for this difference in 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 global problems. But this challenge created by technology is also being answered by it.

The Next Einstein Initiative (NEI) is a plan to focus resources on the talented mathematical minds of Africa (see Figure 1.3). Cambridge professor Neil Turok founded the African Institute of Mathematical Sciences (AIMS) to bring together the brightest young minds across Africa with the best lecturers in the world. By capturing the enthusiasm of the world with presentations distributed through TED (*ted.com*) and Google's Project 10^{100}, there is now a push to create additional AIMS centers across Africa.

Table 1.1 shows additional examples of people putting technology into action to impact the world. How will you join them?

Table 1.1 Technology in Action: Taking on Global Problems

Person/ Organization	Global Problem	Technology Used	Action	Find Out More . . .
Start Network	Corruption	Blockchain, a digitized public ledger for recording a series of transactions	Blockchain technology can help track humanitarian aid funds as they flow from donors to recipients.	Start Network: *startnetwork.org*
SolaRoad/ Netherlands	The need for a renewable, nonpolluting energy resource	Solar cells	Solar cells are integrated into the asphalt roadway. They collect solar energy and distribute electricity all day.	Netherlands SolaRoad: *solaroad.nl*
United Nations World Food Programme (WFP)	Issues of hunger for 1 in 7 of the world's population	GIS (geographical information systems) and mobile devices	The WFP can analyze the location and need for food, positioning it where it will help the most.	World Food Programme: *wfp.org*
Gates Foundation	The threat of global pandemic disease, like Ebola, or weaponized biological warfare	Mobile apps, data analytics, and enhanced global communications	Worldwide organizations like the Gates Foundation are taking steps to build better networks to detect outbreaks and deliver vaccines.	Gates Foundation: *gatesfoundation.org*

Sample Pages

Technology Connects Us with Others

Technology is also allowing us to redefine 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 and Why We Connect and Collaborate

Objective 1.3 *Describe how technology is changing how and why we connect and collaborate with others.*

Collaborating for the Benefit of Others

With the arrival of many web applications that allow individuals to become "creators" of the web, a new kind of Internet has come into being. Nicknamed Web 2.0, the web now allows users to easily contribute content and connect with each other. Web 2.0 has fostered a dramatic shift across the

world, from simply consuming to having the ability to volunteer and collaborate on projects. The term cognitive surplus was coined to reflect the combination of leisure time and the tools to be creative. The availability of media tools and the easy connectivity of Web 2.0, along with generosity and a need to share, also enable projects like Ushahidi to emerge.

Connecting Through Business

One of the most profound ways we can connect with each other is to support other people's dreams. Someone with an idea can begin by building a first attempt at an area makerspace. Then by posting a launch video on a site like Kickstarter that person can reach people who believe in the idea. Donors agree to put money forward, knowing the product may not come to fruition, in exchange for special rewards like a discounted price or a special color version. This means of generating capital to start a business is known as crowdfunding, asking for small donations from a large number of people. Over $4 billion of funding for businesses has been raised using Kickstarter. Business ideas are not the only projects benefiting from crowdfunding. Sites like GoFundMe allow people to crowdfund to raise money for things such as medical bills or tuition.

Technology Impacts How We Consume

Objective 1.4 *Summarize how technology has impacted the way we choose and consume products and services.*

Technology is also changing how we decide what we'll purchase and how we actually buy goods and services.

Marketing

There are almost 2 billion views of videos each month on YouTube, and marketers are taking note. *Influencers* are YouTube personalities with huge followings and high levels of interaction with their followers. Placing a product for review on their channel or showing a popular YouTube celebrity using that product in their own life can be a huge marketing win.

Marketers also have to be aware of the phenomenon of crowdsourcing—checking in with the voice of the crowd. Frito-Lay's "Do Us a Flavor" campaign asked customers to vote online for what flavor chips to make next. The Lego Ideas website lets fans contribute projects they would like to see and the most popular are produced for sale. Marketing has shifted to take advantage of our digital lifestyle.

Access Versus Ownership

Even the idea of ownership is evolving. Items like cars and bikes can now be "subscriptions" instead of purchases. Services like Uber and Lyft let you use your car to provide rides for others while Zipcar allows you to use a shared car whenever you need it. Bicycles can be shared in most cities with programs like New York City's Citi Bike. It typically supports almost 80,000 rides per day. These new sharing options have revolutionized the transportation industry (see Figure 1.4).

Such collaborative consumption implies that we are joining together as a group to use a specific product more efficiently. There are increasing opportunities to share the services a product provides instead of owning it outright. Mounting environmental concerns and global financial pressures are other forces pushing us toward collaborative consumption (see Figure 1.5).

Figure 1.4 With smartphones and constant networking, sharing services like CitiBike, Zipcar, Uber, and Lyft have revolutionized transportation options. *(MShieldsPhotos/Alamy Stock Photo; Metamorworks/Shutterstock; Mr.Whiskey/Shutterstock; Piotr Swat/Shutterstock)*

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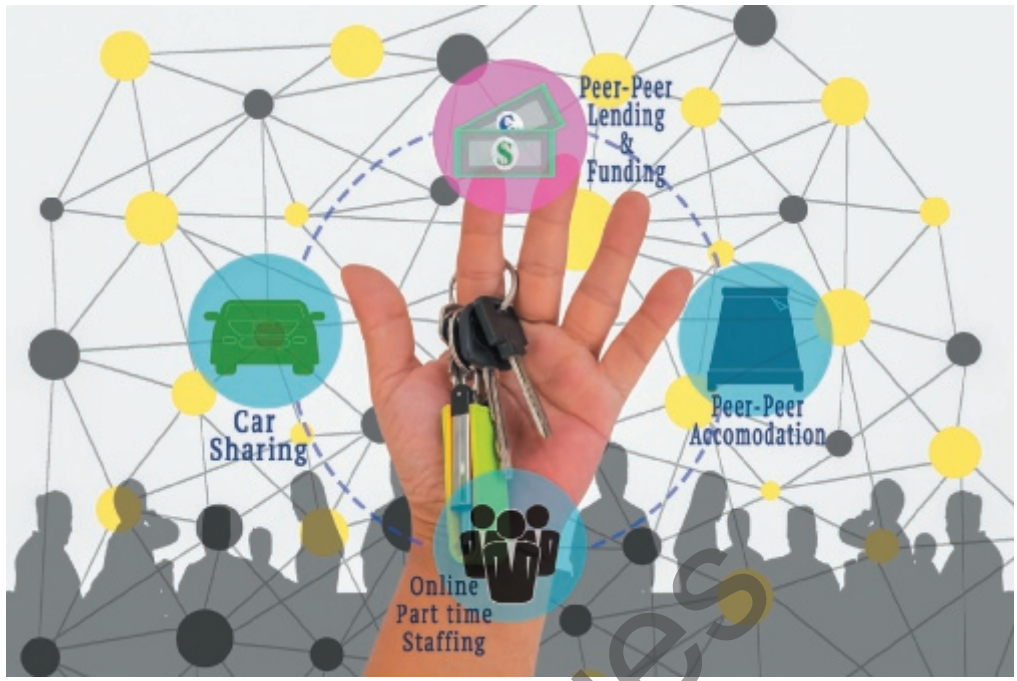

Figure 1.5 Collaborative consumption means that we use networking to share a resource (for example, a car or home) so many people can use the same object. *(Montri Nipitvittaya/Shutterstock)*

The Importance of Computer Literacy

Helpdesk MyLab IT

Technology Impacts

In this Helpdesk, you'll play the role of a helpdesk staffer fielding questions about ways in which technology affects society.

Everywhere you go, you see ads for computers and other devices. Do you know what all the words in the ad mean? What is a GPU? How fast do you need your computer to be, and how much memory should it have? If you're computer literate, you'll be a more informed consumer when it comes time to buy computers, peripherals, and technology services. Understanding computer terminology and keeping current with technology will help you better determine which computers and devices you need.

Computer Literacy

Objective 1.5 *Characterize computer literacy and explain why it is important to be computer literate.*

Let's look at a few examples of what it means to be a savvy computer user and consumer.

Computer literacy. When you are computer literate (see Table 1.2), you understand the capabilities and limitations of computers and you know how to use them safely and efficiently. The topics listed in Table 1.2 and more are covered in detail in the remaining chapters.

Avoiding hackers and viruses. Hackers and viruses can threaten a computer's security. Being aware of how they operate and knowing the damage they can cause can help you avoid falling prey to them.

Protecting your privacy. If your identity is stolen, your credit rating can be quickly ruined. Do you know how to protect yourself from identity theft when you're online?

Understanding the real risks. Being computer literate means being able to separate real privacy and security risks from things you don't have to worry about. Do you know whether cookies pose a privacy risk when you're on the Internet? Do you know how to configure a firewall for your needs?

Using the web wisely. People who are computer literate know how to find reliable, accurate information effectively. They also know how to use the web to work well with others. Are you effective in how you use the web?

Avoiding online annoyances. How can you avoid spam—unsolicited electronic junk mail? Do you know what adware and spyware are? Do you know the difference between viruses, worms,

Sample pages

Table 1.2 What Does It Mean to Be Computer Literate?

You can **avoid falling prey to hackers and viruses** because you are aware of how they operate.	You know how to **protect yourself from identity theft.**	You can **separate the real privacy and security risks from things you don't have to worry about.**
You know how to find information and **use the web effectively**.	You can **avoid being overwhelmed by spam, adware, and spyware**.	You can how to **diagnose and fix problems** with your hardware and software.

(Peter Dazeley/The Image Bank/Getty Images; Yuri_Arcurs/E+/Getty Images; Zakai/DigitalVision Vectors/Getty Images; Justin Lewis/Stone/Getty Images; Argus/Fotolia; Ivanastar/Istock/Getty Images)

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and Trojan horses? What software—the instructions that tell the computer what to do—should you install on your computer to avoid online annoyances?

Being able to maintain, upgrade, and troubleshoot your computer. Learning how to care for and maintain your computer and knowing how to diagnose and fix certain problems can save you time and money. Do you know how to upgrade your computer if you want more memory? Do you know which software and computer settings can keep your computer in top shape? Understanding the hardware of your computing system is a critical part of your computer literacy. (See the Virtual Computer Tour Sound Byte to get started.)

Keeping up to date. Finally, becoming computer literate means knowing about new technologies and how to integrate them into your life. Can you connect your TV to your wireless network? What is a media server, and do you need one? Can a USB type C connection carry HDMI video signals? Being able to stay up to date with technology is an important skill.

This book will help you become computer literate. In Chapter 3, you'll find out how to get the most from the web while staying free from the spam and clutter Internet surfing can leave behind on your computer. Chapter 6 shows you how to determine whether your hardware is limiting your computer's performance and how to upgrade or shop for a new device. Chapter 9 covers how to keep your computer and your digital life secure. You'll be able to save money, time, and frustration by understanding the basics of how computer systems operate.

Sound Byte MyLab IT

Virtual Computer Tour

In this Sound Byte, you'll take a video tour of the inside of a desktop system unit; locate the power supply, CPU, and memory; and learn more about what's inside a computer.

Before moving on to Part 2:

1. Watch Chapter Overview Video 1.1.
2. Then take the Check Your Understanding quiz.

Check Your Understanding // Review & Practice

For a quick review to see what you've learned so far, answer the following questions.

multiple choice

1. Which of the following organizations uses GIS technology and mobile devices across its global operations?
   a. e-NABLE
   b. The Witness Project
   c. United Nations World Food Program (WFP)
   d. Next Einstein Initiative
2. Which of the following terms represents the difference in the levels of Internet access and the availability of technical tools in different parts of the world?
   a. social divide
   b. digital lag
   c. digital divide
   d. cognitive surplus
3. Nowadays, many companies, in a quest to improve the quality of their products, take feedback from consumers using
   a. crowdsourcing.
   b. subscriptions.
   c. crowdfunding.
   d. collaborative consumption.
4. Crowdfunding helps startup businesses by
   a. selling stock more easily.
   b. using QR codes to advertise and market products.
   c. gathering financial contributions from supporters.
   d. replacing Web 2.0 technology.
5. Collaborative consumption is when people get together to
   a. find the best prices on products.
   b. increase the use of a single product by sharing access to it.
   c. fight diseases of the respiratory tract.
   d. exchange reviews on services and goods they have purchased.

Sample pages

chew on this

(Steve Young/Fotolia)

Our thoughts are influenced by the information fed to our mind all day long. Web 2.0 has created numerous channels for people to offer their own work for free—open source software and free music, text, and artwork, to name a few. How has this affected your thinking, what you create, and what value you put on creative work?

MyLab IT

Go to **MyLab IT** to take an autograded version of the *Check Your Understanding* review and to find all media resources for the chapter.

For the IT Simulation for this chapter, see MyLab IT.

Try This

What Does Facebook Know about You?

Social media sites like Facebook and Twitter do not charge you a fee. They make a profit by selling information about your behavior to marketers. By watching what groups you join and what posts you read, their algorithms make conclusions about what kind of person you are. In this exercise we'll show you how to check what information these sites have deduced about who you are. For more step-by-step instructions, watch the Chapter 1 Try This video on MyLab IT.

What You Need

A Facebook account

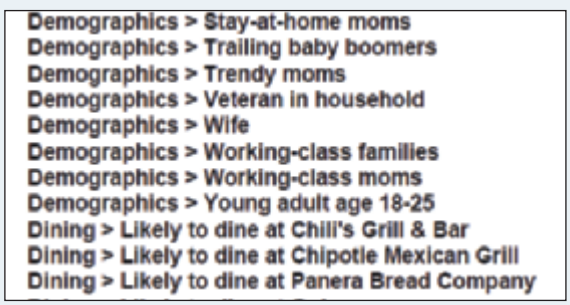
A Twitter account

(rvlsoft/Shutterstock; Solomon7/Shutterstock)

Step 1 **From the Facebook website, download your Facebook data.** On the top line of your Facebook page, click the dropdown arrow on the far right and select **Settings**. Next, select **Your Facebook Information** and click **Download Your Information**. Click the **Create File** button. Facebook will e-mail you when the file is ready.

(Used with Permission from Kendall Martin)

Step 2 **From the Twitter website, download the information Twitter has created on you.** Click on your Twitter avatar and select **Settings and privacy**. From the list on the left, select **Your Twitter data**. Scroll to the bottom and under **Download your Twitter data**, and click the **Request data** button. It will be e-mailed to you when the report is ready.



Step 3 **Examine what these algorithms have decided about you.** Check the list of interests and what items they think you will likely buy. How accurately have they guessed your household income, your politics, and your finances?

Sample pages

Make This

TOOL: IFTTT.com (If This Then That)

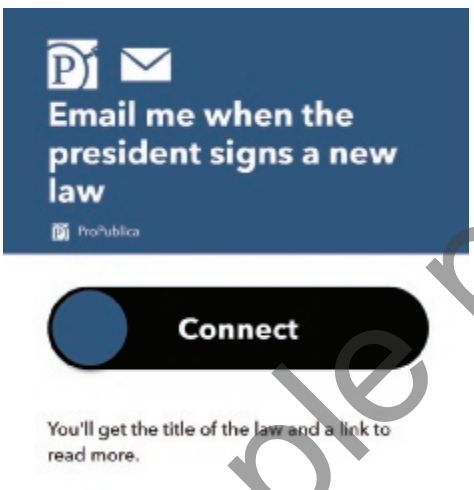
A Virtual Assistant

If This Then That (*IFTTT.com*) is an Internet-based tool that helps you get things done automatically. By using "recipes" within this web-based tool, you can automate tasks you do during the day, such as:

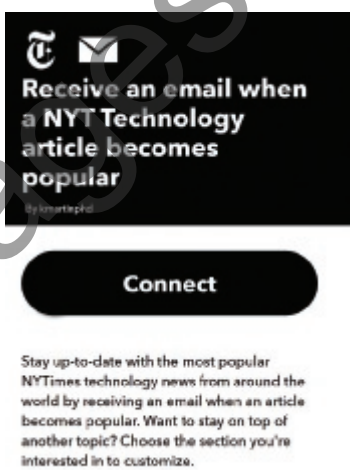
- automatically silencing your phone when you go into class,
- automatically texting your manager when you're on your way to work, or
- notifying you when the president signs a new law.

In this exercise, you'll explore using IFTTT to create recipes like these.

Make the Internet work for you by knowing this one programming statement: IF THIS, THEN THAT.



(IFTTT Inc.)



(IFTTT Inc.)

For the instructions for this exercise, go to MyLab IT.

Sample pages

Part 2

For an overview of this part of the chapter, watch **Chapter Overview Video 1.2**.

Emerging Technologies and Ethical Computing

Learning Outcome 1.2 **You will be able to describe emerging technologies, such as artificial intelligence, and how technology creates new ethical debates.**

Can computing devices really think? Are virtual assistants like Alexa intelligent, or do they just mimic thinking? Rapid developments in the field of artificial intelligence have forced us to consider many new ethical debates. It's important to learn about new advancements in technology, such as artificial intelligence, as well as to understand the ethical dilemmas technology presents.

Artificial Intelligence

Artificial intelligence focuses on creating computer systems that have an ability to perform tasks associated with human intelligence. Let's explore in detail what artificial intelligence is and how it impacts you.

Artificial Intelligence Basics

Objective 1.6 *Describe artificial intelligence systems and explain their main goals.*

What exactly is intelligence? Intelligence is the ability to acquire and apply knowledge and skills. Sociologists point to characteristics that make human beings intelligent, such as learning from experiences, reasoning, problem solving, perception, and using language. Animals can exhibit complex behavior, such as birds flying south for the winter, but this is attributed to instinct rather than intelligence. Some animals can even solve problems, such as sea otters that use rocks to crack open shellfish so they can consume them. But what separates us from other animals is the ability to combine behaviors as opposed to demonstrating one specific rote behavior (such as flying south for the winter).

What is artificial intelligence? Artificial intelligence (AI) is a branch of computer science that focuses on creating computer systems able to perform tasks that are usually associated with human intelligence. By this definition, any computer-controlled device that accomplishes something thought of as "intelligent" by humans is considered AI.

Do computers "think" like human beings? In the 1950s, the goal was to create a machine that could think like a human. Early examples included expert systems that mimicked doctors in diagnosing illnesses. But this goal has shifted somewhat toward creating machines that generate intelligent output but that do not necessarily mimic the human thought process.

Consider visiting the library. You could tell a human librarian your interests and the librarian could ask you some questions and then recommend books you might like. The Amazon recommendation engine fulfills the same purpose. However, the Amazon recommendation engine doesn't mimic a human librarian's thought process but instead analyzes vast amounts of data about you and other shoppers to make its recommendations. It provides intelligent results, but it does not arrive at those results the same way a human would.

Helpdesk MyLab IT

The Impact of Artificial Intelligence

In this Helpdesk, you'll play the role of a helpdesk staffer, fielding questions about artificial intelligence.

Sample pages

What are the main areas of research for AI? AI's central goals can be grouped into a number of categories (see Table 1.3):

- Natural language processing (NLP): NLP works to develop AI systems that understand written and spoken words and can interact with humans using language.
- Perception: AI systems have senses just as we do. AI systems use sonar, accelerometers, infrared, magnetic, and other electronic sensors to gather data. Being able to combine all the data from sensors and then construct information from it is a difficult challenge.
- Knowledge representation: Knowledge representation involves encoding information about the world into formats that the AI system can understand. Humans possess a vast collection of general knowledge based on their experiences in the world. AI systems need to build knowledge bases to solve problems. Developing a knowledge base and using it efficiently are active areas of research and have been demonstrated effectively by IBM's artificial intelligence computer Watson.
- Planning: AI systems need to set goals and then achieve them. An AI system might need to plan how to move a blue block out of the way to reach a red one or how to rotate a block as it moves to fit through a narrow opening.
- Problem solving: Humans tend to make intuitive judgments when solving a problem rather than perform a step-by-step analysis. AI programming combines a rules-based approach, along with trying to make judgments with incomplete information.
- Learning: Like humans, AI algorithms adapt and learn through experience. Supervised learning is used when the system can be trained with a huge number of examples. Unsupervised learning is when a system can look at data and build rules on its own to decide what it is seeing.

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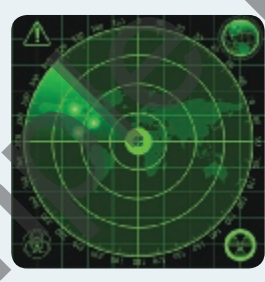
Table 1.3 Main Areas of AI Research

Natural Language Processing	Perception	Knowledge Representation
Understanding Written and spoken words	 Using sensors to gather data	Storing and accessing information about the world
Planning	**Problem Solving**	**Learning**
Goal must be set and achieved	Using even incomplete information to achieve solution	Improve through experience

(Convisum/123RF; Andrija Markovic/123RF; Galina Peshkova/123RF; Viktor Bondar/123RF; Tomertu/123RF; Sentavio/123RF)

A project like a self-driving (autonomous) car requires research in many of these areas. The car must have computer vision—the ability to interpret visual information the way humans do. The AI system needs to be able to tell the difference between trees and pedestrians, but it also needs to know many things about trees and people. Is the tree going to run into the path of the car? The car must scan the scene with sensors, recognize objects, and consult a knowledge base to create and execute a plan.

What has enabled us to deploy effective AI systems? Many information technology developments have contributed to the functional AI systems that we have today.

Artificial Neural Networks

Expert systems, computer programs that mimic the experience of human experts such as doctors or lawyers, were among the first attempts at producing AI. Rules-based systems, software that asks questions and responds based on preprogrammed algorithms, were the first expert systems designed. These systems asked questions ("Do you have a fever?") and initiated other questions or actions based on the answers ("How long have you had a fever?") and worked adequately for some settings. But just a list of rules is not sophisticated enough to handle difficult tasks.

Artificial neural networks (ANNs) are designed based on the structure of the human brain (see Figure 1.6), which is a network of loosely connected neurons. When signals are received by a neuron, it fires an electrical impulse and the signal travels to all the neurons connected to it. In ANNs, digital signals take the place of biological signals. Many modern ANNs feature different layers of neurons that allow many degrees of complexity. ANNs have allowed researchers to tackle complex problems such as speech recognition.

Machine Learning

Machine learning (ML) is a type of AI that doesn't need to be specifically programmed. Instead, it analyzes patterns in data, then uses the patterns to draw conclusions and adjust the actions of the AI system accordingly. By learning, the AI system can adapt itself and become constantly better at its task. You have interacted with these kinds of systems if you use Alexa, the Amazon voice recognition device. Alexa gathers input from human speech and uses this information to become better at understanding language over time.

Deep learning (DL) is a subset of the ML field that describes systems capable of learning from mistakes, just as humans do. DL algorithms can learn from data that is not labeled as "correct" or "incorrect." The algorithm adapts to improve its final result without being presented with a huge, labeled set of training data. This is known as unsupervised learning.

Having a basic understanding about AI systems is necessary to becoming a digitally literate citizen. In the next section, we'll explore various workplace systems that use AI.

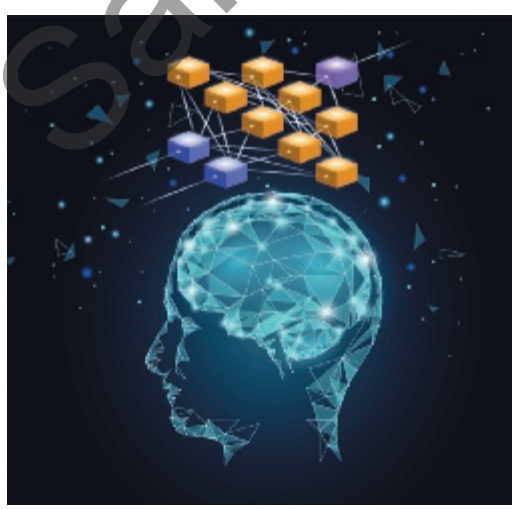


Figure 1.6 Human neurons can either send a signal or block one. Artificial neurons mimic this behavior digitally. *(LuckyStep48/Alamy Stock Photo)*

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Ethics in IT

Ethics in Computing

Should there be rules for conduct in a virtual world? If so, what should they be? What does plagiarism mean in a world where people can easily copy, paste, and upload content of all kinds? Should workplaces be allowed to monitor their employees' computing activities without their knowledge? Should websites be allowed to capture data related to what visitors do on their sites and analyze and sell that data? Should programmers be responsible if their software malfunctions and leads to personal injury or financial loss? Should Internet access be provided for free by communities to their citizens who cannot afford it? How should artificial intelligence be designed to behave ethically? These are the sorts of ethical questions and challenges that technology poses—questions that did not even exist just a few years ago.

As the reach of technology continues to spread, these are questions that more and more societies must face and develop their own answers to. Because different societies have different ideas of what it means to behave ethically, there will be many solutions to ethical questions. How we navigate cultural responses to ethical challenges becomes more important as the pace of technology quickens. How should U.S. companies respond to censorship of their websites in countries such as China? A state in the United States can declare that online gambling is illegal, but what does that mean when its citizens have access to foreign websites hosting gambling (see Figure 1.7)?

Answering challenging ethical questions related to technology is part of being a digitally literate citizen. This text will help you understand technology and the ethical issues it poses. Taking the time to think deeply about the connection between technology and ethics is one step in being a more knowledgeable and thoughtful global citizen.

Cengage pages

Figure 1.7 How do we enforce ethical standards in our global, Internet-enabled environment? (*lucadp/123RF*)

Working with Artificial Intelligence and Other Information Technologies

Information technology (IT) is a field of study focused on the management and processing of information. IT careers include working with computers, telecommunications, and software deployment. Career opportunities in IT are on the rise, but no matter what career you choose, the workplace demands new skill levels in technology from employees. Understanding how AI systems and other technologies can be utilized in the workplace is an important skill for everyone.

Technology and Your Career

Objective 1.7 *Describe how artificial intelligence and other emerging technologies are important in many careers.*

One of the benefits of being digitally literate is that you will most likely be able to perform your job more effectively. Your understanding of key concepts in technology can "future-proof" you, letting you easily and quickly react to the next round of new technologies.

Let's look at a whole range of industries and examine how current and emerging technologies are a part of getting work done.

Retail

The amount of data generated each second of the day is staggering (see Figure 1.8). AI systems deployed in the retail sector are responsible for managing huge amounts of data and performing

Sample pages

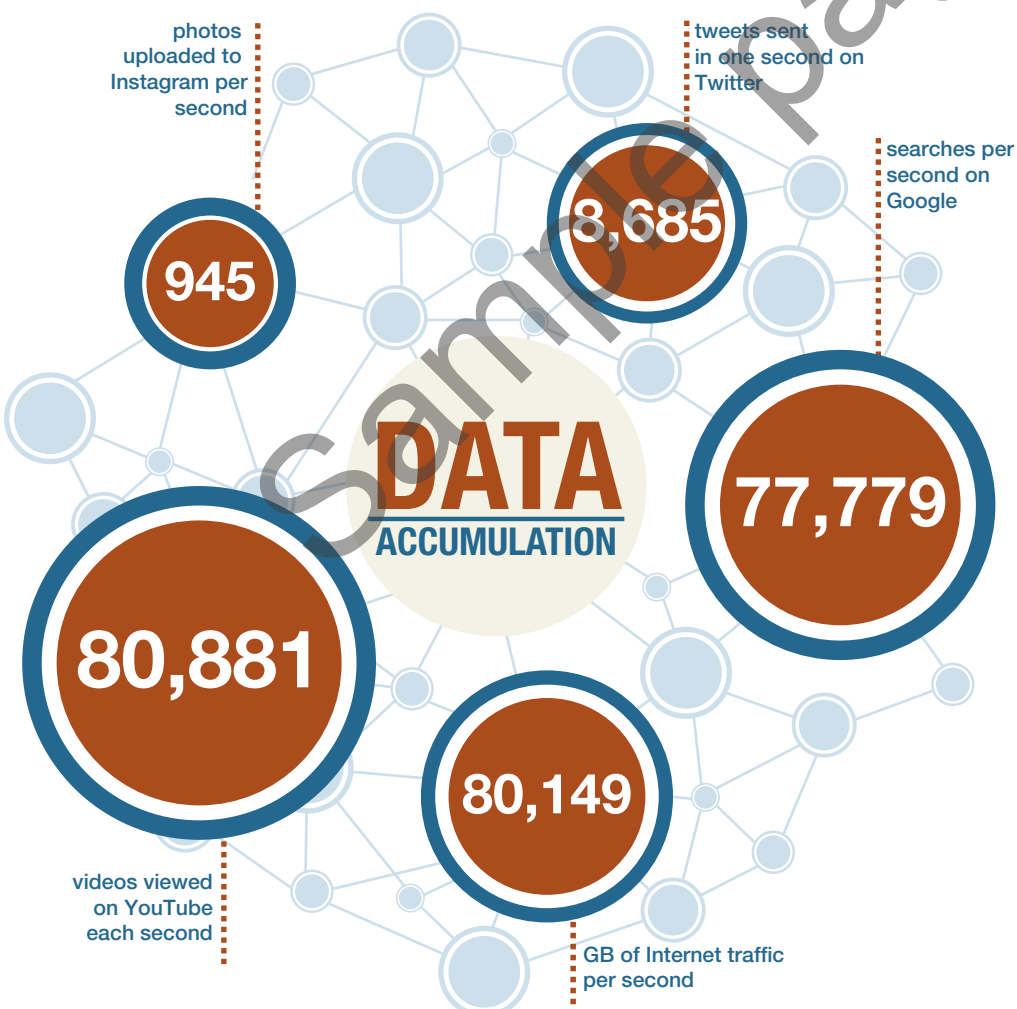


Figure 1.8 Enormous amounts of data are produced every second. Data mining is performed by sophisticated AI systems such as recommendation engines. *(Based on data from http://www.internetlivestats.com/)*

data mining analysis for managers. For example, retailers often study the data gathered from register terminals to determine which products are selling on a given day and in a specific location. In addition to using inventory control systems, which help managers figure out how much merchandise they need to order to replace stock, managers can use mined data to determine that if they want a certain product to sell well, they must lower its price. Such data mining thus allows retailers to respond to consumer buying patterns.

Recommendation engines are AI systems that help people discover things they may like but are unlikely to discover on their own. The secret behind recommendation engines is crunching massive amounts of data effectively. Without the ability to collect massive amounts of data and use data mining to understand it, recommendation engines wouldn't exist. Presenting effective recommendations and learning to make better recommendations are essential to Amazon's success. About 35% of Amazon's sales come from customers using the recommendation list.

Figure 1.9 Autonomous (self-driving) trucks are poised to revolutionize the transportation industry. *(Scharfsinn/Shutterstock)*

Banking

Credit card processors and banks use AI systems to analyze huge volumes of transaction data to spot fraud. Banks use software to assess the risk of extending credit to customers by analyzing spending patterns, credit scores, and debt repayment. The same software also helps determine what interest rates and terms to offer on loans. Researchers at MIT determined that using AI to evaluate credit risk could help reduce an institution's loan losses by 25%.

Transportation

Most cars actually are moving for only 5 percent of their lifetime. Self-driving cars and fleets of trucks would optimize the use of vehicles and increase safety. The software that can anticipate actions of other drivers is proving more difficult to develop than predicted, but with all major car manufacturers working to have a solution you can expect to see this area grow over the next several years. In the next few years trucking companies will face major changes if self-driving trucks become common (see Figure 1.9).

Robots and Embodied Agents

Many robots are deployed in industrial settings doing hazardous or repetitive tasks. But it is difficult to design robots that can match human dexterity and mobility. This has led to designs that mimic how humans walk and grasp objects, producing robots called embodied agents (see Figure 1.10) that look and act like human beings. Still, there are many jobs in which human empathy and understanding are highly valued, such as in medicine, education, and counseling. But we will continue to see more robots appearing in our everyday lives.

Figure 1.10 *Embodied agents* are robots that mimic humans in appearance. *(Dmytro Zinkevych/Shutterstock)*

Education

In the education field, intelligent personal assistants are being used in a variety of ways to support learning. For example, virtual language instructors engage in conversations with students, correcting their grammar and offering new word choices to expand their vocabulary.

Plagiarism checkers, like Turnitin, initially relied on brute force comparisons of student work to databases of published material, looking for exact text matches. But with so much more data now produced, this approach is impractical. Modern plagiarism agents use machine learning to spot similar patterns in writing and estimate the likelihood that it was plagiarized. This allows instructors to review only the papers flagged by the AI for suspected plagiarism, which increases the instructor's efficiency.

As an educator, being digitally literate will help you integrate computer technologies like these into your classroom.

Sample pages

Bits&Bytes Is It AI or Human? Take a Turing Test!

Alan Turing was an early pioneer in computer design and cryptography who inspired many designers of the first digital computers. He proposed a simple test to distinguish between a human and a computer system. The Turing test (see Figure 1.11) places a person in a room, asking written questions of two other "people." But one person is a live human being, while the other is a computer. If the questioner can't tell which one of the respondents is a computer, then Turing felt the computer had reached "intelligence." The computer is permitted to be deceptive; however, the human is required to help the questioner reach the correct conclusion.

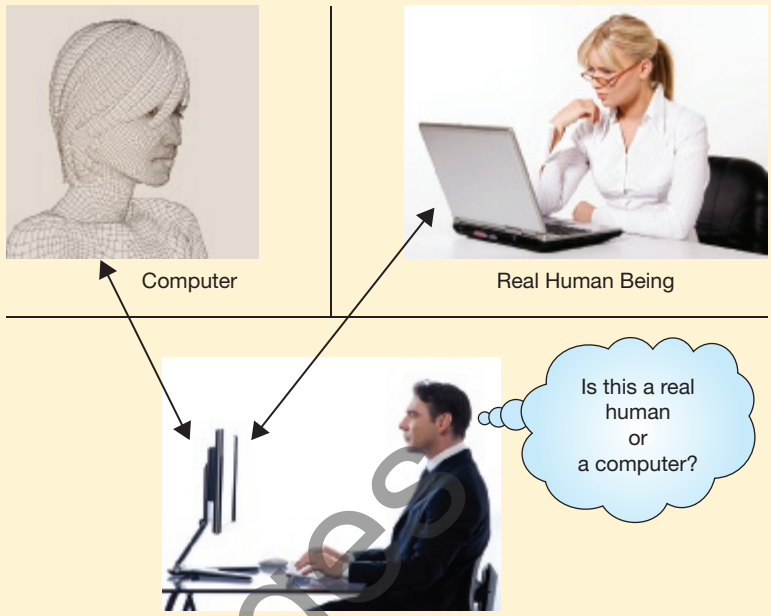


Figure 1.11 Basic Components of a Turing Test *(Design36/Shutterstock, Fotek/123RF, Ostill/123RF)*

Law Enforcement

Today, AI systems are being used in police cars and crime labs to solve an increasing number of crimes. For example, facial reconstruction systems like the one shown in Figure 1.12 can turn a skull into a finished digital image of a face, allowing investigators to proceed far more quickly with identification than before.

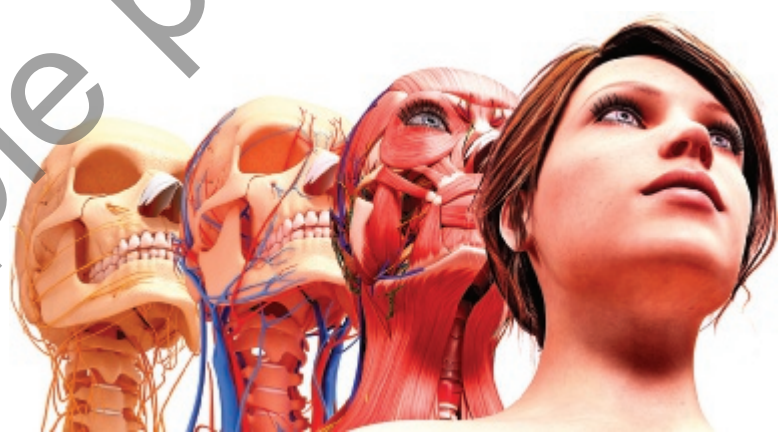


Figure 1.12 Tissue-rendering programs add layers of muscle, fat, and skin to create faces that can be used to identify victims. *(Pixologicstudio/Science Photo Library/Alamy Stock Photo)*

Using AI-powered software, proprietary law enforcement databases can be analyzed for similarities between crimes in an attempt to detect patterns that may reveal serial crimes. In fact, a law enforcement specialty called computer forensics is growing in importance in order to fight modern crime. Computer forensics analyzes computer systems with specific techniques to gather potential legal evidence. For example, Steven Zirko was convicted of two Chicago-area murders based on computer forensics work. Computer forensics examiners trained by the FBI scoured Zirko's computer and located searches for terms like *hire a hitman.* In many cases, files, videos, and conversations conducted using a computer can be recovered by forensics specialists and can be used as evidence of criminal activity.

Medicine

A career in medicine will connect you to new ways of using technology to better people's lives. Websites like Modernizing Medicine (*modmed.com*) use AI software to search through data on millions of patient visits and treatments provided by thousands of physicians. The website can help doctors quickly diagnose conditions with which they're not familiar and research alternative means of treatment for illnesses to reduce costs and side-effects for patients.

AI is also being integrated directly into patient information systems. Dashboards on the physician's computer screen can make recommendations about treatments to specific patients after

Sample pages

Figure 1.13 3D printing has become a tool for developing more inexpensive, and more stylish, prosthetic devices. *(Cem Ozdel/Anadolu Agency/Getty Images)*

the AI has analyzed their genetic traits and compared them to millions of other patients through records. The AI can recommend drugs for treatment as well as remind physicians about tests they may need to perform.

The design and construction of prosthetic devices is another area of medicine impacted by modern technology. MIT's Biomechatronics lab has developed software that uses an array of pressure sensors to gauge the softness or stiffness of a patient's remaining tissue to create a better fit for a prosthetic to the limb. Meanwhile, 3D printing is allowing more inexpensive designs for prosthetic arms and legs, and more stylish artificial limbs as well (see Figure 1.13).

Psychology

Fear of speaking in public is common, but for people with autism spectrum disorders, making proper eye contact and reacting to social cues is so difficult that it can severely limit their opportunities for relationships and jobs. Researchers at the MIT Media Lab have developed a system to help improve interpersonal skills for people who have autism.

MACH (My Automated Conversation coacH) is a computer system that generates an on-screen person that can, for example, conduct a job interview or appear ready for a first date. The computerized person (see Figure 1.14) nods and smiles in response to the user's speech and movement. This is an example of affective computing, developing systems that can recognize and simulate human emotions. MACH users can practice as many times as they wish in a safe environment. They receive an analysis that shows how well they modulated their voices, maintained eye contact, smiled, and how often they lapsed into "umms" and "uhhhs."

Sample Pages

Figure 1.14 My Automated Conversation coacH (MACH) generates an on-screen interviewer you can practice with over and over. *(Zero Creatives/Cultura Limited/SuperStock)*

Dig Deeper XR Extended Reality

What is *extended reality*? XR is the full set of ways we can manipulate reality with digital intervention, whether augmented reality (AR), new virtual realities (VR), or a combination of real world and digitally created reality (mixed reality).

Augmented reality (AR) is the addition of digital information directly into our reality, either to add more detail or at times to remove unwanted visual effects. How does this happen?

AR 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 in augmented reality apps for smartphones or placed in the natural world like a heads-up display on a car windshield to show car speed and location. Displays in stores that augment your image with the clothing you're interested in, creating a virtual fitting room (see Figure 1.15), are another example of AR.

Instead of adding information to the reality you perceive, virtual reality (VR) replaces it with a different world. Virtual reality creates an artificial environment that is immersive and interactive. VR environments can be as simple as a pair of goggles or as elaborate as entire "caves" that you walk into (see Figure 1.17). VR has also come to the consumer gaming market with the introduction of VR goggles, like Sony's Project Morpheus and the Rift by Oculus (see Figure 1.18). These goggles have high pixel count displays that wrap your full field of view.

Mixed reality is a mixture of both worlds. Digitally created objects are placed in the real world and can be interacted with directly. Surgeons might interact with a 3D hologram of their patient, and that information can be used to guide a robotic system to perform those steps (see Figure 1.17).

So reality may be a bit less absolute than it once seemed. Whether we are adding, creating, or combining digital environments, XR technology is expanding our sense of what is real.

Figure 1.15 This high-tech fitting room uses augmented reality technology to allow shoppers to try on clothes virtually. *(Yoshikauz Tsuno/Staff/AFP/Getty Images)*

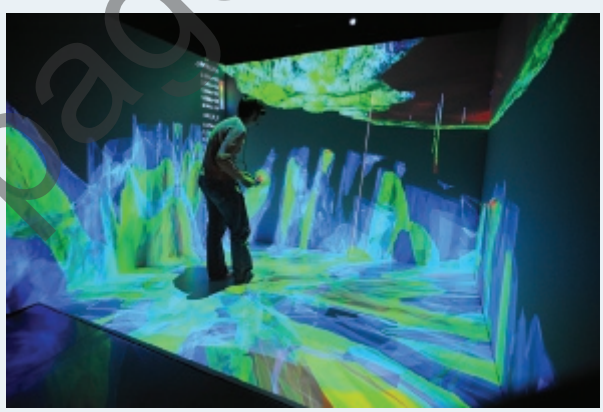


Figure 1.17 Virtual reality "caves" replace our ordinary reality with a new, immersive environment. *(Idaho National Laboratory/US Department of Energy/Science Photo Library)*

Figure 1.16 Surgeons use mixed reality. Their glasses project 3D scans of the structures they are manipulating in real time. *(ImaginechinaLimited/Alamy Stock Photo)*

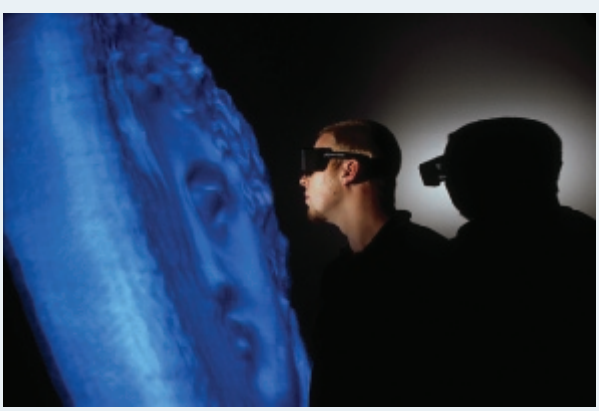


Figure 1.18 VR goggles like these wrap around your full field of view, creating a totally immersive environment. *(Philippe Plailly/Science Photo Library)*

Sample pages

Ethical Computing

As noted earlier, technology has brought about a new set of ethical challenges. And because technology often moves faster than rules can be formulated to govern it, how technology is used is often left up to the individual and the guidance of his or her personal ethics. Ethical considerations are complex, and reasonable people can have different, yet valid, views. In this section, we define ethics and then examine a set of ethical systems. Next, we discuss personal ethics and how technology affects our personal ethics. Finally, we ask you to consider what your personal ethics are and how you make ethical choices.

Defining Ethics

Objective 1.8 *Define ethics and examine various ethical systems.*

Ethics is the study of the general nature of morals and of the specific moral choices individuals make. Morals involve conforming to established or accepted ideas of right and wrong (as generally dictated by society) and are usually viewed as being black or white. Ethical issues often involve subtle distinctions, such as the difference between fairness and equity. Ethical principles are the guidelines you use to make decisions each day, decisions about what you will say, do, and think.

There are many systems of ethical conduct (see Table 1.4). *Relativism* states that there is no universal truth and that moral principles are dictated by the culture and customs of each society. *Divine command theory* follows the principle that God is all knowing and that moral standards are perfectly stated by God's laws, such as the Ten Commandments. *Utilitarianism* judges actions to be right or wrong solely by their consequences. Actions that generate greater happiness are deemed to be better than those actions that lead to less happiness. *Virtue ethics* teaches that we each have an internal moral compass and should try to be a person who spontaneously follows that guide. Finally, the duty-based ethical system, or *deontology,* suggests we should all follow common moral codes and apply those to all humanity.

Systems of Ethics

What is the difference between laws and ethics? Laws are formal, written standards designed to apply to everyone. It's impossible to pass laws that cover every human behavior, though. Therefore, ethics provide a general set of unwritten guidelines for people to follow. Unethical behavior isn't necessarily illegal, however. Consider the death penalty. In many U.S. states, putting convicted criminals to death for certain crimes is legal. However, many people consider it unethical to execute a human being for any reason.

Not all illegal behavior is unethical, either. Civil disobedience, which is intentionally refusing to obey certain laws, is used as a form of protest to effect change. Gandhi's nonviolent resistance to the British rule of India, which led to India's establishment as an independent country, and Martin Luther King's protests and use of sit-ins in the civil rights movement are both examples of civil disobedience. What does civil disobedience look like in our hyper-connected age of social media and the Internet?

Note that there is also a difference between unethical behavior and amoral behavior. Unethical behavior is not conforming to a set of approved standards of behavior—cheating on an exam, for example. Amoral behavior occurs when a person has no sense of right and wrong and no interest in the moral consequences of his or her actions, such as when a murderer shows no remorse for his or her crime.

There is no universal agreement on which system of ethics is the best. Most societies use a blend of different systems. Regardless of the ethical system of the society in which you live, all ethical decisions are greatly influenced by personal ethics.

Sound Byte MyLab IT

How to Debate Ethical Issues

This Sound Byte will help you consider important aspects of debating difficult issues arising from the ethical use of technology.

Sample Pages

Table 1.4 Systems of Ethics

Ethical System	Basic Tenets	Examples
Relativism	• There is no universal moral truth. • Moral principles are dictated by cultural tastes and customs.	Topless bathing is prevalent in Europe but generally banned on public beaches in the United States.
Divine Command Theory	• God is all-knowing and sets moral standards. • Conforming to God's law is right; breaking it is wrong.	The Ten Commandments of Christian religions The Five Pillars of Islam
Utilitarianism	• Actions are judged solely by consequences. • Actions that generate greater happiness are judged to be better than actions that lead to unhappiness. • Individual happiness is not important. Consider the greater good.	Using weapons of mass destruction ends a war sooner and therefore saves lives otherwise destroyed by conventional fighting.
Virtue Ethics	• Morals are internal. • Strive to be a person who behaves well spontaneously.	A supervisor views the person who volunteered to clean up a park as a better person than the workers who are there because of court-ordered community service.
Deontology (Duty-Based)	• Focus on adherence to moral duties and rights. • Morals should apply to everyone equally.	Human rights (like freedom of religion) should be respected for all people because human rights should be applied universally.

(Solomin Andrey/Fotolia; Olga Galushko/Fotolia; Kentoh/Fotolia; Alexmillos/Fotolia; Scanrail/Fotolia)

Sample pages

Personal Ethics

Objective 1.9 *Describe influences on the development of your personal ethics.*

Each day as you choose your words and actions, you're following a set of personal ethics—a set of formal or informal ethical principles you use to make decisions. Some people have a clear, well-defined set of principles they follow. Others' ethics are inconsistent or are applied differently in different situations.

A person's ethics develop in many ways. Naturally, your family plays a major role in establishing the values you cherish in your own life, and these might include a cultural bias toward certain

Part 2
Emerging Technologies and Ethical Computing

Learning Outcome 1.2 **You will be able to describe emerging technologies, such as artificial intelligence, and how technology creates new ethical debates.**

Artificial Intelligence

Objective 1.6 *Describe artificial intelligence systems and explain their main goals.*

- Artificial intelligence (AI) focuses on creating computer systems that have an ability to perform tasks associated with human intelligence.
- Machines using AI do not necessarily mimic the human thought process.
- Current AI research is focused in the following areas: natural language processing, perception, knowledge representation, planning, problem solving, and learning (both supervised and unsupervised).
- A Turing test can be used to determine whether a system is a computer AI or a human being.

Working with Artificial Intelligence and Other Information Technologies

Objective 1.7 *Describe how artificial intelligence and other emerging technologies are important in many careers.*

- Artificial intelligence impacts the full range of careers, from retail and psychology to robotics and medicine.
- Understanding how to use software, how to use and maintain computer hardware, and how to take advantage of Internet resources will help you be a more productive and valuable employee, no matter which profession you choose.

Ethical Computing

Objective 1.8 *Define ethics and describe various ethical systems.*

- Ethics is the study of moral choices.
- There are several different ethical systems. There is no universal agreement on which system is best.
- Unethical behavior is not necessarily unlawful behavior.
- Amoral behavior is when a person has no sense of right and wrong.

Objective 1.9 *Describe influences on the development of your personal ethics.*

- Personal ethics are a set of formal or informal ethical principles you use to make decisions in your life.
- Your personal ethics develop from a number of sources: your family values, your religion, the values of the larger culture, and your life experiences.

Objective 1.10 *Present examples of how technology creates ethical challenges.*

- Technology is posing new ethical challenges with regard to intellectual property, privacy, social justice, liability, censorship, social activism, and automated robotic machinery, among other concerns.

Sample pages

MyLab IT

Be sure to check out **MyLab IT** for additional materials to help you review and learn. And don't forget to watch the Chapter Overview videos.

Key Terms

affective computing **48**
amoral behavior **50**
artificial intelligence (AI) **41**
artificial neural networks (ANNs) **43**
augmented reality (AR) **49**
bot accounts **32**
cognitive surplus **35**
collaborative consumption **35**
computer forensics **47**
computer literate **36**
computer vision **43**
crisis-mapping tool **33**
crowdfunding **35**
crowdsourcing **35**
data mining **46**
deep learning (DL) **43**
digital divide **34**
embodied agents **46**
ethics **50**
expert systems **43**
hacktivism **55**
information technology (IT) **45**
intellectual property **53**
intelligence **41**
knowledge representation **42**
machine learning (ML) **43**
natural language processing (NLP) **42**
personal ethics **51**
predictive policing **53**
recommendation engines **46**
rules-based systems **43**
social media **32**
software **37**
spam **36**
supervised learning **42**
Turing test **47**
unethical behavior **50**
unsupervised learning **42**
virtual reality (VR) **49**
Web 2.0 **34**

Chapter Quiz // Assessment

For a quick review to see what you've learned, answer the following questions. Submit the quiz as requested by your instructor. If you are using **MyLab IT**, the quiz is also available there.

multiple choice

1. A computing technique that relates to the development of computer systems that can recognize and simulate human emotions is known as
   a. augmented reality.
   b. cloud reality.
   c. affective computing.
   d. ethical computing.

2. Sophisticated modeling software is helping international researchers
   a. create more intricate screenplays and movie scripts.
   b. analyze computer systems to gather potential legal evidence.
   c. market new types of products to a wider audience.
   d. increase the pace of research in finding and producing vaccines.

3. Which of the following is one of the basic tenets of *relativism?*
   a. Moral principles are dictated by cultural tastes and customs.
   b. Morals should apply to everyone equally.
   c. Morals are internal and we should follow them spontaneously.
   d. God is all-knowing and sets moral standards.

4. Crowdfunding sites include
   a. Citi Bike and Zipcar.
   b. Bing and Google.
   c. Kickstarter and GoFundMe.
   d. Amazon and Netflix.

5. Which of the following is not a recommended step to help a person in determining personal ethics?
   a. Keep track of individual preferences.
   b. List the key principles you believe in.
   c. Identify external influences.
   d. Examine various ethical systems.

6. Being computer literate includes being able to
   a. avoid spam, adware, and spyware.
   b. use the web effectively.
   c. diagnose and fix hardware and software problems.
   d. all of the above.

7. All of the following are current focuses of AI research EXCEPT
   a. natural language processing.
   b. perception.
   c. cognitive surplus.
   d. knowledge representation.

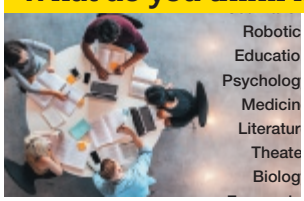
Sample pages

8. Which of the following statements is FALSE?
   a. Unethical behavior is always illegal.
   b. Ethical decisions are usually influenced by personal ethics.
   c. Individuals who have no sense of right or wrong exhibit amoral behavior.
   d. Life experience affects an individual's personal ethics.
9. Which of the following actions would NOT help to identify your personal ethics?
   a. Describe yourself.
   b. Conduct a genetic study of your extended family.
   c. Identify the influences of your work environment.
   d. Prepare a list of values that are most important to you.
10. Intellectual property
   a. is the result of someone's creative work and design.
   b. can be protected legally by the patent system.
   c. can include works of music, film, or engineering design.
   d. all of the above.

true/false

_____ **1.** Relativism approach defines that moral principles are derived from cultural taste and social norm.
_____ **2.** The move toward access instead of ownership is a sign of cognitive surplus.
_____ **3.** The success of 3D printing technology has allowed inexpensive designs for prosthetic arms and legs.
_____ **4.** Web-based databases cannot be used to help investigators solve criminal cases.
_____ **5.** Hacktivism is different from cyberterrorism.

What do you think now?



1. Examine your answer to the What Do You Think question from the beginning of the chapter. Describe how the topics of this chapter have influenced you. Have they pushed you to change your answer? Reinforced your thinking? Why?
2. Using the Reilly Top 10 list (*reillytop10.com*), investigate three areas where technology is producing conflict for society. What kind of CS + X combination majors would produce people who are well equipped to solve these challenges?

Sample pages

Team Time

A Culture of Sharing

problem

As more and more peer-to-peer music-sharing services appeared, like BitTorrent and LimeWire, many felt a culture of theft was developing. Some argued there was a mindset that property rights for intellectual works need not be respected and that people should be able to download, for free, any music, movies, or other digital content they wanted.

But there is another view of the phenomenon. Some are suggesting that the amount of constant access to other people—through texting, e-mail, blogging, and the easy exchange of digital content—has created a culture of trust and sharing.

This Team Time will explore both sides of this debate as it affects three different parts of our lives—finance, travel, and consumerism.

task

Each of three groups will select a different area to examine—finance, travel, or consumerism. The groups will find evidence to support or refute the idea that a culture of sharing is developing. The finance group will want to explore projects like Kickstarter (*kickstarter.com*) and Kiva (*kiva.org*). The travel group should examine what is happening with Airbnb (*airbnb.com*) to

start their research. The team investigating consumerism will want to look at goods-exchange programs like Freecycle (*freecycle.org*).

process

1. Divide the class into three teams.
2. Discuss the different views of a "culture of sharing." With the other members of your team, use the Internet to research up-and-coming technologies and projects that would support your position. People use social media tools to connect into groups to exchange ideas. Does that promote trust? Does easy access to digital content promote theft, or has the value of content changed? Are there other forces like the economy and the environmental state of the world that play a role in promoting a culture of sharing? What evidence can you find to support your ideas?
3. Present your group's findings to the class for debate and discussion.
4. Write a strategy paper that summarizes your position and outlines your predictions for the future. Will the pace of technology promote a change in the future from the position you are describing?

conclusion

The future of technology is unknown, but we do know that it will impact the way our society progresses. To be part of the developments that technology will bring will take good planning and attention, no matter what area of the culture you're examining. Begin now—learn how to stay on top of technology.

Ethics Project

Can Data Predict Your Grade?

background

As you move through your academic career, you leave an enormous swath of data: which courses you chose to register for; which ones you looked at but didn't pick; and how you did on each homework assignment, test, and project. Could this massive amount of data be analyzed to predict your grade in a course? Could the data suggest which courses you should take next? Should those predictions be public to your instructor, to you, and to financial aid officers?

research topics to consider

- Course Signals
- Degree Compass, Austin Peay State University

process

1. Divide the class into teams. Each team will select a web-based tool that allows access to information.
2. Team members should each think of a situation where a person would benefit from the type of results data mining can bring to a campus and a situation where it might be undesirable.
3. Team members should select the most powerful and best-constructed arguments and develop a summary conclusion.
4. Team members should present their findings to the class or submit a PowerPoint presentation for review by the rest of the class, along with the summary conclusion they developed.

conclusion

As technology becomes ever more prevalent and integrated into our lives, we will increasingly face ethical dilemmas. Being able to understand and evaluate both sides of the argument, while responding in a personally or socially ethical manner, will be an important skill.

Sample pages

Solve This MyLab IT Grader

How Technology Is Used on the World Stage and in Your Personal Life

In this activity, you'll use Microsoft Word to reflect on how technology is affecting the world as well as you, personally and professionally. Reflect on the content in Chapter 1 as you work through this exercise.

You will use the following skills as you complete this activity:

- Open and Modify a Document Template
- Apply Styles and Advanced Font Formats
- Use Format Painter
- Insert Text
- Apply Themes
- Create a Header and Footer

Instructions

1. Open TIA_Ch1_Start.docx. Save the document as **TIA_Ch1_LastFirst.docx**, using your own Last and First names.
2. Double-click the **Title placeholder** and type **Technology**, then double-click the **Heading 1 placeholder** and type **Introduction**. Press Enter, then type the following: **Political and global issues are showing that technology is accelerating change around the world and galvanizing groups of people in new ways. Technology allows us to refine how we connect with each other, and it also impacts our daily personal and professional experiences.** Press **Enter**.
3. Type **How Technology Impacts Society**, press **Enter**, and then type a few sentences that describe how technology is impacting global events such as political revolutions, health care, the environment, and the digital divide. In addition, address how businesses are using social media. Press **Enter**.
4. Type **How Technology Impacts Me Personally and Professionally**, press **Enter**, and then type a few sentences that describe how technology is impacting your personal life. You should address the importance of being computer literate. You should also address the kinds of technology being used in the industry of your current or desired career.
5. Click anywhere in the heading *Introduction*, then using **Format Painter**, apply the **Heading 1** format to the paragraph headers: *How Technology Impacts Society* and *How Technology Impacts Me Personally and Professionally*.
   Hint: Format Painter is in the Clipboard group on the Home tab.
6. Change the Document Theme style to the **Slice Theme**.
   Hint: Document Themes are found on the Design tab, in the Document Formatting group.
7. Select the title *Technology*, then format the font as **Small caps**. **Center align** the title.
   Hint: Click the dialog box launcher in the Font group on the Home tab to access the Small caps font effect.
8. Apply the **Whisp header style** to the document. Click to add Today's date in the Date header and delete the Document title header. Add a **File Path** to the document footer. Select the footer text and change the font size to **8**. Close the Header and Footer.
   Hint: Headers are found on the Insert tab in the Header & Footer group. File Path is found in Document Info in the Insert group on the Header & Footer Tools Design tab.
9. Save the document and submit based on your instructor's directions.

Sample pages