

CPSI10003 GETTING STARTED WITH COMPUTERS AND MICROSOFT OFFICE



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CPSI10003 Getting Started with Computers and Microsoft Office

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SECTION OVERVIEW

1.1: Introduction to Microcomputer Applications Sections

Topic hierarchy

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1.1.1: Introduction to Microcomputer Applications

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Technology Scenario

WorldCorp welcomes you to your new position within the company, a multinational corporation where the jobs are plentiful, and the future is bright. To be successful at WorldCorp, you will need to know a little bit about the computing past and a lot about the computing present. You'll also need to have a sense of the computing future, especially as it pertains to business. That's what this chapter is about. You will also need to know how to perform basic functions at WorldCorp using two major computer programs you've probably heard of—Microsoft 365, or more commonly known as Office, and Google Workspace. The next chapter in this textbook, Essentials of Software Applications for Business, covers the basics of these programs.



Figure 1.1: Today's workspaces represent decades of advances in technology. Portable personal computers, cellular communications, tablets, and advances in artificial intelligence have changed the way people do their jobs. (credit: modification of "Home office, Computer, Desk" by Pexels/Pixabay, CC0)

WorldCorp activities presented in other chapters will lay out specific computing tasks, such as formatting documents, creating spreadsheets, designing online slide presentations, posting on social media, and conducting virtual meetings. Even though the online environment changes rapidly, these are fundamental computing skills that workers need regardless of their level of employment. As you move forward in the text, you will learn more about WorldCorp, its structure, products, customers, and strategies.

Chapter Learning Objectives

1. Recognize information systems and their key components.
2. Outline the fundamental history of information systems.
3. Examine the primary components, including technology, people, and process.
4. Identify the evolution of technology integrations within an organization.
5. Identify communication and network concepts, systems, and applications.

Welcome to the world of information systems, a world that seems to change almost daily. Over the past few decades information systems have progressed to being virtually everywhere, even to the point where you may not realize its existence in many of your daily activities. Stop and consider how you interface with various components in information systems every day through different electronic devices. Smartphones, laptop, and personal computers connect us constantly to a variety of systems including messaging, banking, online retailing, and academic resources, just to name a few examples. Information systems are at the center of virtually every organization, providing users with almost unlimited resources. Have you ever considered why businesses invest in technology? Some purchase computer hardware and software because everyone else has computers. Some even invest in the same hardware and software as their business friends even though different technology might be more appropriate for them. Finally, some businesses do sufficient research before deciding what best fits their needs. As you read through this book be sure to evaluate the contents of each chapter based on how you might someday apply what you have learned to strengthen the position of the

business you work for, or maybe even your own business. Wise decisions can result in stability and growth for your future enterprise. Information systems surround you almost every day. Wi-fi networks on your university campus, database search services in the learning resource center, and printers in computer labs are good examples. Every time you go shopping you are interacting with an information system that manages inventory and sales. Even driving to school or work results in an interaction with the transportation information system, impacting traffic lights, cameras, etc. Vending machines connect and communicate using the Internet of Things (IoT). Your car's computer system does more than just control the engine – acceleration, shifting, and braking data is always recorded. And, of course, everyone's smartphone is constantly connecting to available networks via Wi-fi, recording your location and other data. Can you think of some words to describe an information system? Words such as “computers,” “networks,” or “databases” might pop into your mind. The study of information systems encompasses a broad array of devices, software, and data systems. Defining an information system provides you with a solid start to this course and the content you are about to encounter.

Defining Information Systems

Many programs in business require students to take a course in information systems. Various authors have attempted to define the term in different ways. Read the following definitions, then see if you can detect some variances.

- “An information system (IS) can be defined technically as a set of interrelated components that collect, process, store, and distribute information to support decision making and control in an organization.”
- “Information systems are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings.”
- “Information systems are interrelated components working together to collect, process, store, and disseminate information to support decision making, coordination, control, analysis, and visualization in an organization.”

As you can see these definitions focus on two different ways of describing information systems: the components that make up an information system and the role those components play in an organization. Each of these need to be examined.

The Components of Information Systems

Information systems can be viewed as having five major components: hardware, software, data, people, and processes. The first three are technology. These are probably what you thought of when defining information systems. The last two components, people and processes, separate the idea of information systems from more technical fields, such as computer science. In order to fully understand information systems, you will need to understand how all of these components work together to bring value to an organization science. In order to fully understand information systems, you will need to understand how all of these components work together to bring value to an organization.

Technology

Technology can be thought of as the application of scientific knowledge for practical purposes. From the invention of the wheel to the harnessing of electricity for artificial lighting, technology has become ubiquitous in daily life, to the degree that it is assumed to always be available for use regardless of location. As discussed before, the first three components of information systems – hardware, software, and data – all fall under the category of technology. Each of these will be addressed in an individual chapter. At this point a simple introduction should help you in your understanding.

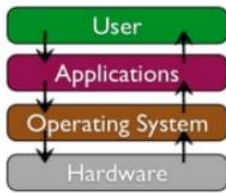
Hardware

Hardware is the tangible, physical portion of an information system – the part you can touch. Computers, keyboards, disk drives, and Flash drives are all examples of systems hardware. How these hardware components function and work together will be covered in future chapter.

Software

Software comprises the set of instructions that tell the hardware what to do. Software is not tangible – it cannot be touched. Programmers create software by typing a series of instructions telling the hardware what to do. Two main categories of software are: Operating Systems and Application software. Operating Systems software provides the interface between the hardware and the Application software. Examples of operating systems for a personal computer include Microsoft Windows and Ubuntu Linux. The mobile phone operating system market is dominated by Google Android and Apple iOS. Application software allows the user to

perform tasks such as creating documents, recording data in a spreadsheet, or messaging a friend. Software will be explored more thoroughly later in the book.



Data

The third technology component is data. You can think of data as a collection of facts. For example, your address (street, city, state, postal code), your phone number, and your social networking account are all pieces of data. Like software, data is also intangible, unable to be seen in its native state. Pieces of unrelated data are not very useful. But aggregated, indexed, and organized together into a database, data can become a powerful tool for businesses. Organizations collect all kinds of data and use it to make decisions which can then be analyzed as to their effectiveness. The analysis of data is then used to improve the organization's performance. Future sections will focus on data and databases, and how it is used in organizations.

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1.1.2: Computing from Inception to Today

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Learning Objectives

By the end of this section, you will be able to:

- Explain the evolution of computing in the workplace
- Explain the rise of computing for personal use
- Discuss the use of technology in today's workplace
- Describe key technologies in mobile devices, digital imaging, and gaming
- Discuss recent advances in technology and related career opportunities

Today's workplace looks very different from the workplace of even a decade ago. Much has changed in the field of computer science and computing in general, reshaping the use of technology at both individual and professional levels. From the early uses of massive, room-size computers to perform large, complex calculations to today's much smaller, more advanced computers—even one so small it can fit in the palm of your hand like the Raspberry Pi 4 shown in Figure 1.2—computing has secured a solid foothold in our everyday lives.



Figure 1.2: The Raspberry Pi 4 contains the basic components and power of a computer. It can power a robot, smart products, and basic PCs. At 3.4 inches by 2.2 inches and only .6 inches high, it fits in the palm of your hand. (credit: "Raspberry pi" by kritsaday/Pixabay, CC0)

Workers today need to know how to use computers to perform basic (and advanced) tasks that employers need. Those tasks could be preparing documents, creating spreadsheets for financial calculations, designing slide presentations for meetings, constructing databases, and even navigating social media and virtual meeting spaces that help companies communicate internally and externally. This text explores the basic software applications that perform these tasks, mostly through Microsoft Office and Google Workspace.

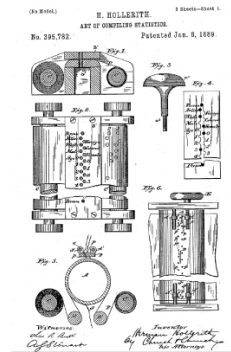
But, first, this chapter looks at the evolution of computing to provide some context and appreciation for the field itself and to show its importance not just for today's workplace, but also to give you a sense of where computing is heading.

Computing in the Workplace

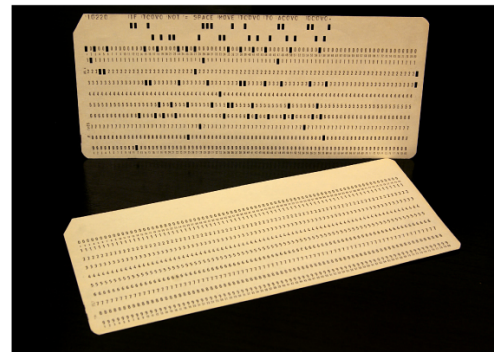
The rise of computers for work came out of a need to manage a massive quantity of numbers. The early computers essentially were developed to be "data crunchers." Their origins date back to the 1800s in France. Joseph Marie Jacquard, a textile merchant, developed a machine to automatically weave designs in fabric using a punch card system, as you can see in Figure 1.3. This punch card system laid the foundation for more advances in number calculations, including those developed by Herman Hollerith for the 1880 U.S. census. Hollerith went on to improve the initial punch card system and eventually founded IBM, one of the first major computing companies.



(a)



(b)



(c)

Figure 1.3: (a) Jacquard's loom, which performed calculations using a punch card system, was an early development in computing, as was (b) Herman Hollerith's punch-card tabulating machine, for which he was awarded a patent in 1889. (c) Each hole in a punch card equals a piece of data (called a "bit" today) that the machines read. (credit a: modification of work "Jacquard.loom.cards" by George H. Williams/Wikimedia Commons, Public Domain; credit b: modification of work "Hollerith395782Figures1-6" by Herman Hollerith/Wikimedia Commons, Public Domain; credit c: modification of work "2punchCards" by José Antonio González Nieto/Wikimedia Commons, CC BY 3.0)

The first computer (in the modern sense of the term) was the Z1, designed and built in the late 1930s by Konrad Zuse of Germany. This machine was motor-driven, programmable, and weighed over 2,000 pounds, about 400 times the average laptop today. The Z1 contained many of the internal components still used in today's computers, paving the way for other inventors to evolve the technology.

Bill Hewlett and David Packard, two Stanford University engineering students, began working out of a garage in California, initially developing equipment for engineers and major companies. They founded their company, Hewlett Packard (HP), in 1939, but it wasn't until a few decades later that it would become a titan in the computer manufacturing industry.

Meanwhile, the 1940s and 1950s saw major advances in computing technology. Most notable was the 1943 invention of the ENIAC (Electronic Numerical Integrator and Calculator). This massive unit, built by two professors at the University of Pennsylvania, is considered the forerunner of today's digital computers because it was the first machine to run calculations electronically. Other innovations included solving equations simultaneously and the invention of the transistor, which allowed for much smaller computers to be built.

The development of computer language is another major milestone in computing history. By using words rather than symbols, computer coding became easier to learn and write, especially for those in the business world who did not have mathematics or engineering degrees. It is thanks, in large part, to mathematician and U.S. Navy Admiral Grace Hopper (Figure 1.4). Hopper's PhD in mathematics from Yale, along with her naval career working on technology to aid the war effort during World War II, positioned her to make some remarkable contributions, and in a male-dominated field.

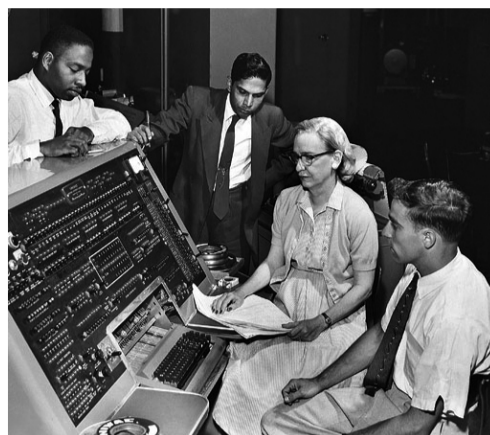


Figure 1.4: Grace Hopper, shown here in 1960 with a UNIVAC computer, earned her PhD in mathematics and went on to an illustrious career in computer science. (credit: "Grace Hopper and UNIVAC" by Public.Resource.Org/Flickr, CC BY 2.0)

Spotlight on Ethics

Grace Hopper: A Pioneer in Computer Science

Historically, science, technology, engineering, and mathematics (known as the STEM fields) were seldom viewed as appropriate fields for females, and the same was true for careers in the military. Although women today make up half of the U.S. workforce, less than 30 percent of employees in STEM fields are women. As a reflection of this gender bias, in 1950, fewer than 5 percent of doctoral degrees awarded in chemistry, math, and physics were granted to females, and even today, that number has only risen to just under 20 percent.

Grace Hopper was a pioneer in the computer science field and in the military as a woman working in STEM. She was also a member of the first group of women to be granted a PhD in mathematics from Yale University. Hopper's work in computer science had a profound impact on the future of computer programming, especially through her creation of an English-language-based programming language, which eventually became COBOL (still in use today).

There are many organizations centered on narrowing the gender gap in STEM fields. One of these is the American Association of University Women (AAUW). Founded in 1881, it has been tirelessly focused on investing in education, especially in STEM fields, and on promoting these fields to females through tech camps and other initiatives.

Computers entered the workplace in the 1950s. Their use at that time was for scientific and engineering applications, mostly as calculating machines to facilitate data analysis. In 1964, the Programma 101, an Italian desktop-sized programmable calculator, was the first commercially viable workplace computer to hit the market. It was heavy and expensive—its \$3,200 price tag in 1964 dollars was the equivalent of nearly \$30,000 today. As a result, only large corporations and research institutions had the space and resources to use the computers that were commercially available. This remained the status quo into the 1970s, when the development of the microcomputer changed the face of the industry. The first personal computer, the Kenbak-1, came on the market in 1971. *Microcomputer* is the technical name for the personal computers that operated with a single processing unit and were much smaller than the machines used in corporations or industrial institutions. Intel's 1970 invention of the microchip (a group of small circuits that work together to make a computer operational) was quickly followed by the floppy disk (which allowed for data to be stored and moved easily), developed by IBM engineers, and ethernet connection capability, developed by Xerox. Ethernet connects computers and devices such as printers through hard cables. With advances in technology, the market for computers expanded rapidly in the 1970s. That's when Paul Allen and Bill Gates founded Microsoft to focus on developing software and an operating system for the new computers. It is also when Steve Jobs and Steve Wozniak founded Apple, creating the Apple I computer with a single circuit board.

Xerox's revolutionary Alto computer, shown in Figure 1.5, introduced in 1973, included a screen resembling those we use today, plus a mouse and keyboard. The screen included, for the first time, elements such as folders, buttons, and icons controllable through the mouse. The Alto not only had the ability to act as a calculator but also could print documents and send electronic mail, anticipating the email we know today.



Figure 1.5: Xerox's Alto computer has a similar look to today's computers, even including the mouse. (credit: "Xerox Alto Computer) by Joho345/Wikimedia Commons, Public Domain)

Early personal computers like the Programma and the Alto set the stage for the rapid expansion of computing in the workplace. By 1980, there were several microcomputers on the market that made computing more accessible to small businesses and even individuals. Computing capabilities had expanded to include color graphics, spreadsheets, and word processing programs. The market competition between Microsoft, HP, IBM, Apple, and others shaped the industry and our society. In fact, in 1983, *Time* magazine's cover recognized the computer as "Machine of the Year," replacing its traditional "Man of the Year." These early computers have evolved into today's laptops, cell phones, tablets, and wearables.

These innovations in computing technology have had a profound impact on the workplace. Figure 1.6 shows just how different today's "workplace" has become. From the automation of manual processes, to the ways we store and analyze information, to how and where we communicate with colleagues and customers—all have changed dramatically. Resulting improvements include improved efficiency and productivity, reduction of errors, improved database management and analytics, advanced communication capabilities, telecommuting, enhanced graphics and marketing, the need for new organizational structures and departments (such as information technology, or IT, departments), and the development of technology privacy policies and legal regulations. Computing machines, along with the emergence and subsequent explosion of the internet, have forever transformed both our work and our personal lives.



Figure 1.6: Computing technology has transformed the modern workplace. People no longer have to be "in the office." (credit: "left": modification of work by Cory Zanker; credit "center": modification of work by "@Saigon"/Flickr; credit "right": modification of work by Daniel Lobo)

Computing for Personal Use

By the 1970s, new workplace technology filtered into homes in the form of entertainment devices. With technological improvements and more accessible prices, the value of a computer in the home—to help manage everything from household finances to children's homework assignments—was becoming evident. The advertisement for the Apple II computer shown in Figure 1.7 shows what this early technology looked like.

The home computer that's ready to work, play and grow with you.

Clear the kitchen table. Bring in the color TV. Plug in your new Apple II[™] and connect any standard cassette recorder/player. Now you're ready for an evening of discovery in the new world of personal computers.

Only Apple II makes it that easy. It's a complete, ready to use computer—not a kit. At \$1298, it includes features you won't find on other personal computers costing twice as much.

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Features such as video graphics in 15 colors. And a built-in memory capacity of 8K bytes ROM and 4K bytes RAM—with room for lots more. But you don't even need to know a RAM from a ROM to use and enjoy Apple II. It's the first personal computer with a fast version of BASIC—the English-like programming language—permanently built in. That means you can begin running your Apple II the first evening, entering your own instructions and watching them work, even if you've had no previous computer experience.

The familiar typewriter-style keyboard makes communication easy. And your programs and data can be stored on (and retrieved from) audio cassettes, using the built-in cassette interface, so you can swap with other Apple II users. This and other peripherals—optional equipment on most personal computers, at hundreds of dollars extra cost—are built into Apple II. And it's designed to keep up with changing technology, to expand easily whenever you need it to.

As an educational tool, Apple II is a sound investment. You can program it to tutor your children in most any subject, such as spelling,

history or math. But the biggest benefit—no matter how you use Apple II—is that you and your family increase your familiarity with the computer itself. The more you experiment with it, the more you discover about its potential.

Start by playing PONG. Then invent your own games using the input keyboard, game paddles and built-in speaker. As you experiment you'll acquire new programming skills which will open up new ways to use your Apple II. You'll learn to "paint" dazzling color displays using the unique color graphics commands in Apple BASIC, and write programs to create beautiful kaleidoscopic designs.

As you master Apple BASIC, you'll be able to organize, index and store data on household finances, income tax, recipes, and record collections. You can learn to chart your biorhythms, balance your checking account, even control your home environment. Apple II will go as far as your imagination can take it.

Best of all, Apple II is designed to grow with you. As your skill and experience with computing increase, you may want to add new Apple peripherals. For example, a refined, more sophisticated BASIC language is being developed for advanced scientific and mathematical applications.

And in addition to the built-in audio, video and game interfaces, there's room for eight plug-in options such as a prototyping board for experimenting with interfaces to other equipment; a serial board for connecting teletype, printer and other terminals; a parallel interface for communicating with a printer or another computer; an EPROM board for storing programs permanently; and a modem board communications interface. A floppy disk interface with software and complete operating systems will be available at the end of 1977. And there are many more options to come, because Apple II was designed from the beginning to accommodate increased power and capability as your requirements change.

If you'd like to see for yourself how easy it is to use and enjoy Apple II, visit your local dealer for a demonstration and a copy of our

Apple II is also available in board-only form for the do-it-yourself hobbyist. Has all of the features of the Apple II system, but does not include case, keyboard, power supply or game paddles. \$798.

Apple II[™] is a completely self-contained computer system with BASIC in ROM, color graphics, ASCII keyboard, light-weight, efficient switching power supply and molded case. It is supplied with BASIC in ROM, up to 48K bytes of RAM, and with cassette tape, video and game I/O interfaces built-in. Also included are two game paddles and a demonstration cassette.

SPECIFICATIONS

- **Microprocessor:** 6502 (1 MHz).
- **Video Display:** Memory mapped, 5 modes—all Software-selectable:
 - Text—40 characters/line, 24 lines upper case.
 - Color graphics—40h x 48v, 15 colors
 - High-resolution graphics—280h x 192v; black, white, violet, green (16K RAM minimum required)
 - Both graphics modes can be selected to include 4 lines of text at the bottom of the display area.
 - Completely transparent memory access. All color generation done digitally.
- **Memory:** up to 48K bytes on-board RAM (4K supplied)
 - Uses either 4K or new 16K dynamic memory chips
 - Up to 12K ROM (8K supplied)
- **Software**
 - Fast extended Integer BASIC in ROM with color graphics commands
 - Extensive monitor in ROM
- **I/O**
 - 1500 bps cassette interface
 - 8-slot motherboard
 - Apple game I/O connector
 - ASCII keyboard port
 - Speaker
 - Composite video output

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Apple II[™] is a completely self-contained computer system with BASIC in ROM, color graphics, ASCII keyboard, light-weight, efficient switching power supply and molded case. It is supplied with BASIC in ROM, up to 48K bytes of RAM, and with cassette tape, video and game I/O interfaces built-in. Also included are two game paddles and a demonstration cassette.

SPECIFICATIONS

- **Microprocessor:** 6502 (1 MHz).
- **Video Display:** Memory mapped, 5 modes—all Software-selectable:
 - Text—40 characters/line, 24 lines upper case.
 - Color graphics—40h x 48v, 15 colors
 - High-resolution graphics—280h x 192v; black, white, violet, green (16K RAM minimum required)
 - Both graphics modes can be selected to include 4 lines of text at the bottom of the display area.
 - Completely transparent memory access. All color generation done digitally.
- **Memory:** up to 48K bytes on-board RAM (4K supplied)
 - Uses either 4K or new 16K dynamic memory chips
 - Up to 12K ROM (8K supplied)
- **Software**
 - Fast extended Integer BASIC in ROM with color graphics commands
 - Extensive monitor in ROM
- **I/O**
 - 1500 bps cassette interface
 - 8-slot motherboard
 - Apple game I/O connector
 - ASCII keyboard port
 - Speaker
 - Composite video output

Apple II is also available in board-only form for the do-it-yourself hobbyist. Has all of the features of the Apple II system, but does not include case, keyboard, power supply or game paddles. \$798.

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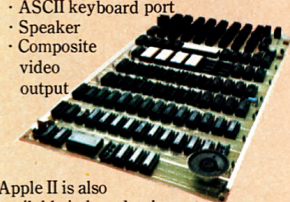
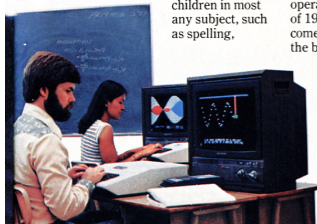


Figure 1.7: This December 1977 advertisement for the Apple II computer touts its uses around the home, such as organizing finances, storing recipes, and gaming. (credit: modification of "Apple II advertisement Dec 1977 page 2" by Apple Computer Inc./Wikimedia Commons, Public Domain)

In the early 1980s, personal computers were made available to the average consumer through retailers such as Sears and Radio Shack. In 1981, IBM introduced a personal computer—first known by the code name "Acorn" and subsequently renamed the IBM PC—that included the Microsoft operating system and Office software, as well as an Intel microchip. Soon to follow was Apple's Macintosh computer, launched in January 1984, running Apple's own operating system and officially establishing Apple as competitors to Microsoft and the PC. Many of these new designs were streamlined and user-friendly for the whole family. Moreover, the price point made them more attainable for the consumer, though still expensive for that time.

Initially, home computers were focused on gaming and entertainment. Figure 1.8 shows what that primitive technology looked like in the 1980s. Classic games such as chess and solitaire were translated into the computer environment, a trend that quickly caught on even with rudimentary graphics and text-based games. These games allowed the user to experience the computer's capabilities in settings far beyond the workplace and established the personal computer as a technology to support not only work, but pleasure and entertainment, too.



(a)



(b)

Figure 1.8: (a) The Apple II and (b) the Commodore PET offered video games that popularized the use of computers at home. (credit a: modification of “Living Computers – Apple” by Michael Dunn/Wikimedia Commons, CC BY 2.0; credit b: modification of “Commodore PET Exhibit at American Museum of Science and Energy Oak Ridge Tennessee” by Frank Hoffman/Wikimedia Commons, Public Domain)

With developments such as disk storage and programming capabilities, the market for personal computers continued to grow. Manufacturing costs decreased with innovations in the industry and as many producers shifted manufacturing overseas. Although computers evolved into home workstations with capabilities beyond gaming, the home computing trend was slow to catch on. Many potential home users simply did not see the value in owning a personal computer; in the late 1980s, fewer than 20 percent of households owned one. This changed in the late 1990s and early 2000s, when the home computer industry exploded with the expansion of the internet, improved interfaces that were less technically challenging for the average user, and customizable products and features such as color schemes. Increasingly, home workstations became the place to maintain family finances, store recipes, and write school research reports. Email, followed quickly by instant messaging, offered a new way to connect and communicate. Then came a way to connect to the internet without wires, using high-frequency radio signals.

Since 2000, the warp speed of innovation has brought to market lightweight laptops that can be easily carried from workplace to workplace. The computing power of the computers that first took astronauts to the moon was similar to that of a couple of today’s gaming consoles. Many modern home computing devices are laptops less than one inch thick, equipped with high-speed connectivity, high-quality graphics, and touchscreen capabilities. Computing power today has increased nearly 1 trillion percent since the 1960s.

Technology Today

The rapid trajectory of innovations in computing has forever changed today’s workplace, where computing power is at our fingertips. It is difficult to imagine any industry that doesn’t depend on computing technology as an integral part of its business. Some of the more basic technologies that are present in businesses may include:

- direct deposit of paychecks
- key card building access
- shared company computer drives for document storage
- paperless documentation systems for recordkeeping
- high-speed printers/copiers
- automated inventory systems

Industries that are traditionally considered nontechnical have also embraced improvements that depend on computing technology—for example, farmers can control irrigation and monitor field conditions. Computing technologies have also enabled individuals to embark on entrepreneurial ventures that once only seemed like a dream and have launched some of them into marketplace leadership. From manufacturing to health care to the service sector, we can see the impact of computing and how technological innovations continue to shape the future of many industries.

For example, consider the auto industry, where advances in technology continue to pave the way for changes in how we drive, safety improvements, and new ways to purchase vehicles. Recent innovations include the introduction of self-driving vehicles (see Google’s self-driving car, Waymo in Figure 1.9) and of vehicle-to-vehicle communication—cross-communication that allows cars

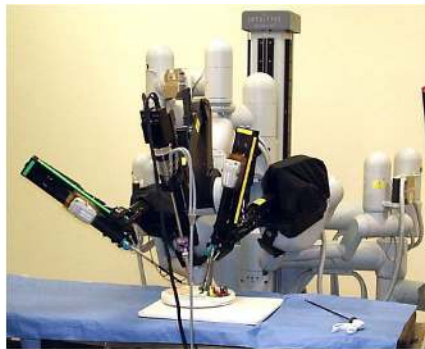
to wirelessly share information such as speed, spatial proximity to other cars or objects, and traffic status, with the potential to reduce vehicle crashes and congestion on roadways. Technology has also created a space for nontraditional car dealers, such as Carvana, that offer an online purchase experience and home delivery. The use of technology in the auto industry can be seen at all stages of the business cycle.



Figure 1.9: Google's Waymo, a self-driving car, can navigate roads, maintain safe speeds, and see obstacles in time to apply the brakes. (credit: "Google Self-Driving Car" by R Boed/Flickr, CC BY 2.0)

Computing technology has also brought substantial changes to the health-care industry. Most medical practices and hospitals utilize electronic medical records. These records and the ability to share them across providers have increased the efficiency and accuracy of record management and have also increased the transparency of information provided to patients and their families and care providers. Performance of surgical procedures has been advanced through the use of visualization technology and robotics. Figure 1.10a shows a robotic arm used in surgery.

More recently, telehealth and virtual health-care options have grown. Figure 1.10b shows a virtual telehealth appointment. These options have reduced many barriers (including some financial barriers and transportation issues) for those seeking care for a variety of needs, including mental health issues, child illness, or support for the elderly. This virtual option has not only added convenience, but has also improved communication between patient and provider, increased speed of care, and allowed patients to take a better informed and more active role in addressing their own health-care needs. And, of course, the use of virtual technology for health-care needs was a lifesaver during the COVID-19 pandemic, when in-person appointments were too risky.



(a)



(b)

Figure 1.10: (a) Robotic surgery and telehealth services are two health-care industry-changing technologies. (credit a: modification of "Laposcopic Surgery Robot" by GPA Photo Archive/Flickr, CC BY 2.0; credit b: modification of "People on a Video Call" by Anna Shvets/Pexels, CC BY 2.0)

With today's available technologies, organizations and individuals alike are continuing to rethink the traditional business model. Many organizations have come to see the value of giving employees the freedom afforded by working from home, and even many industries that had resisted telecommuting learned to incorporate it as a necessary response to the COVID-19 pandemic. Some companies have found that organizational efficiencies can be realized in terms of cost savings, improved employee satisfaction, and enhanced productivity. Other businesses, such as smaller retailers, have shifted more resources to e-commerce. Banks have found innovative ways to connect with their customers using technology rather than through in-person transactions. Still others, such as

restaurants, have used technology to deliver their products to consumers in new ways. In Figure 1.11, customers can order directly through the internet à la Uber Eats or even have their food delivered by robot.



Figure 1.11: (a) Uber Eats is a popular food delivery service that is becoming more widely available because of technological advances. (b) Autonomous delivery robots are becoming a more common sight on campuses. (credit a: modification of “Uber Eats bicycle” by Yuya Tamai/Flickr, CC BY 2.0; credit b: modification of “Starship food delivery robot” by bikesharedude/Flickr, Public Domain)

Real-World Application: Technology and Food Trucks

Food trucks have been growing in popularity in the early decades of the twenty-first century. In fact, the food truck industry has grown at a faster rate than traditional restaurants. The availability of technology has helped foster this growth, especially in two areas: point-of-sale (POS) systems and social media marketing. It used to be that food trucks could accept only cash because the registers that could take credit cards did not work on the road. A POS system does even more than exchange money. A food truck can use a POS product—for example, a product called Square—to track inventory and sales, and can even use social media to post messages and to make sales.

Our interactions with computing, both at home and in the workplace, rely on interfaces and communications like those you will likely use in this course. Tools for documenting information, analyzing and exporting data, and communicating with others form the foundation of business computer applications.

Mobile Devices, Digital Imaging, and Gaming

It might be hard to imagine a world without access to information at our fingertips—or, for that matter, a world without Xbox or PlayStation. Today, many households no longer have a traditional landline phone, instead relying on mobile devices. It is estimated that less than 10 percent of homes in the United States have a traditional landline phone. Think about how advances in digital imaging technology over the past half century have forever changed the way we capture and preserve life’s notable moments—our days are now routinely filled with screens and images. The rise of the computing industry has brought along changes in companion industries that have impacted most of our lives in one way or another.

In this section, you will learn about the origins of the mobile phone industry and its evolution into today’s diverse handheld computing devices. The rise of the computing industry also led to a new industry, gaming. You will look at how the gaming industry not only changed the face of family entertainment but also created additional industries and shaped cultures across the world. Finally, you will explore the digital imaging industry, the impact on other fields, and recent technological developments in imaging.

Mobile Devices

The concept of a mobile phone has been around a lot longer than you might imagine—since the early 1900s, in fact. In 1908, a patent was issued for a wireless telephone in Kentucky, but the idea was considered so far-fetched that its inventors were accused of fraud. (The case was later dropped, and the invention was never produced.) Not long after, during World War I, Germany was testing radio-based wireless telephones (essentially two-way radios) on trains traveling from Berlin. By 1940, this technology had

improved, and handheld receivers were widely available and used in World War II, prompting the private sector to use this emerging technology (Figure 1.12a).

Bell Laboratories, founded in the late nineteenth century by Alexander Graham Bell, was a key player in bringing mobile phones to the public. In 1946, Bell Labs developed a system to offer a mobile phone service in cars. Because of the limited number of channels available, the system quickly reached capacity, and was mostly used by taxi drivers and emergency vehicles localized in urban areas. From the 1950s to the 1980s, the technology continued to develop, built mostly around radio frequencies.

The first cellular technology using automated cellular networks, called 1G or first generation, was introduced in Tokyo in 1979. It was deployed to other countries soon after and, in 1981, reached North America, where it was known as the Advanced Mobile Phone System (AMPS). This led to the launch of the first truly mobile cell phone, Motorola's DynaTAC, in 1983 (Figure 1.12b). With a price point of just under \$4,000, the unit was not designed for the everyday consumer. Motorola believed the phone's customers would include realtors and large-company executives who could afford the purchase price as well as the \$50-per-month plan to use the device. But they underestimated the appeal of the cell phone. Sales far exceeded projections, and the concept of the cell phone quickly replaced the unwieldy mobile car phones of the past.

The overwhelming demand, along with advances in digital technology, prompted the migration of the old AMPS networks to a digital format, an effort that began in 1990 and was completed in the early 2000s. The popularity of the cell phone also prompted competition between European and American networks. 2G cellular networks emerged, providing basic short message service (SMS) text messaging capabilities. The first text message was sent in 1993 in Finland. The 2G network had better security than 1G and was also much faster. These changes in network capabilities influenced the development of phone technologies.

Although smartphones are seen as a rather new technology, the first smartphone was actually introduced by IBM in 1993. The Simon Personal Communicator (Figure 1.12c) looked very different from modern smartphones. Its features included a calendar, address book, and email service. The phone even had a touchscreen. The price point, around \$1,000, was high at the time, equivalent to about \$2,000 in today's dollars. The device was well received in the United States, where consumers viewed it primarily as a digital personal assistant that just happened to have phone capabilities. Though popular with business executives, the Simon stayed on the market for less than a year and sold only around 50,000 units, but it did pave the way for the smartphones of today. Other notable phone introductions soon to follow were the first flip phone (the Motorola StarTAC in 1997) and the first BlackBerry device in 1999.

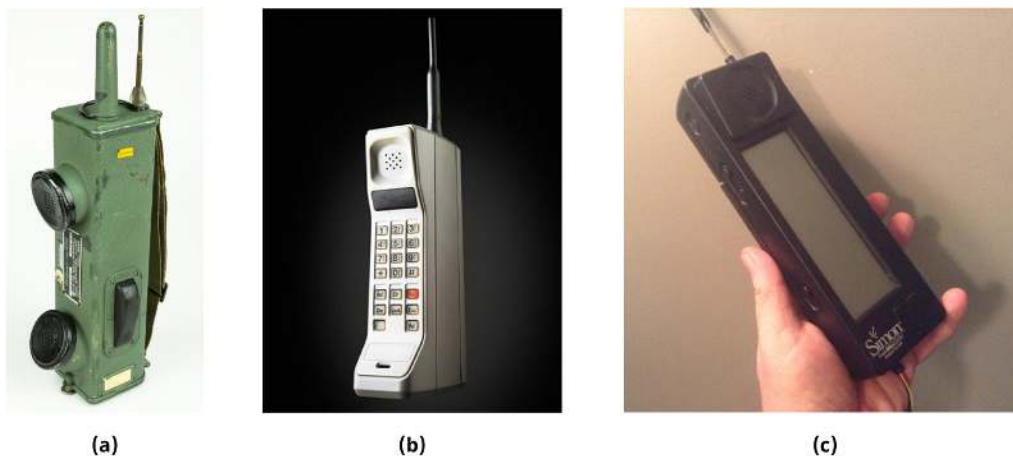


Figure 1.12: (a) This two-way wireless communication device was used during World War II to communicate critical information among troops. (b) Motorola's DynaTAC was the first mobile phone to use cellular technologies rather than radio frequencies. DynaTAC was marketed toward wealthy business professionals at a price point of nearly \$4,000. (c) The first smartphone, a personal assistant device, was a precursor to today's cell phones. (credit a: modification of "Bärbar radio" by Flygvapenmuseum, CC BY; credit b: modification of "MF013: Figure 2.8" by Rosenfeld Media/Flickr, CC BY 2.0; credit c: modification of "Simon FIRST Smart Phone" by Mike Mozart/Flickr, CC BY 2.0)

As the technology rapidly advanced, 3G and then 4G networks soon followed. This allowed faster speeds as well as streaming services—4G networks were nearly 10 times faster than their 3G counterparts. With this expanded network accessibility, phones rapidly came to be seen less as a luxury and more as a need.

Apple's introduction of the iPhone in 2008 had a major impact on the market. With this introduction came the iPhone operating system (iOS), exclusive to Apple. An operating system is one of the most important components of a computing device. It runs the interactions between the device's hardware and software components (more on these later in the chapter). The second most popular operating system to emerge during this time was the Android operating system, first developed in 2005 and later acquired by Google. These two operating systems, each of which has advantages and disadvantages, are engaged in an ongoing battle for market share. At the end of 2022, the Android operating system had a majority share of the market worldwide (nearly 72 percent). Today, nearly 90 percent of Americans own a cell phone; of those, nearly 60 percent are smartphones.

Link to Learning

It seems that people are either iPhone users or Android device users, with an unwillingness to shift platforms. Although the two operating systems that run iPhones and Android devices (such as Samsung's Galaxy phones), respectively, have similar performance capabilities, they vary dramatically in terms of the user experience. The proprietary software working behind the scenes also limits the apps, or programs, that are compatible with each device. Read this [article on the differences between Android and iOS](#) to learn more. Which operating system do you prefer? Why?

The adoption of mobile phone technology has had a large economic impact in the United States and worldwide, giving rise to new products (cell phone cases, pop sockets, wireless earbuds, screen protectors) that did not exist before mobile phones hit the market. Other industries such as clothing and handbags have also been impacted: It's now commonplace for a jacket to have a specific phone pocket, and many handbags and backpacks have slots designed to accommodate most cell phones. The creation of mobile phone apps has developed into an entirely new industry that has created many jobs worldwide. And beyond these tangible effects of the cell phone boom, there have been some significant changes in how we operate in our business and professional lives. About 40 percent of all business transactions are conducted on a mobile phone device. Companies rely on mobile technology to conduct essential correspondence with their employees and their customers.

Gains in efficiency and collaboration across geographic boundaries are now easier than ever. Consumer product companies use mobile devices to advertise in new ways and to expand their market reach. We may use the technology to stay in contact with out-of-town family members, to connect to our bank or our health-care provider, and to make everyday purchases. Many children growing up today have never had a home landline phone ring or not even heard a dial tone. The dial tone is a sound that indicates that a landline is active. It can be difficult to imagine a world before cell phones, even though it was not all that long ago they first emerged on the market.

Link to Learning

Listen to this [video on vintage telephone network sounds](#) to hear what a dial tone sounds like, as well as sounds from telephone technology through the ages.

Digital Image, Video, and Audio Capture Devices

Image, video, and audio capture are another area of technological growth that many people now use daily. Photography was invented in the mid-1800s, and it took a century and a half for digital imagery to emerge, in 1957. Using binary digits, Richard Kirsch was able to convert a photograph of his son into a digital image using the only programmable computer available in the United States at the time. The photograph was scanned electronically in small squares of the image, now called pixels, and reconfigured using white and black, as Figure 1.13 shows. The binary data for the image could then be stored on the computer. This development, along with the invention of the microchip, laid the foundation for future work in digital imaging.

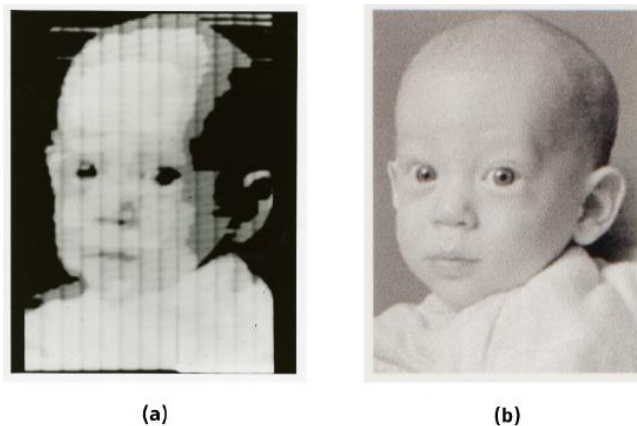


Figure 1.13: Kirsch took a photo of his son Walden and was able to capture the image digitally using binary digits. Part (a) shows the digital scan of Walden Kirsch from (b), the original photo. (credit a: modification of “NBSFirstScanImage” by Russell A. Kirsch/Wikimedia Commons, Public Domain; credit b: modification of “Walden Kirsch” by Russell A. Kirsch/ Portland Art Museum, Public Domain)

The scientific community, government, and the military soon took notice of the advantages of using the digital approach to capturing images. Beginning in the 1960s, NASA used the technology to transmit images back from space through television receivers. Tech companies created new storage methods, such as saving images to tape. RCA built the photo-dielectric tape camera for NASA, which was able to store about 120 images on tape—a huge improvement over the long processing times needed for previous digital images.

This technology continued to grow over the decades, and soon combined with mobile phone technology. In 1997, the first image was taken using a camera phone. Cell phone manufacturers quickly launched new phone models that included cameras, and most of today’s devices include a digital camera. The 2004 emergence of Flickr, a popular photo-sharing site, as well as the launch of Facebook that same year, provided new ways for people to share and connect via digital photographs.

The digital camera revolution transformed how we conduct business and stay in touch with family and friends. The use of webcams and videoconferencing technology has enabled many to conduct business across geographic boundaries and to telecommute from home to their job. This has changed the face of the traditional office environment for all industries and parts of the marketplace, such as government agencies, corporations, small businesses, and service organizations. And in many ways, digital cameras have changed our everyday lives. The use of digital cameras has revolutionized many medical procedures and how we interact with our health-care providers. Digital cameras have enabled us to see space beyond the earth and moon. Consumer products can be test marketed and brought into consumers lives’ virtually. Parents have the capability to monitor their babies sleeping in cribs. Doorbell cameras have increased our sense of security in our homes. The cameras we have at our fingertips today have far surpassed the imaginations of the early inventors of this technology.

Real-World Application: Virtual Reality and Marketing

Virtual reality (VR) refers to a simulated environment that is computer-generated. Through the use of devices such as a helmet or glasses, the user sees a simulated world and is able to move about it visually. Instead of simply viewing the scene from an outsider’s point of view, the user is immersed in the actual scene. Companies such as Nike, Wendy’s, McDonald’s, and Gucci have used VR to creatively demonstrate new products to consumers and to allow consumers to interact with a new product concept. Even small businesses have capitalized on the technology, which enables them to bring ideas in front of consumers quickly without the expense of creating an actual prototype of the product. This concept has application across a wide range of industries, from restaurants to real estate to consumer products.

Games and Gaming Devices

Computerized games for entertainment existed long before today’s gaming consoles. When computers were starting to gain a foothold in the American household, their primary use was for entertainment. The initial concept of computerized games was centered on taking existing, often traditional games, such as checkers and chess, and moving those to the computerized platform.

The first video game was developed by an American physicist. William Higinbotham developed the game Tennis for Two in 1958 using an analog computer with an oscilloscope display. This simple invention laid the groundwork for one of the most profitable industries in the world. It is estimated that over 60 percent of U.S. households today have members who regularly play video games. Technology progressed to the first gaming console, 1967's Brown Box, and then to 1972's Atari, with its popular game, Pong. In 1978, Space Invaders hit the arcade market—a game venue marketed heavily to bowling alleys and retail locations. The arcade craze became a huge commercial success for the game makers as well as the businesses that purchased the games (Figure 1.14). Motivated by getting to the top of the scoring list, players were readily putting their quarters into the machines. Over the next decade, nearly two dozen companies developed arcade games, including the well-known game Pac-Man, which was introduced to the U.S. market in 1981.



Figure 1.14: The arcade of the 1980s changed how teenagers spent their time and their money. (credit: “the Luna City Arcade” by Blake Patterson/Flickr, CC BY 2.0)

The decades that followed saw the leap from Intellivision to the Nintendo Entertainment System (NES) and Nintendo's handheld Game Boy device. At the end of the 1980s, Sega emerged as a major competitor to Nintendo. Their gaming system had better graphics and new creative energy, bringing on what would become some of the most popular games of our time, like Sonic the Hedgehog. As new game concepts emerged, controversy over violence in games and other questionable content prompted a government response and the creation of an industry rating system for games.

Spotlight on Ethics: Video Games and Violence

Early video games were based on traditional board games such as chess and checkers. But over time, with increases in graphic capabilities and new companies coming into the market purely as game developers, new game concepts were developed. At times, these new game concepts contained what some considered to be inappropriate language and situations. The American Psychological Association even considers the playing of violent video games as a risk factor for aggression. The violence in video games prompted a congressional hearing on the matter in 1993. The hearing focused on three controversial games: Doom, Night Trap, and Mortal Kombat, the first video game to include realistic depictions of violence. Despite this, the game was allowed to be sold, but a new rating board emerged from the hearings called the Entertainment Software Ratings Board (ESRB). It is a voluntary, self-regulated entity run by the Entertainment Software Association, which rates games according to their level of violence and recommends appropriate age levels for users. Some stores will not sell video games without an ESRB rating.

As the trajectory of advances in games and consoles continues, today it seems that a new and improved system hits the market every year. Many people also have games downloaded on their phones. And the concept of e-sports has reached colleges and universities, both as an academic program and as an NCAA-recognized collegiate sport. The future of video games seems to be moving in the direction of artificial intelligence (AI) and virtual reality simulations, with both Apple and Google making company acquisitions in that arena.

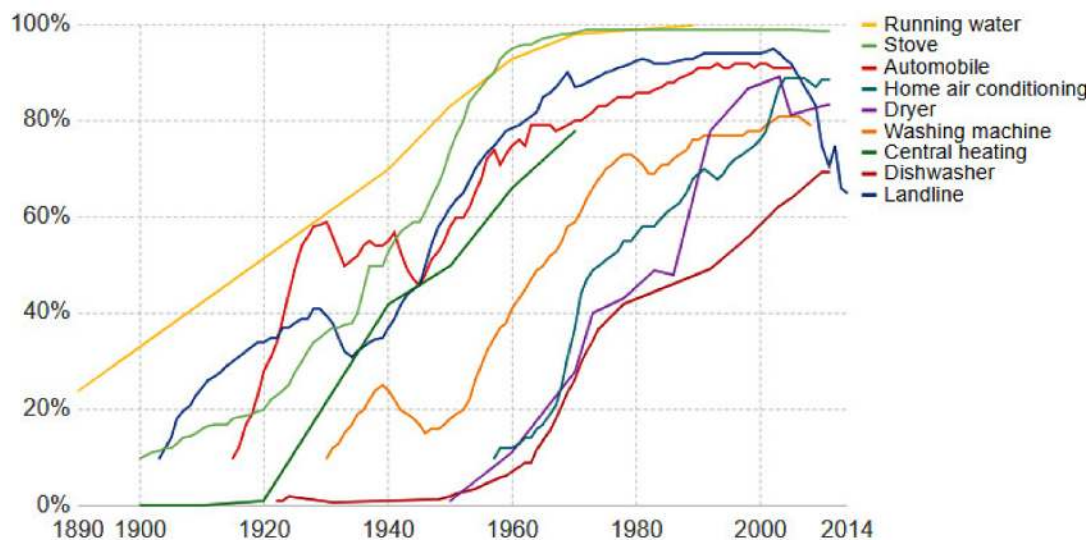
Real-World Application: E-sports in Colleges and Universities

The term e-sports refers to a sports competition using video games. Like professional football, baseball, and other sports, e-sports events have a large following, including both spectators at the actual events and others who join to watch the action virtually. E-sports became a large player in the gaming industry around 2010 and has since exploded worldwide to such an extent that colleges and universities are taking notice. The impact on the academic environment can be seen in three key areas: academic programs such as game developing, student groups focused on gaming, and collegiate sports. Some institutions are even offering scholarships for e-sports similar to traditional athletic scholarships.

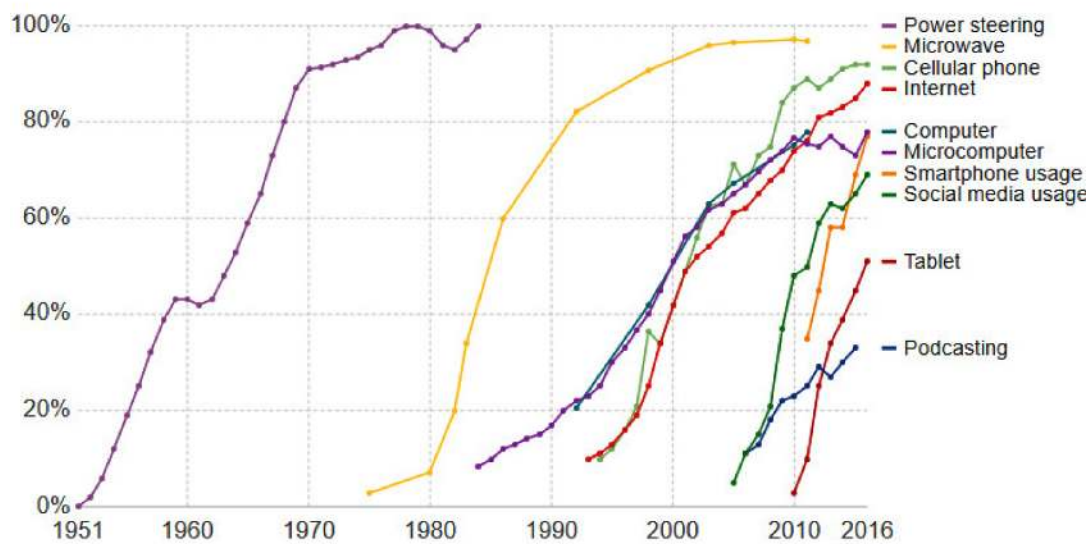
Mobile technology, digital imaging, and gaming capabilities today are inherently intertwined. Often, all three coexist on a single device. As just one example, consider how we use Google Photos on our phones to share family memories. Extending this capability, in a video game app on a mobile phone, a user can create a character using their photo and then have this virtual character interact with other players across the world. In the business world, many of us now use Zoom or other videoconferencing tools to connect with colleagues remotely. Outside of work, users of gaming consoles can chat with other players through their phones or through the console. Many games today are designed from the start to be played on multiple platforms. Microsoft is even offering mobile phone plans for customers. Each technology has changed our lives, but together their impact has been remarkable.

Advances in Technology

Technology is advancing faster than what was previously believed to be possible. In just a short period of time, we have gone from having no computers to today where nearly 90 percent of people in the United States have some access to a computing device. What's also impressive is that 90 percent of data in the world today was generated in just the last two years. Today's 5G technology is 100 times faster than 4G, and the rate of adoption of new technologies has diminished from years to mere months in some cases. As you can see in Figure 1.15, older technologies such as refrigerators and landlines took decades to reach widespread adoption with a majority of Americans buying them, while today's smartphones and tablets achieve broad adoption as soon as they enter the market.



(a)



(b)

Figure 1.15: (a) Historically, the rate of adoption for new technologies has taken decades. (b) Now, new products to the market reach more than a 50 percent adoption rate in just a few years. (credit a and b: modification of work by Our World in Data, CC BY 4.0)

Computers today typically double their capabilities in less than two years. With this in mind, we can expect computing capabilities to continue to increase at a similar rate. The rate of change is increasing exponentially because companies are building on existing technologies. Researchers can take what has worked well to rapidly refine and enhance technologies for innovations and improvements. Additionally, resources from across the world—both financial resources and human capital—are being pumped into supporting these technological advances. To put the popularity of computer technology into perspective, consider how long it takes to get fifty million users for a product. Radio took thirty-eight years after its invention to become that popular, while the hit game Angry Birds needed only about thirty-eight days to reach that milestone. Figure 1.16 shows some common products and how long each of them took to reach the same milestone.

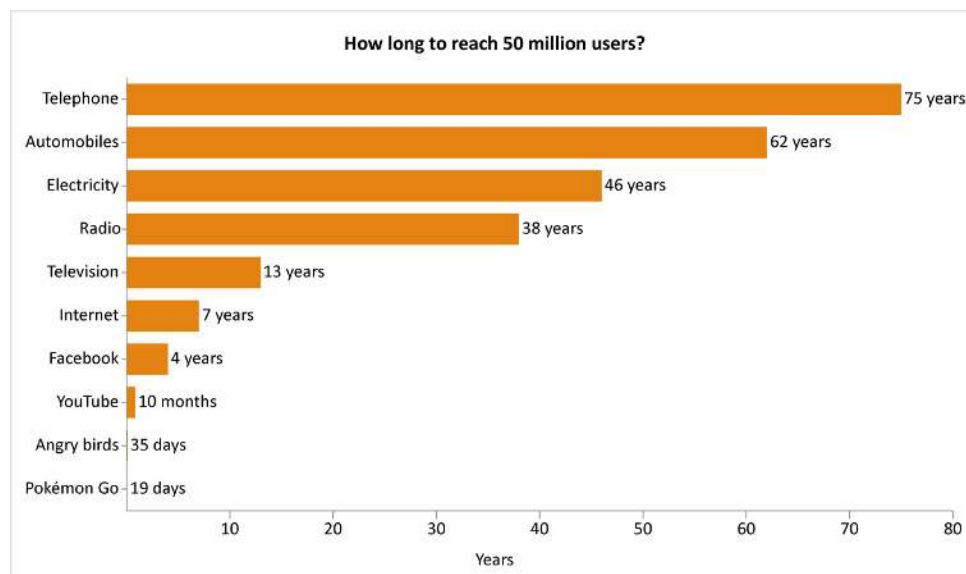


Figure 1.16: Products are being adopted at a faster rate than ever before. The advent of social media has exponentially increased the spread of some of these later innovations. (data source: Interactive Schools, <https://blog.interactiveschools.com/...this-milestone>)

AR/VR Simulations

Using digital objects in a real-life picture or scene is called augmented reality (AR). For example, think about the overlays or filters you can put on photos in some social media apps. A mostly simulated, 3-D environment in which the user can move about visually and interact is called virtual reality (VR). Both technologies have applications in many industries. For example, if you want to try a new style of glasses, you could use AR to see what those glasses might look like on your face. You might use a VR simulation to offer your insight on a yet-to-be-developed product concept. Other applications could be in manufacturing, real estate, medicine, and education.

One recent example of the use of VR was seen when the NBA had to cancel games because of the COVID pandemic. To keep fans engaged, the league offered VR passes that enabled ticket holders to attend past games in a VR environment and nearly be courtside for the action. The only equipment they needed was the app and a VR headset. (VR headsets are widely available for purchase, typically for under \$200.) This was a unique use of the technology to keep the audience's attention during a difficult time.

Robotics and Automation

Robotics should be distinguished from automation, which refers to using computers or machines to do tasks that could be completed by a person. Automation can be quite technical, using computerized technology, or it can be a mechanical process using machines. For example, processing retail transactions, which was once handled by people using pen and paper, is now well automated through the use of a computer.

On the other hand, robotics is centered on robotic machines, which are now used in nearly every industry. These machines can automate some tasks that were previously performed by humans, but they can also be programmed to perform tasks that no human could perform. Consider some medical procedures that can now be carried out using robotic machines but that simply were not possible in the past, such as certain procedures on the brain. The use of robots in the workplace can reduce errors, increase safety, enhance productivity, and reduce time spent on routine tasks for employees.

Robotics has been a part of the manufacturing environment for some time. But today we see increasingly unique applications of robotics in the workplace. For example, the University of California is testing a robotic pharmacist, which will perform many of the functions of a traditional pharmacist, such as choosing the correct prescription and dosage. Robots are also being used to keep areas clean and sanitized; in some cases, robots can be used to clean up spills that might otherwise be hazardous to humans. Giant Food Stores is piloting a program that uses robot assistants throughout the store to monitor for spills and potential hazards in the aisle. Drones (a kind of robot) are used in some military applications, and the use of drones is being tested for package delivery. Finally,

robots can be used to find and rescue victims in disaster situations where it might be too dangerous to send in typical emergency personnel.

Nanotechnology

Another advancement in technology is nanotechnology, which entails changing individual molecules to produce different properties or attributes. It can be applied to a wide variety of fields, including engineering and chemistry, as well as to medicine and consumer products. The U.S. National Nanotechnology Initiative was launched in 2000 to manage research and development in the field, and the first academic program centered on nanotechnology emerged by 2004. At that time, the technology was being heavily tested with consumer products. Nanotechnology has been used to make golf balls go straighter, make car bumpers more dent resistant, and give cosmetics and lotions deep skin-penetrating properties. With nanotechnology, drug delivery to patients can be better targeted and controlled. Filters made using nanotechnology have been used to filter drinking water sources in countries such as India. In agriculture, nanotechnology has improved yields with the use of soil analysis and targeted fertilizer applications. Nanotechnology can also be used to better combat air and water pollution through increased filtration efforts. Research into nanotechnology possibilities continues to expand.

Wearables

A wearable is a device that uses computing technology to collect and receive data via the internet. You may already be using a wearable technology device—for example, a smartwatch. Using similar technology to a smartwatch, Motiv has developed a ring that can track fitness goals and sleep cycles. As Figure 1.17 shows, you would never know it was a smart ring from its outward appearance. Other wearables include heart rate monitors and a medical alert device. These devices can be worn, incorporated into apparel, or even embedded into the skin. The military is even considering using embedded wearables to keep track of troops. Some cutting-edge wearables are centered in the medical industry; for example, a wearable has been developed that can detect early signs of breast cancer.



Figure 1.17: The fitness tracking ring is a new take on the fitness tracker. It can track activity and sleep cycles and send the information to your smartphone. (credit: “Left hand with Aura smart ring on finger, right hand shows phone with the Aura app’s energy and activity statistics” by Marco Verch/Flickr, CC BY 2.0)

Some professional athletes use wearables to improve performance and track incidences of concussions. Wearables for children are becoming more popular for location tracking. The possibilities are endless. It is estimated that there are nearly a billion wearable devices active globally, over 50 percent of which are smartwatches. And about a quarter of wearable users wear the device while sleeping. Revenues in the industry are nearly \$10 billion in the United States. Wearables are now also being used for ticketing purposes at concerts and amusement parks.

Link to Learning

You may have a smartwatch or use a fitness tracker when working out. These are commonplace wearables in today’s society. But where is the industry headed? Wearables have been identified as an area of growth in the economy. Many tech companies are focusing on innovative ways to incorporate internet-connected devices in different settings, as illustrated in this [article on the wearable tech of the future](#) in *Time*. You may be surprised to discover just how futuristic they are becoming.

Smart Spaces

An internet-connected space—office, home, car, or building that incorporates technologies that can be controlled from the internet—is called a smart space. In homes, we see products centered on convenience, security, and comfort. The goal is to improve your life without interfering and creating a nuisance. For example, you can have a thermostat that enables you to control the temperature in your home from your phone, even when you are not at home. You can have a device that switches on the lights or the TV when you verbally ask it to do so, or home security lights that come on for your safety as you approach the front door. With products such as Google Home Smart, shown in Figure 1.18—a virtual assistant that is connected to the internet—all members of the family can control many devices. If you have your devices synced to one another, you can even have Google Home tell you your calendar appointments for the day or set reminders and alarms.



Figure 1.18: Devices such as Google Home Smart are creating "smart" spaces that are able to be managed from remote locations, such as the workplace. (credit: "Home Automation22" by mikemacmarketing/Wikimedia Commons, CC BY 2.0)

Similar technologies can be employed in the workplace. Smart offices/buildings can be equipped with many of the same technologies—a good strategy for managing utility costs and adding convenience for employees. Smart offices can make employees more productive by giving them more time to focus on creative and strategic tasks as opposed to more routine and mundane responsibilities such as sending invoices or even turning on the office lights. Job satisfaction can be increased by giving employees more control over their workspaces.

A unique application of the technology is its use in schools, which is being piloted in Texas with a partnership between two private companies and Microsoft. They are equipping schools with a variety of connected devices centered on security and communication in an emergency. These devices can communicate internally during an emergency, such as a fire, and can also communicate externally with first responders and police.

There are some challenges in the smart space industry. Many concerns arise about the invasive nature of some of the connected devices, including concerns about recording personal information, governmental monitoring of the information, and the usage/security of the data collected. Another challenge is educating consumers on how to use the equipment and its capabilities. Finally, the price point is high for some of these devices because many are still rather new to the market.

AI and Machine Learning

Using computers, robots, and machines to mimic the human brain is called artificial intelligence (AI). From problem solving to perception to learning, the goal is to reduce errors and minimize human biases and emotions in the process. In machine learning, a subset of AI, an AI device learns on its own, gathering data and using that data to continuously refine and "learn" about the system and its usage. Speech and image recognition are two examples of AI. Another example is a robot vacuum cleaner, where the AI system uses a computer and the data it collects to know where to clean in the home. Figure 1.19 shows the popular Roomba vacuum. Still another example is seen when websites show recommended products for you based on your prior searches. The device learns your likes and dislikes based on your clicks and other related data.



Figure 1.19: AI in the home can take over inconvenient or repetitive tasks such as cleaning. (credit: “iRobot Roomba 870” by Kārlis Dambrāns/Flickr, CC BY 2.0)

In a more large-scale use of AI, for quite some time airlines have made use of autopilot features, including robotics, image recognition, and GPS, to fly and navigate an aircraft. In the retail industry, the use of AI is expected to grow about 30 percent by 2028, a strong increase, to include applications centered on personalizing the customer experience as well as managing distribution and inventories. Today, AI technology has evolved to create stories in the style of famous writers or even write detailed research papers when prompted.

Workplace and Career Implications

Technology in the workplace has made processes faster and more reliable, increased collaboration, made it possible to work from anywhere, and, overall, changed the typical office culture. The adoption of new technologies in the workplace has some distinct career implications for individuals, while organizations need to figure out the best mix of humans and technology to allow the business to thrive.

The idea that technology eliminates jobs is a myth: Technology introduced into the workplace is intended to help employees do their jobs better, not to replace jobs. But this does mean that employees may need to shift from more traditional tasks to tasks that are more technology-driven. For example, an employee in the human resources field may have spent hours sifting through résumés for contact information to schedule interviews. With technology, this process can be automated, freeing up time for the employee to focus on more meaningful tasks such as interviewing candidates and decision making. In a manufacturing environment, technology can enable employees to focus on process improvements and problem solving rather than working with repetitive tasks on a production line.

These changes affect our future educational and training needs. Some jobs that require a lower skill base have been replaced with technology. Additional training may be necessary in areas such as troubleshooting technology in the workplace. The shift for employees today is toward capitalizing on brain power, reserving human capital for the complex, multifaceted tasks that technological advances cannot tackle. Therefore, training and education in critical thinking, communication, problem solving, and teamwork skills are a necessity. These skills are of value at all levels within an organization. Jobs in the technological fields are expected to grow; however, an emphasis will be placed on the essential skills of communication, fostering cross-functional collaborations, and creative problem solving that cannot be replicated by technology.

Real-World Application: Changing Careers

Facing a career change (whether voluntary or not) can be a scary proposition, especially if you have been in your current position for some time. With changes in technology, many people will face decisions regarding their career direction, either needing to change focus within their current industry or, in some cases, pivoting to an entirely different industry. Here are some tips to consider when you are facing a career change:

- Identify areas where you can further develop your technological skills.
- Use your network to find out about job opportunities.
- Take a certification course for a particular computer program or a class on enhancing your public speaking skills.
- Reach out to your network, either social media or sites such as LinkedIn, to make people aware that you are interested in a new opportunity.

It is important to take the time to find the right opportunity and then to take small steps to get where you want to be. Think about your long-term goal. Do your research by interviewing those in the industry you want to be in or utilize a job coach/mentor to assist in your journey. Would you consider a career change? Why or why not? If so, what strategies will you use to make the transition easier?

Importance of Lifelong Learning

To protect your job security in the workplace of the future, you will want to demonstrate to your employer that you are committed to lifelong learning. With the rapid acceleration of technological change, some employers today are actively seeking employees with a lifelong learning mind-set. Lifelong learning requires continuous self-improvement and education—the motivation to be a continual student. It often occurs outside a traditional educational system and includes both informal channels and formal ones such as corporate training programs. Employee development is a core part of many human resources departments within organizations. Mandatory training or education may be required for your position, or voluntary opportunities may be offered to employees. Taking the initiative to learn and adopt new workplace technologies can be both professionally and personally fulfilling.

There are some strategies you can use to help further a lifelong learning mind-set. First, understand your personal interests and set some goals that align with them. Lifelong learning does not always have to incorporate building skills or knowledge applicable to the workplace. It might be centered on something you enjoy in your personal life. For example, suppose you really enjoy genealogy and local history. Perhaps you decide you want to learn more about the history of your hometown. For local history, you might visit the local historical society or find internet resources about the history of your hometown. Then, you can determine how you might incorporate this desire for learning into your life. Will you do something related to your personal learning goals once a week? Will you share your new knowledge with coworkers, friends, or family? Or maybe you can find a way to utilize the new information in the workplace or the community.

There are many ways to incorporate a lifelong learning mind-set into your life. Regardless of your approach, the lifelong learning mind-set can be advantageous from both a personal and a professional standpoint.

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1.1.3: Web Browsers and the Internet

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

A web browser is a type of software that allows you to find and view websites on the Internet. There are many different web browsers, but some of the most common ones include Google Chrome, Internet Explorer, Safari, Microsoft Edge, and Mozilla Firefox.

Web Browser Interface

Every web browser contains a different interface, however, there are some common attributes of all of them.

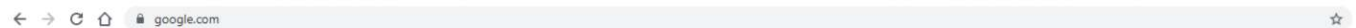
URLs and the address bar

Each website has a unique address, called a URL (short for Uniform Resource Locator). URL's are street addresses for computers, letting your computer know where to connect to on the internet. URLs are entered on the browser's address bar. The address bar is usually located at the top of the website window. Sometimes, address bars also have built-in search features, to search for the address if you do not know the exact website address. Website addresses usually contain **HTTP://** or **https://** which stands for *Hypertext Transfer Protocol* or *Hypertext Transfer Protocol Secure*. **https://** addresses are more secure. The next letters are usually **www** which stands for *World Wide Web*. After **www**, the website address is displayed. Usually, website addresses end in **.com** (commercial), **.org** (organization), or **.edu** (educational institution) depending on their classification. In the address bar, please type or www.clcmn.edu to take you to the CLC website.

Hyperlinks

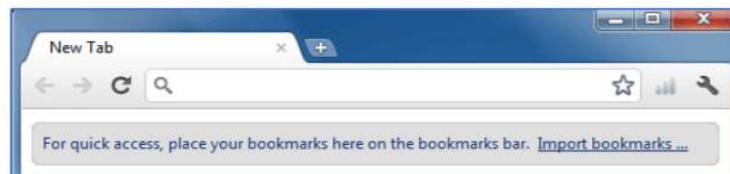
The website www.clcmn.edu displayed above that is underlined in blue is an example of a hyperlink, which provides the user with a direct address to a location on the web. Usually, the mouse pointer icon will switch to a  indicating the text is a hyperlink.

Navigation buttons



The Back and Forward arrow buttons allow you to move backward and forward through websites you've recently viewed. You can also click and hold either button to see your recent history. The Refresh button  will load the current website you are viewing a second time. Often a user will click on the refresh button when a website stops working to correct the error or to view new information because the website was updated while the user was viewing the information.

Browser Tabs



Many browsers allow you to open links in a new tab. Each tab is a new instance of the browser to help you manage your applications more efficiently. The more browser tabs that you open, the more system resources you consume. To open a link in a new tab, right-click the link and select Open link in a new tab (the exact wording may vary from browser to browser). You can close a tab by clicking the "X" on the particular tab, and open a new tab by clicking the "+" button on the particular tab.

Downloading Files

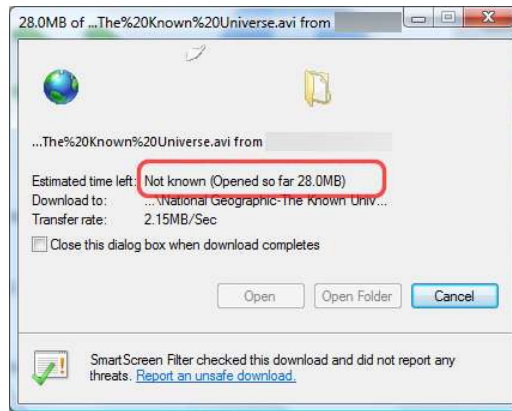


Figure 1.1.3.1: [This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Links don't always go to another website. In some cases, they point to a file that can be downloaded, or saved, to your computer. If you click a link to a file, it may download automatically, but sometimes it just opens within your browser instead of downloading. To prevent it from opening in the browser, you can right-click the link and select Save link as (different browsers may use slightly different wording, like Save target as). Files downloaded from the internet are often downloaded to your download folder, which is a quick access folder accessible on the left navigation pane of windows explorer. Sometimes you may want to save an image from a website to your computer. To do this, right-click the image and select Save image as (or Save picture as). Make sure you trust the file that you downloaded to your computer, as downloading any file or program to your computer contains security risks to your computer (links).

Internet Security

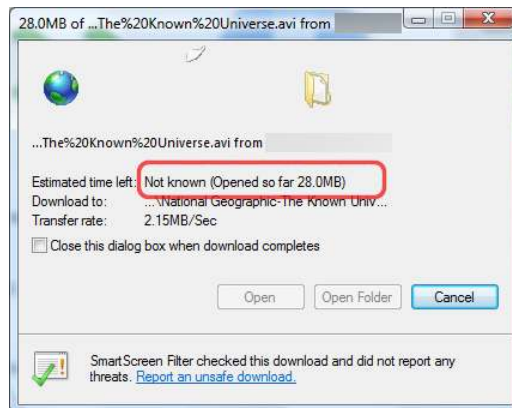


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Bookmarks and Internet History

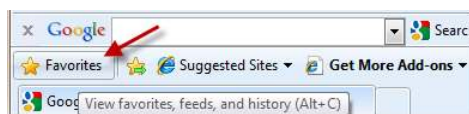


Figure 1.1.3.1: [This Photo](#) by Unknown Author is licensed under [CC BY-NC-ND](#)

If you find a website you want to access later, it can be difficult to remember all of the websites you want to visit. Bookmarks or favorites allow your computer to remember your favorite website URLs so you do not have to. To create a bookmark, select the Star icon to bookmark the current website. In addition to bookmarks, your browser will also keep track of every website you visit through your internet history. To view your history, open your browser settings—usually by clicking the icon in the upper-right corner—and select History.

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1.1.4: Essentials of Microsoft 365

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Learning Objectives

By the end of this section, you will be able to:

- Know how to access Microsoft applications
- Describe the key functions within Microsoft's standard menus
- Create, save, and open a document

Both personal and business productivity have increased as the result of technological advances. Computer technology has facilitated communication, information sharing, and data analytics. Although there have been several software programs developed over the years in these areas, two main leaders have emerged: Microsoft and Google are most common in organizations today and are suitable for a variety of purposes. Google and Microsoft have dominated the market for productivity software programs because they have adapted to the changing needs of businesses. Their success continues because of their forward-thinking and response to market needs.

Overview of Microsoft 365

Microsoft launched Microsoft Office in 1990. This suite of applications included three main programs: Word, Excel, and PowerPoint. These programs are bundled as a package to give the user the full range of productivity tools to meet a wide variety of needs. Office applications offer the flexibility to appeal to various preferences with the many ways to perform tasks within the software.

Office applications are compatible across a wide variety of platforms, including mobile devices and Apple/Mac operating systems. The applications also integrate well with other software. You may be aware of older versions of Office, such as Office 2016 or 2019, but the latest product, Microsoft 365, moves beyond these static versions, instead offering a subscription that updates automatically. With the introduction of Microsoft 365, the programs use a cloud-based technology that can be accessed anywhere. Microsoft 365 also enhanced the collaborative features of the programs.

Accessing and Maintaining Microsoft Products

When you register for a Microsoft 365 account, you are given access to OneDrive, which is its product that provides online storage in the cloud. This offers many advantages. When you save a file to your OneDrive, you will be able to access it from any computer as long as you have an internet connection. There are different versions of Microsoft 365 available for purchase, but most software today uses this subscription-based model for a fee. The software programs are installed on your devices as “apps,” but can also be accessed through the web-based versions with some limitations to functionality. Updates to the programs are provided regularly by Microsoft and should be performed when prompted. Sometimes the information technology department (IT) will take care of these software maintenance issues with your company or school equipment. There are student editions of most versions of Microsoft 365 that can be purchased at a reduced cost or even for free. The student editions might also have some limitations to the functionality of the programs.

Applications

The Microsoft 365 suite includes software for many of the most common computer needs in today's workplace, as well as for personal use, including word processing, spreadsheets, presentations, database management, an email and calendar interface, and a collaboration tool. Table 2.2 provides an overview of the applications within the suite. Other chapters in this text will cover these programs in detail. What comes next in this chapter is a breakdown of commands that are common to all the Microsoft 365 applications, so you can get a basic understanding of how to navigate.

Table 2.2: Microsoft 365 Applications

Application	Type	Description
Word	Word processing	Create documents such as reports, memos, agendas, résumés, flyers, and mailings.
Excel	Spreadsheet	Create data-based sheets and workbooks for gathering data, performing functions, and analysis.
PowerPoint	Presentations	Create slide presentations for use in workplace meetings or client showcases.
Access	Database	Create and maintain databases of information.
Outlook	Email	Manage email communications and calendars.
Teams	Collaboration tool	Set up workspaces for collaboration, such as a team might use on a specific project.

Overview: Ribbons, Tabs, and Commands Menu

Since its initial release, Microsoft's suite of office products has been a driver of change, introducing new features in each subsequent version. Since the 2007 version, the apps have used the ribbon—an interactive bar of commands at the top of the application—as their user interface. With the ribbon, all the functions are clearly organized and user-friendly.

The ribbon is organized into tabs, each of which houses a collection of thematically grouped commands. The default tabs are File, Home, Insert, Design, Layout, References, Mailings, Review, View, and Help. As you hover your mouse over the ribbon, you will notice many small icons (pictures) that have a command over them. A command directs the program to complete a process, such as Save. When you select the Save icon, the command will start.

As you can see in Figure 2.19, the commands in the ribbon are organized into a command group of similar or related buttons, which appear together on the ribbon tabs.

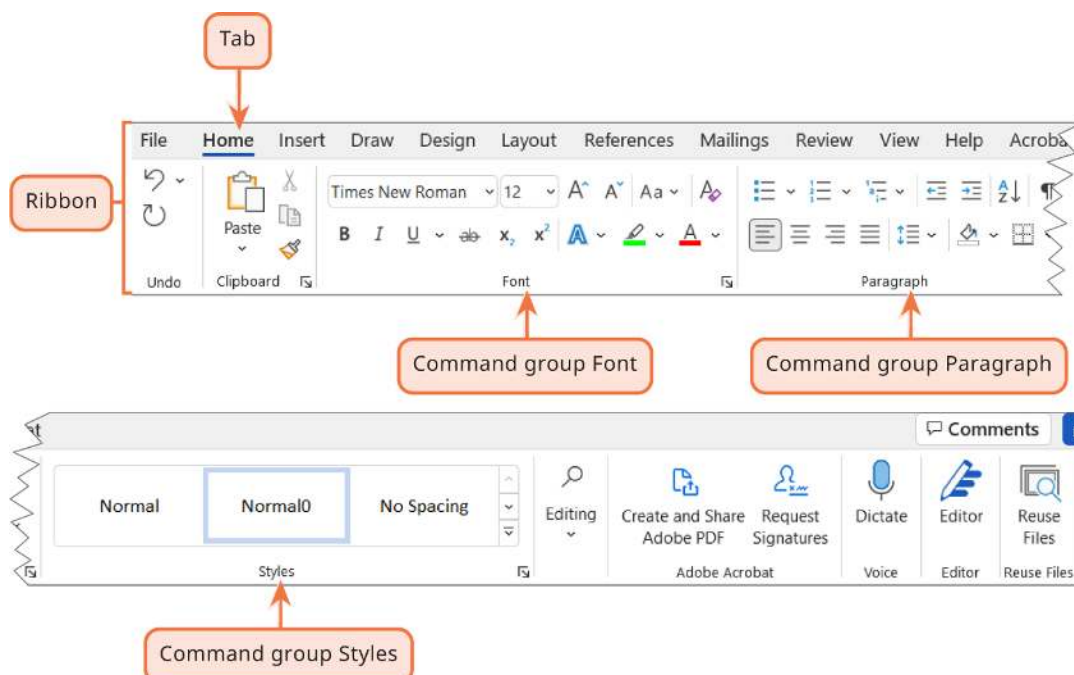


Figure 2.19: The Home tab contains the command groups Font, Paragraph, and Styles, which are used for formatting text. (Used with permission from Microsoft)

Each tab generates a different ribbon with the appropriate commands and command groups. This section introduces the most used tabs. You will learn more details about them and practice using them in each specific application as the book goes on. Figure 2.20 shows the tabs available in Word and Excel, and Figure 2.21 shows the tabs available in PowerPoint and Access.

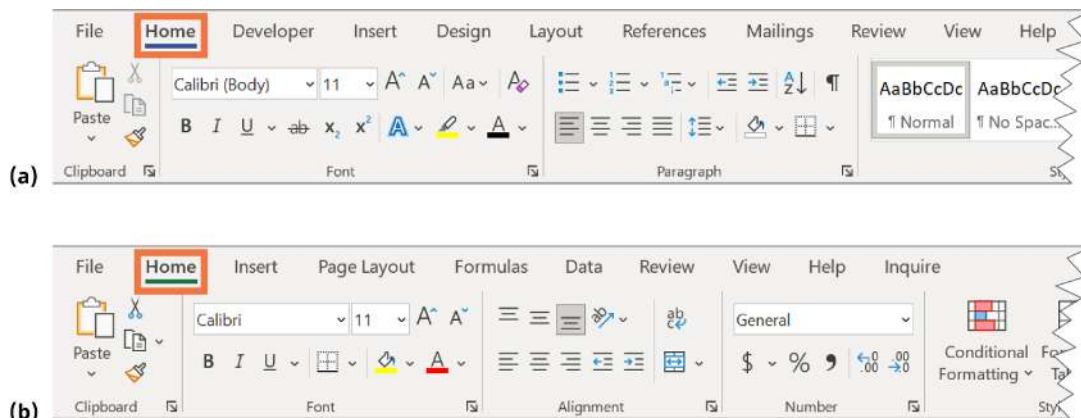


Figure 2.20: The main menu bars for (a) Word and (b) Excel share common tabs (File, Home, Insert, Help, for instance), but also contain tabs that are in character with their main functions (such as References in Word and Formulas in Excel). (Used with permission from Microsoft)

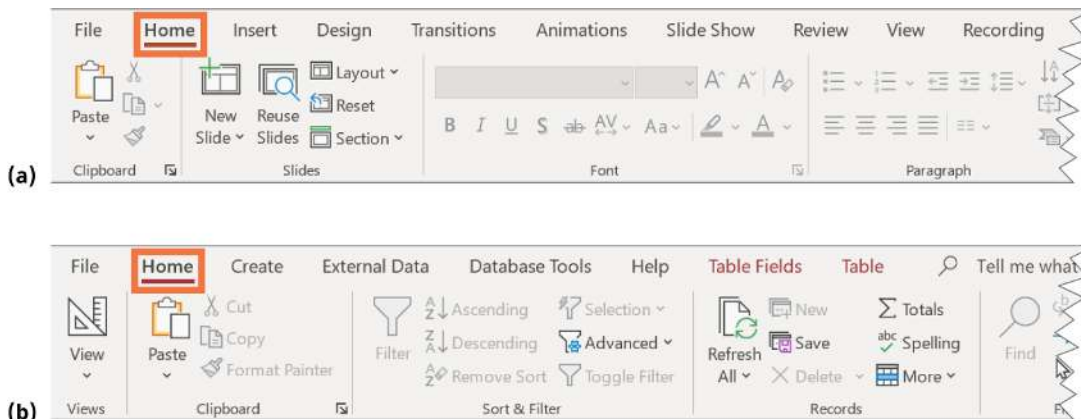


Figure 2.21: The main menu bars for (a) PowerPoint and (b) Access also share common tabs with one another and with Word and Excel (File, Home, Insert, Help, for instance). They also contain tabs that are in character with their main functions (such as Animations in PowerPoint and Database Tools in Access). (Used with permission from Microsoft)

File Tab

If you open a Microsoft product without opening any specific file, you will see the welcome screen, which provides a Backstage view. The Backstage view is located in an application for managing most tasks related to the documents. In Backstage view, you can open, close, rename, print, and control the settings for the application. There will be many commonalities within the Office programs for the tabs. When you have opened a file in an application such as Word or Excel, the Backstage view gives you information about that file you are working with. As you can see in Figure 2.22, the file properties are shown on the right pane of the Backstage view, which displays critical metrics about your document, such as its size, number of pages, number of words, file name, last saved time, and when it was printed. Backstage view also includes important commands such as file protection, inspecting the document, and managing the document, which will be discussed later in this chapter.

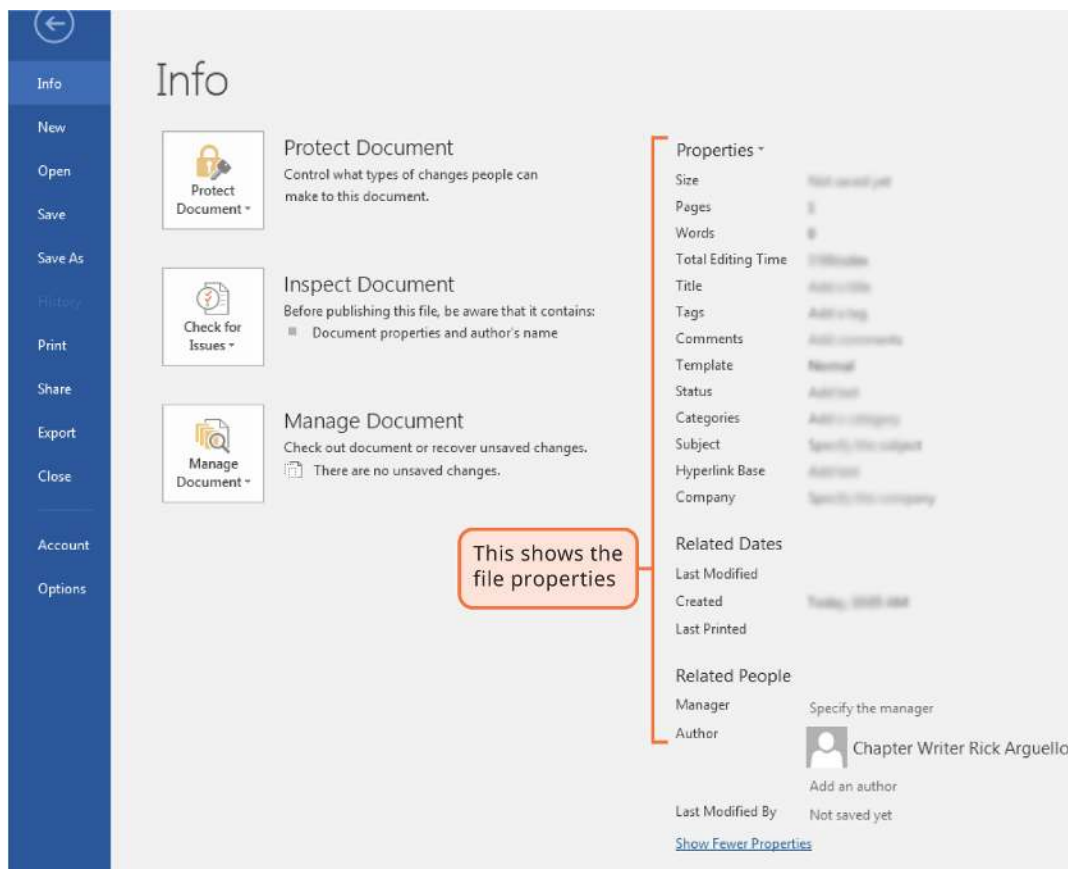


Figure 2.22: Backstage view shows file properties, which are the statistics and technical details of your file. (Used with permission from Microsoft)

Mac Tip

The Backstage view is not included in the Mac Version of Office, but you can get the properties of a file by going to the File tab and choosing Properties.

Creating a New File

As you open an Office application, you will be introduced to the welcome screen, which shows your recent files on the left and your options on the right. See Figure 2.23. Because you are in Word, you can choose Blank document to start a new document, or you can select a template from the default template list. A template is a document with many fields already filled and formatted, ready for the user to work on.

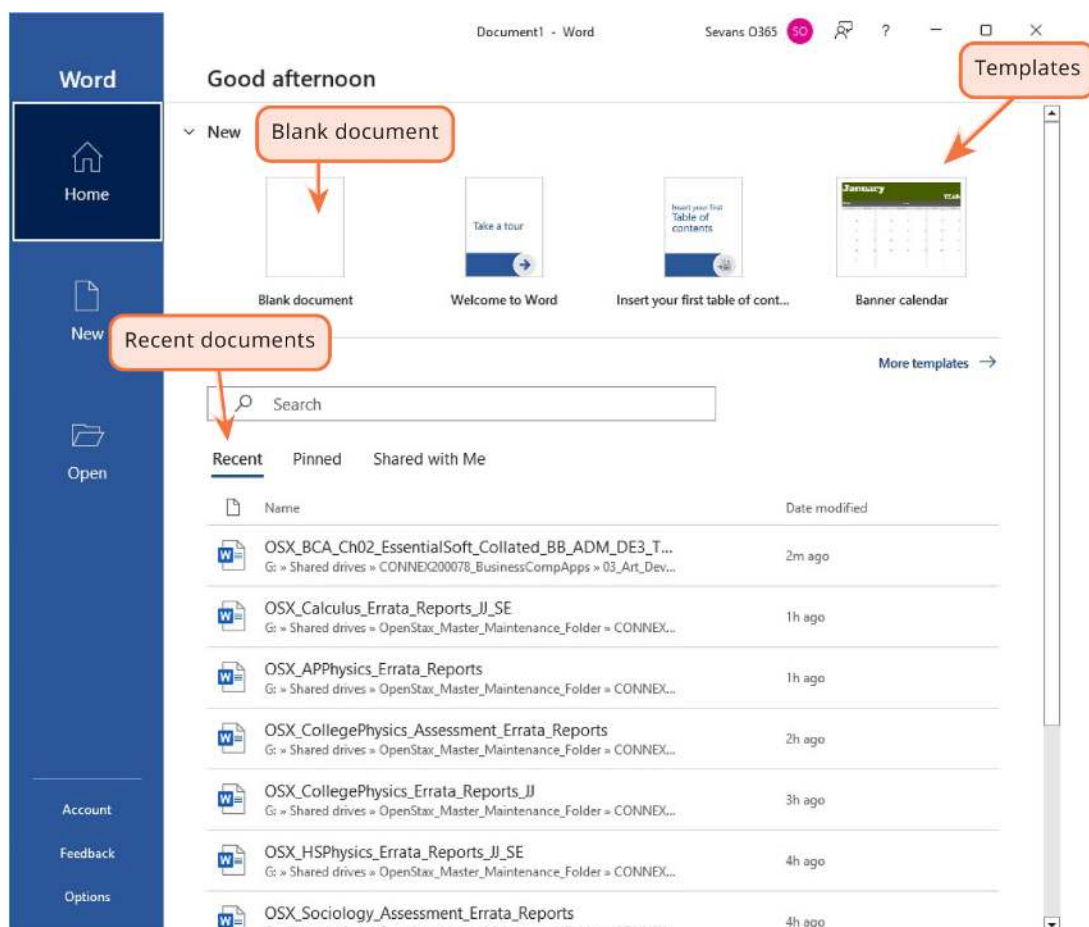


Figure 2.23: The welcome screen gives you three choices: start from scratch with a new file, create a file from a template, or open a recent file you have already saved. (Used with permission from Microsoft)

Mac Tip

The Mac version does not have the same welcome screen. To create a new file, go to the File tab and choose New Document or New Document from Template.

To create a new document without using a template, simply select Blank document. A new document will be opened with a blank screen for you to create your file. This new document will be opened in a new window. You can then add the content to the document and save the document if desired. More about document creation will be covered in later chapters in the book.

Saving a File

The Save command is located at the upper-left corner of the window. Using the Save command saves your document in its same location, with its same file name. It is a way of making sure your work does not get lost in case your computer crashes or the application closes suddenly. A good best practice is to save your document occasionally, by either pressing on the Save icon or using Ctrl+S. You can also set up automatic saving at specified time intervals.

The Save As command, located on the File tab, allows you to not only save the file with a different name but also to change its location and its type. When you save the file to a new type (for instance, Save As PDF), the file opens in the new file format. The previous file type remains open. When you click on the Save As command, a dialog box will appear, asking you to select the location where you want to save the new version and what you want to name it.

Large companies like WorldCorp will typically give their employees a schema or convention to follow when naming files so that the company will have a unified system that all employees can easily identify and understand. This also allows people within the organization to be able to keep track of different information about the file, such as its version and the project or department it is

associated with. For example, if the name of your market trends report is “market_report_v1.docx,” the next version could be “market_report_v2.docx.” This gives you a version history of the file, which enables you to keep track of older and newer versions. Figure 2.24 shows the current folder and the name of the file you want to change.

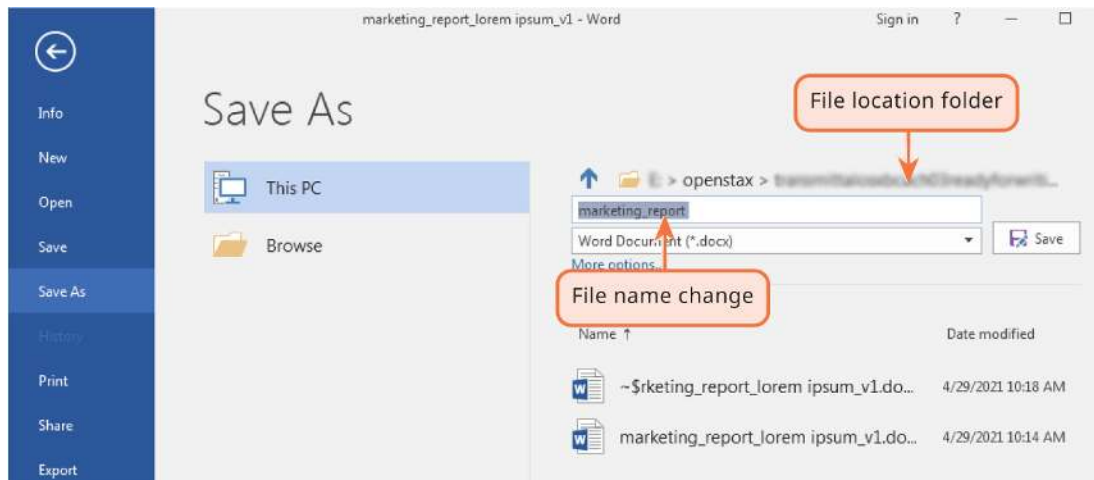


Figure 2.24: When you Save As, you can change the file name, the file format, or both. (Used with permission from Microsoft)

Save As can also be helpful in other situations. For example, you may want to save your file in a different format so that it can be opened by a different application. You would also use the Save As command to save the file in a different folder, with a different name for categorization purposes. The default Word file format is .docx, but you could also save it as a .pdf or .rtf.

Microsoft also offers the option to save to a different location—for example, your local computer, a shared private location (such as a company drive), or the cloud OneDrive. This allows you to save your work easily even if the device you are working on does not have saving capacity, and also gives you the ability to share your work with others. (You will learn more about collaboration later.) To share a file with others, first save your presentation to OneDrive. Choose File, then Share, and then Share with People.

Opening an Existing File

With the desktop version of Microsoft 365, your recent file list will be readily available in Backstage view. If the file you want does not appear in your recent file list, click on File and then Open. Locate the file, select it, and click Open. If you want a file to always appear in your recent file list, you can “pin” it: Go back to File, and the file that is now open will have a pushpin icon next to its name. Click on the pushpin, and the file will be pinned.

To access a file in Microsoft 365 online, you must set up an account with Microsoft if you do not already have one. Then, you can go to the program you are working in and you will find your recent file list. OneDrive also gives you access to files not listed in your recent file list. Locate the file you want and click Open. Your document should appear.

Printing a File

To print a file, choose the File tab. In the list of options on the left, you will see Print. When you click on Print, you will be shown a preview of your document along with print options. See Figure 2.25. The print options include a variety of settings, such as number of copies, printer selection, and paper size. You can also print on both sides of the paper or select only certain sheets to print. When you have chosen the desired settings, choose Print on the upper-left side of the screen.

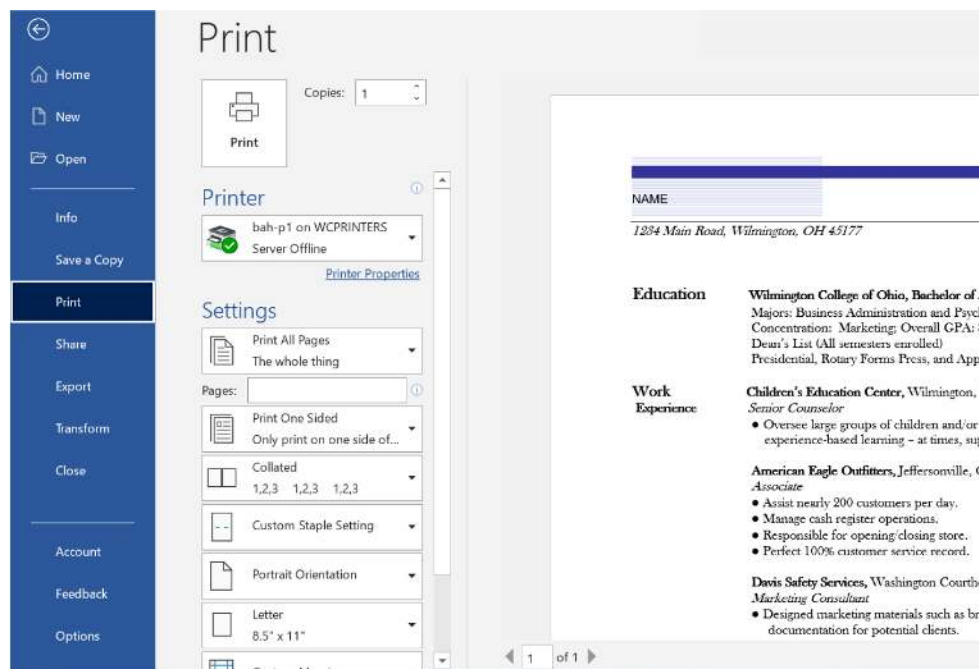


Figure 2.25: You can also choose to have your document stapled if that option is available on your printer. (Used with permission from Microsoft)

Mac Tip

Print screen on a Mac displays the options that are included with the user's installed printer.

Options

The Options command at the bottom of the File tab contains a multitude of choices that control the way your workspace appears, determine the way the text is corrected, and allow changes to many aspects of the program. A summary of the options available is shown in Table 2.3.

Table 2.3: Summary of the Options Dialog Box The Options command appears in all Office applications and provides helpful settings.

General	Provides options that affect the user interface
Display	Changes how the content is shown on the screen and when it is printed
Proofing	Sets the way spelling and grammar are checked
Save	Sets up AutoSave to save a copy of your work at scheduled intervals
Language	Chooses the language in which menus and controls appear
Accessibility	Checks your documents for accessibility to people with visual or other challenges
Advanced	Sets how words are edited, replaced, or cut and pasted
Customize Ribbon	Allows users to choose which commands are shown on the ribbon
Quick Access Toolbar	Allows users to choose what is displayed on the Quick Access Toolbar above the ribbon
Add-ins	Manages the available Office add-ins
Trust Center	Sets security settings, most of which should remain as set

The Options command, present in all Office applications, opens an Options dialog box, as shown in Figure 2.26. Before you start working, it's advisable to click on each of the Options items to see what each covers.

An Options item that is critical to your work is a Save option called AutoRecover. Just ask yourself, "Has my computer ever frozen in the middle of a sentence?" This happens to everyone, but AutoRecover can prevent a catastrophe by allowing you to set the program to automatically save your work every two minutes, five minutes, or whatever interval you choose.

Another helpful option is proofing, which allows Microsoft to check your spelling as you type.

You will find some options that you may never need to change. In the future, however, you will be glad to know where to locate these hidden settings.

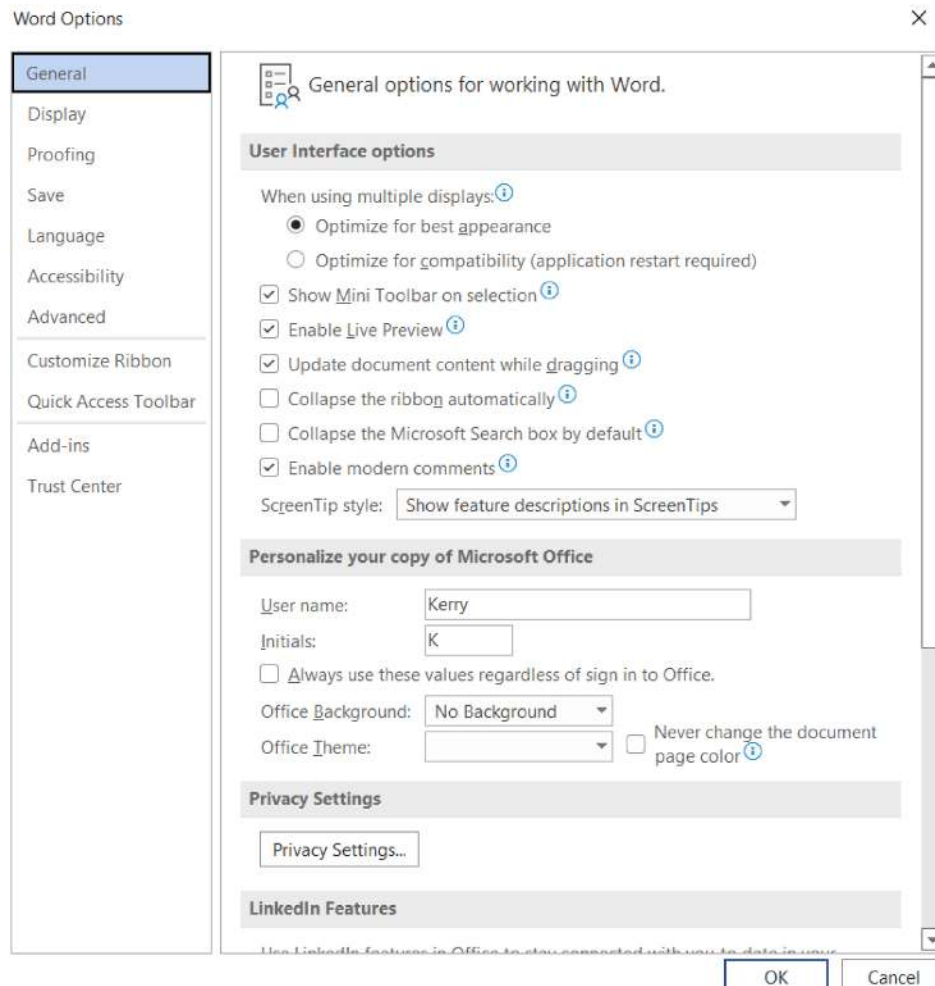


Figure 2.26: The Options command, present in all Office applications, opens an Options dialog box with many available options or settings that can be changed. (Used with permission from Microsoft)

Customize Ribbon and the Quick Access Toolbar are useful features. Because you are likely to use both functions on a regular basis, you want their commands to always be visible. This is most easily done by customizing the ribbon or the Quick Access Toolbar.

There are probably some other commands that you wish you had immediate access to but did not know this was possible. For example, did you know that you can add an email command to either the ribbon or the Quick Access Toolbar? Suppose you want to email someone and add a presentation to your email as an attachment. If you add Email to your ribbon or Quick Access Toolbar, you can just click on the Email command, which will open your regular email program with access to your address book and add an attachment of the presentation to the email. No more need to open the email program independently, then search for the file on your computer, and finally attach it.

As another example, suppose you work with a lot of graphics. There are numerous commands associated with drawing and inserting graphics that are generally hidden. You may not even be aware that these functions exist, but when you change the scope to All Commands and look through the choices, you will find many commands that can save you a lot of time if you set them up for immediate access.

There are two ways to customize the Quick Access Toolbar. First, from the Options dialog box, select the Quick Access Toolbar, shown in Figure 2.27.

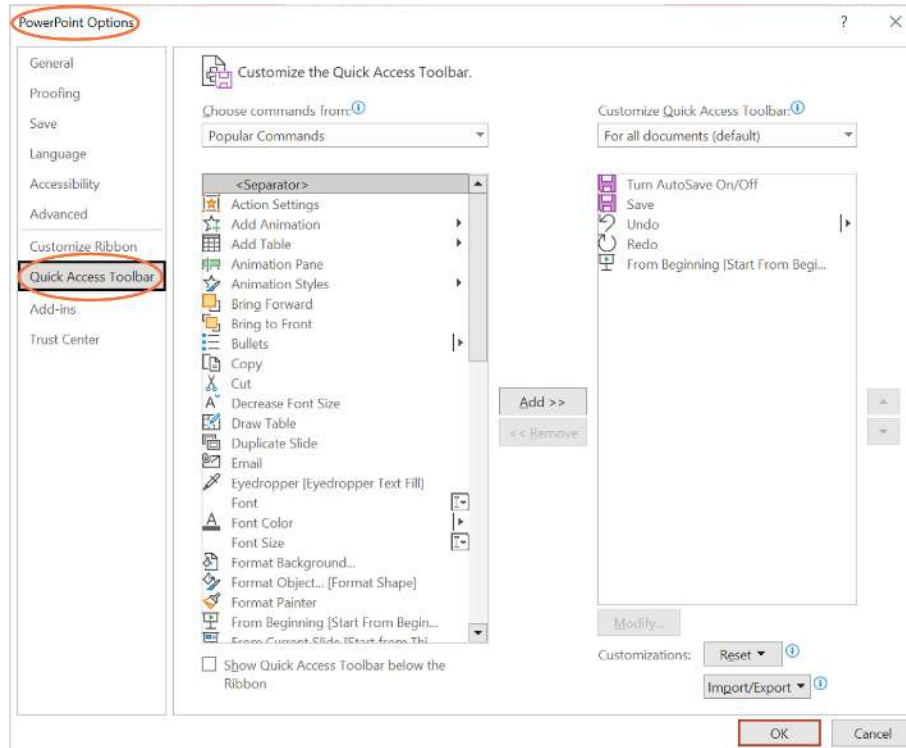


Figure 2.27: To customize the Quick Access Toolbar, add commands from the selections on the left to the list on the right. (Used with permission from Microsoft)

For example, to add a Quick Print option, scroll down to Quick Print in the list of commands on the left. Highlight Quick Print, click the Add button, and Quick Print will appear on the Quick Access Toolbar, as seen in Figure 2.28, which shows the result of customizing the Quick Access Toolbar.

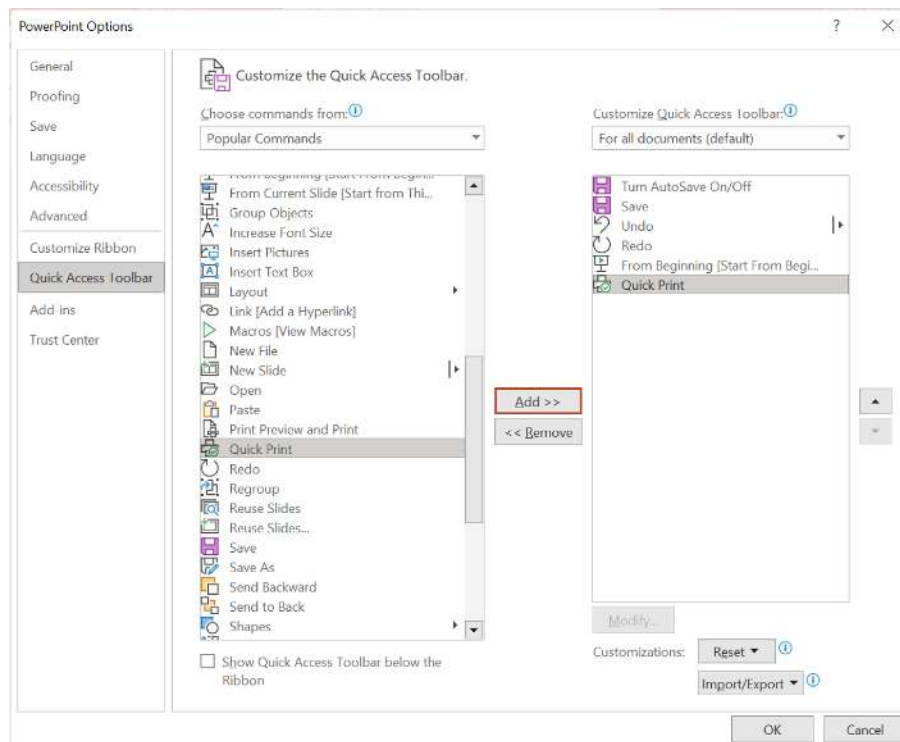


Figure 2.28: Items added to the Quick Access Toolbar will appear at the top of the screen when you open the program. (Used with permission from Microsoft)

The second way to customize is to right-click on the Quick Access Toolbar, which opens a context menu. Choose Quick Print from the menu items, as shown in Figure 2.29. The Quick Print option should appear on the Quick Access Toolbar.

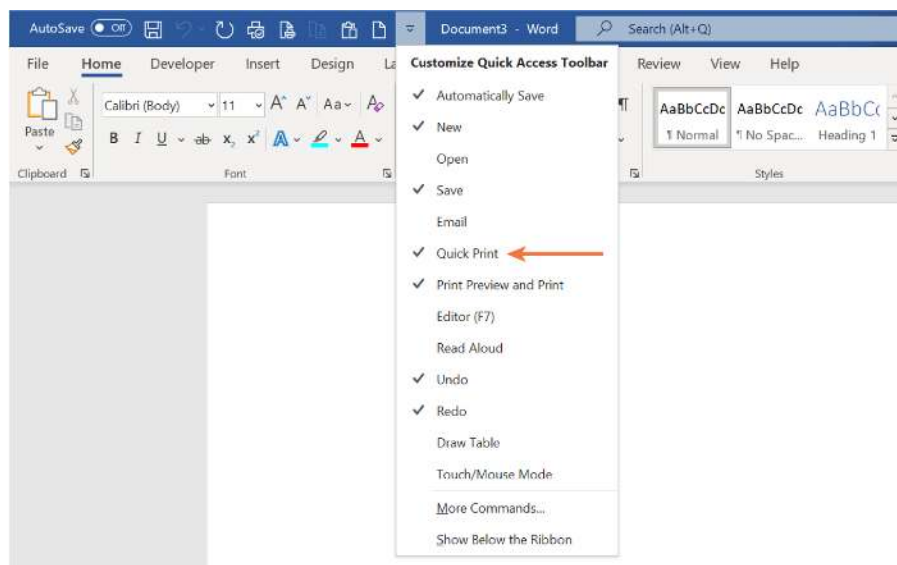


Figure 2.29: Using the context menu, you can easily add the Quick Print option to the Quick Access Toolbar. (Used with permission from Microsoft)

Mac Tip

The Quick Access Toolbar is found on the Preferences tab on the app main page.

Customizing the ribbon is a similar process. Start at the Customize the ribbon command from Options in Backstage view. To add a command to the ribbon, you first have to create a new group, as follows:

1. Choose the tab on the right where you want to add the new command. (For the purposes of this demonstration, choose the Draw group, making sure there is a check mark next to the Draw box.)
2. Click on New Group, which will be listed when you click on the plus sign next to Draw.
3. In the box at the top left, select Commands Not in the ribbon (see Figure 2.30).
4. Scroll down to Borders and Shading and click Add.
5. Then, select another command, Brightness, and click Add.

When you return to the application, you will see your New Group with the options selected. Using this method, you can select any command from the left and add it to the ribbon commands on the right. This works for all the Office programs.

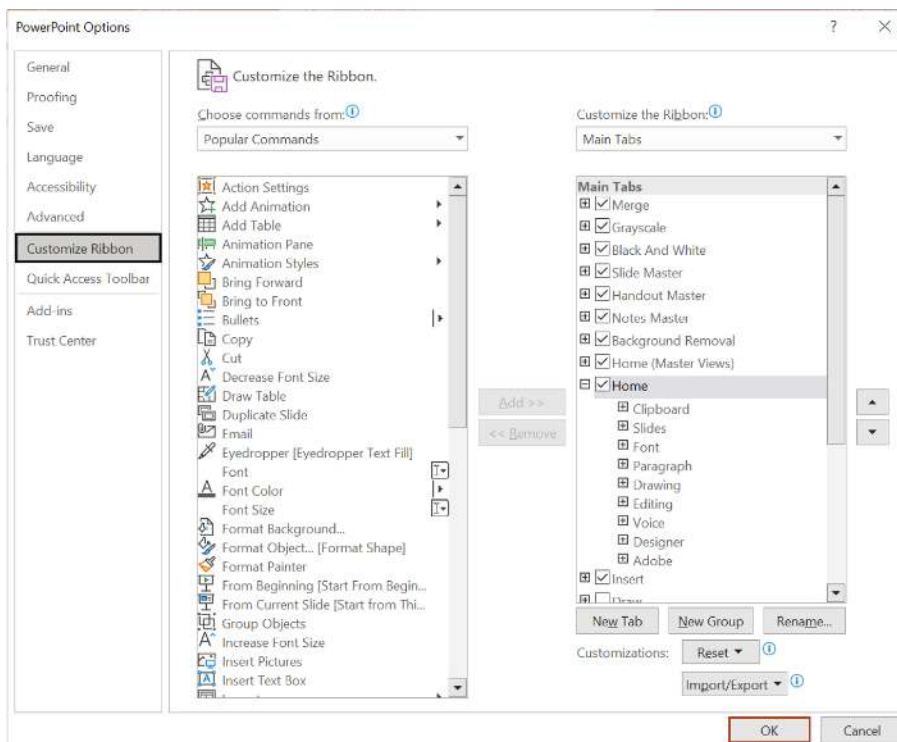


Figure 2.30: Customizing the ribbon can facilitate your productivity by including items you use frequently for quicker access. (Used with permission from Microsoft)

Link to Learning

Microsoft products offer hundreds of keyboard shortcuts (such as holding down the Ctrl button and S at the same time saves a document) that can help you work more quickly and efficiently. The [Microsoft support page on keyboard shortcuts in Word](https://support.microsoft.com/en-us/keyboard-shortcuts-in-word) provides a long list of these shortcuts, categorized by activity type.

Home Tab

The Home tab is where you begin to create your document, spreadsheet, or presentation. The ribbon for the Home tab in Word is shown in Figure 2.31. You can view the ribbon as command central for the application: It is a collection of commands and command groups that govern the basics of the program you are working with. Each group of commands is separated by a thin vertical line (see arrow in Figure 2.31).

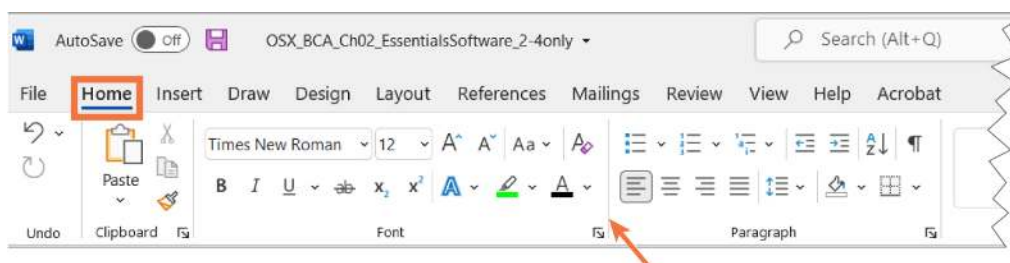


Figure 2.31: The Home tab contains items such as formatting the font size and determining the line spacing. (Used with permission from Microsoft)

First is the Clipboard group, which contains the commands for all the cut-and-paste functions. As in all the Office applications, an arrow next to or below a label means that there are other possible choices for that function. Notice that the Paste command has an arrow below it. Clicking on the arrow gives you several Paste options; if you hover over them, you will see helpful descriptions and previews.

The Font command group is similar across applications. You can choose Bold, Italic, Underline, Strikethrough, and Highlight. You can also regulate character spacing and add a superscript or subscript. Primarily, however, you will change the font face, color, and size.

Sticking with Word to get an idea of how the Home tab operates, the Paragraph command group contains the commands for indentation and for aligning text to the right or to the left, centered, or justified. You can create columns, change the direction of the text by rotating 90, 180, or 270 degrees, or stack the letters on top of one another. The Paragraph command group also contains the commands for creating bulleted and numbered lists and for adding SmartArt graphics to text. Notice that there is an arrow associated with most of these commands, indicating that each one offers still more choices for formatting a paragraph.

Table 2.4 lists common keyboard shortcuts. To use each action, press the Ctrl button, and while holding it down, press the next key. You may find these shortcuts useful so that you do not have to take your hands from the keyboard to use the mouse. It might be helpful to bookmark this table for future reference as you work through the rest of the book.

Table 2.4: Common Keyboard Shortcuts in Office

Action	Keyboard Shortcut	Action	Keyboard Shortcut	Action	Keyboard Shortcut
Copy	Ctrl+C	Italic	Ctrl+I	Help	F1
Cut	Ctrl+X	Center	Ctrl+E	Open a file	Ctrl+O
Paste	Ctrl+V	Justify	Ctrl+J	Create a new file	Ctrl+N
Undo	Ctrl+Z	Underline	Ctrl+U	Save a file	Ctrl+S
Redo	Ctrl+Y	Align left	Ctrl+L	Print a file	Ctrl+P
Bold	Ctrl+B	Find	Ctrl+F	Close a file	Ctrl+W

Mac Tip

On a Mac, Control is replaced with Command.

Format Painter

Format Painter, represented with a paintbrush icon, is a shortcut tool that is available in Word, Excel, and PowerPoint. This tool lets you copy the formatting of a section of text, a cell, or whatever you choose to another place on a document, spreadsheet, or slide, respectively. It is especially useful when you need to reformat large amounts of text.

First, select the text that has been formatted in the way you want. Then, click on Format Painter, and the cursor will turn into a little paintbrush, as Figure 2.32 shows. Brush over the text you want to change, let go of the mouse, and the text will now be formatted in the desired style.

Note that if you want to use Format Painter again, you will have to repeat the steps outlined above. To format a lot of text, double-click on the Format Painter icon, and it will last until you click on it one more time.



Figure 2.32: Format Painter is a handy tool to brush, so to speak, over text and format it as you like. (Used with permission from Microsoft)

Insert Tab

The Insert tab allows you to insert a variety of items into your file, including visual images such as pictures or diagrams, tables, links, and equations or special symbols. The Insert tab will differ a bit by program. Figure 2.33 shows what the Insert tab looks like for Word, Excel, and PowerPoint. For example, in Word and PowerPoint, you have options to insert SmartArt. Excel has many options to insert charts and graphs. More details about the specific insert options will appear in the chapters to follow on each of the programs.

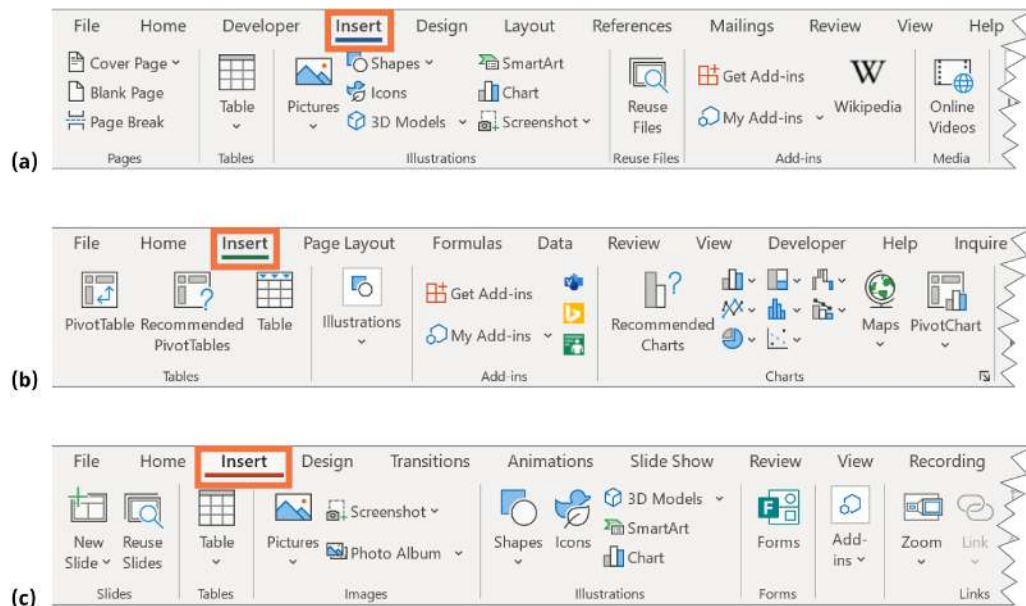


Figure 2.33: (a) Insert tab for Word, (b) Excel, and (c) PowerPoint. Different tabs appear for each program depending on the program's purpose. (Used with permission from Microsoft)

Design Tab

The Design tab is found on the ribbon in Word and in PowerPoint. See Figure 2.34. The tab includes options to customize the look of the document or presentation. There are preset themes that you can use to enhance the document or slide, or you can create your own theme. The options on the Design tab are covered in more depth in Creating and Working in Documents and Preparing Presentations.

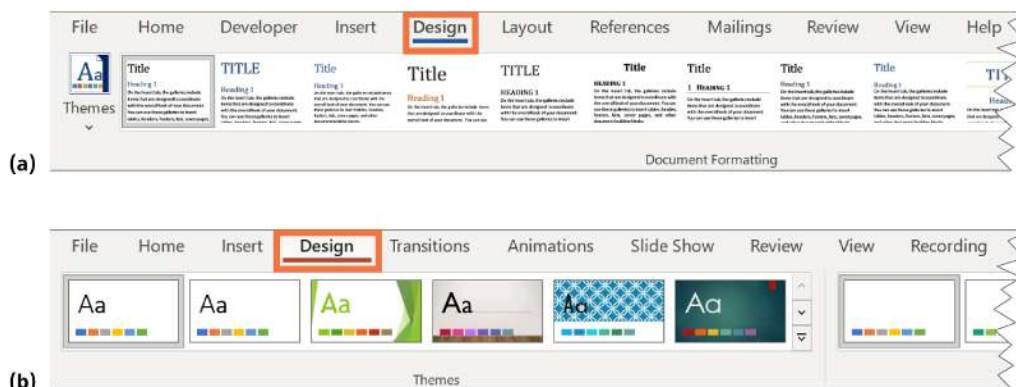


Figure 2.34: (a) The Design tab in Word allows you to choose preset themes for formatting text or you can create your own design choices. (b) PowerPoint's Design tab functions similarly. (Used with permission from Microsoft)

Layout and Page Layout Tabs

The Layout tab (Word) and Page Layout (Excel) tabs control items such as spacing and margins in your file. You can use the options on the tabs to insert page breaks, change the orientation, and define the print area. In Page Layout in Excel, you can also apply a theme to your spreadsheet to enhance the visual appeal. This is similar to what you would find on the Design tab for Word and PowerPoint. Figure 2.35 shows the tabs for Word and Excel. The chapters on Word and Excel will cover these tabs in depth.

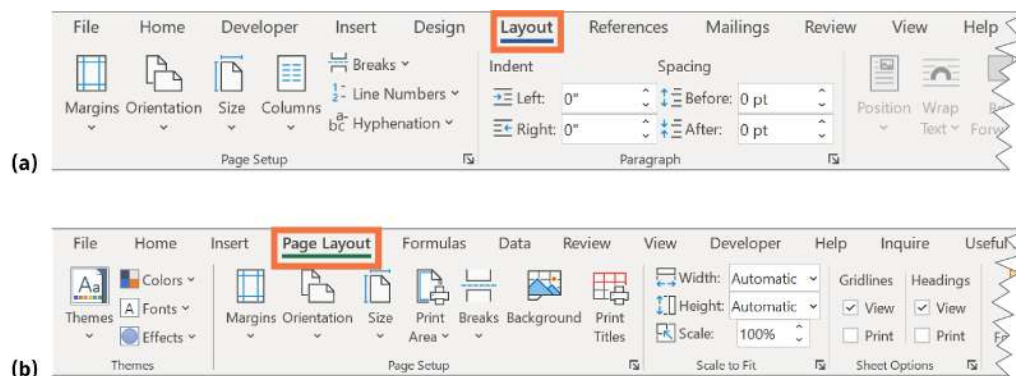


Figure 2.35: (a) The Layout tab in Word and (b) Page Layout tab in Excel allow you to set up your document or spreadsheet for easier reading and visual appeal. (Used with permission from Microsoft)

Review Tab

The Review tab is found in three Office programs (Access does not have a Review tab). In Word, the Review tab is useful to check spelling, track changes within a document, and compare previous versions of documents to each other. The Review tab in Excel also contains a spell-check feature, but also allows you to add comments and to protect the worksheet from editing by others. Finally, the Review tab options in PowerPoint are very similar to those in Excel. The Review tab is a great place to reference to make sure your file is ready to share with others and to collaborate by adding comments. Figure 2.36 shows the Review tabs for Excel, Word, and PowerPoint.

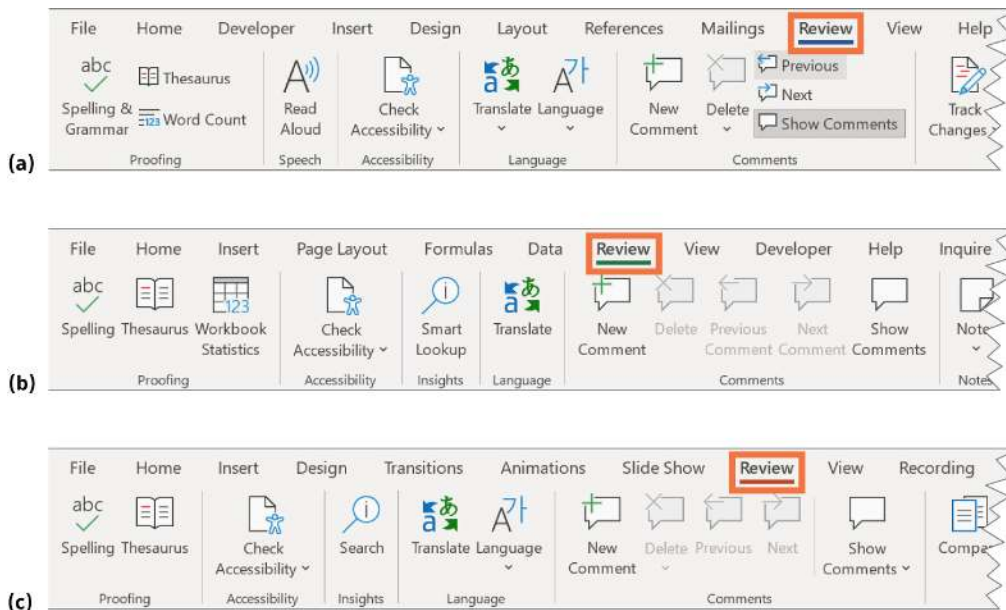


Figure 2.36: The Review tab in (a) Word, (b) Excel, and (c) PowerPoint all share common functions, such as creating and managing comments from multiple users. (Used with permission from Microsoft)

View Tab

The View tab is also seen in Office applications, except Access. It can customize what you see on the screen. You can change the options to show you what the file will look like when printed by choosing the Print Layout view. You can use the options to zoom in to make the screen larger. Finally, there are options to view files open in the same program side by side or to switch between the open windows when working with multiple files at a time. Notice the slight differences in options between the three applications in Figure 2.37.

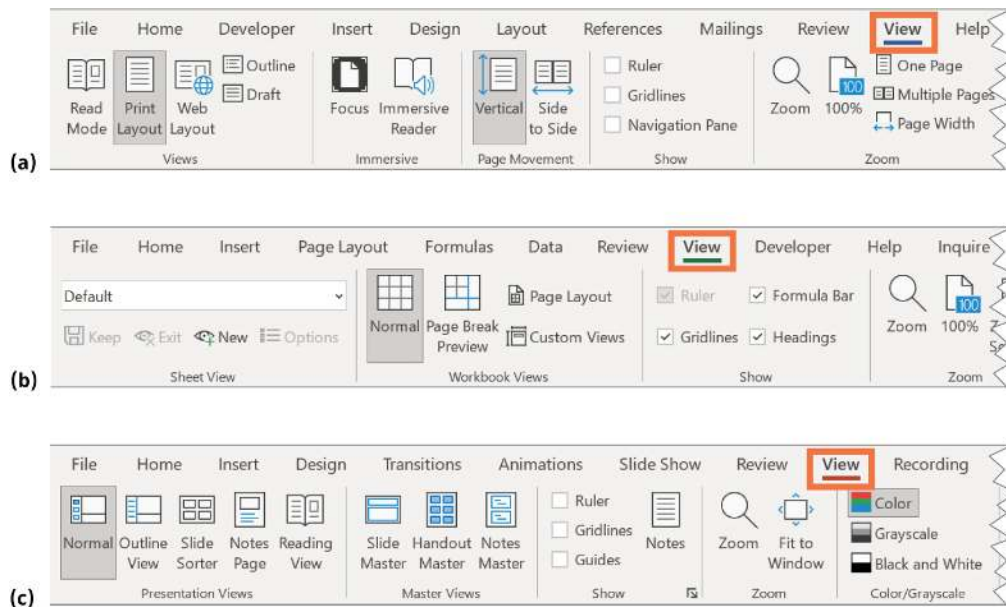


Figure 2.37: The (a) View tab in Word, (b) Excel, and (c) PowerPoint sets how your document, spreadsheet, or presentation will appear on-screen. (Used with permission from Microsoft)

Help Tab

The Help tab looks the same in all the Office applications. The Help tab gives you options to seek help on an issue with the application you are working with. Through the tab, you can use the Help search by clicking on the question mark or you can contact support directly. The Show Training is a good place to start if you have not used the program at all before. It gives you a

collection of help tutorials to walk you through many of the more common features used in the program. When you select any of the options on the Help tab, a window will open at the right to assist you further (see Figure 2.38).

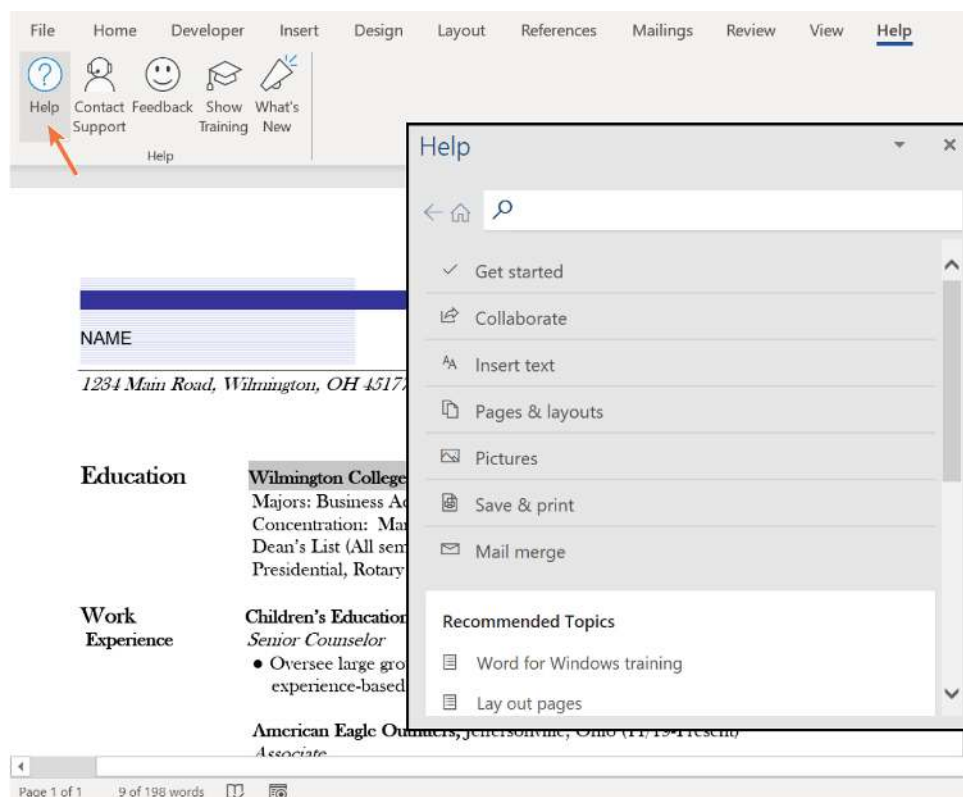


Figure 2.38: When you select the general help search with the question mark, you can type the topic or question you need help with into the search bar. (Used with permission from Microsoft)

Other Tabs

Based on the application you are using, there are different tabs that are included in the ribbon specific to that program. These tabs offer options that relate to the functionality of the program. For example, in Word, you have a Mailings tab that can send a document to a large database of individuals. In PowerPoint, you have the Slide Show tab that contains options for developing your presentation. Table 2.5 gives you the default tabs for each program. Remember, using the Customized Ribbon option, you can change which tabs you have displayed in the programs.

Table 2.5: Default Tabs by Office Program Each program has a ribbon of default tabs.

Word	Home, Insert, Layout, References, Mailings, Review, View, and Help
Excel	Home, Insert, Page Layout, Formulas, Data, Review, View, and Help
PowerPoint	Home, Insert, Design, Transitions, Animations, Slide Show, Review, View, and Help
Access	Home, Create, External Data, Database Tools, Help, Table Fields, and Table

Office Web Applications

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1.1.5: Communication and Calendar Applications

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Learning Objectives

By the end of this section, you will be able to:

- Identify common communication applications for email and messaging
- Apply best practices to crafting an email
- Describe features and uses of calendar applications

Effective communication is a key component of any organization. Today's technologies enable us to communicate nearly seamlessly across thousands of miles, so that organizations can operate more efficiently and respond quickly to their customers' changing needs.

Communication technologies fall into three broad categories: email, instant chat/messaging, and videoconferencing programs. Some companies might also conduct communication by placing calls over the internet. Email is electronic mail. It is like writing a letter and delivering it via the internet rather than through the postal service. Instant chat/messaging is designed for brief, typed messages that are delivered in real time as if you were chatting with someone face-to-face. Finally, videoconferencing programs use video to mimic a face-to-face meeting where you can see and hear the other participants, but in a virtual environment (rather than in the same physical location).

There are advantages and disadvantages to each type of communication technology. Email is not ideal for conveying emotion clearly. Instant chat/messaging, though quick, as its name implies, may not preserve the entire conversation for later reference. (This may depend on the messaging service used.) Many email and instant messaging applications include a video chatting/meeting option as well.

With video communication programs, engagement from participants could be limited, especially if participants keep their video cameras turned off or if there are a large number of participants. It may be difficult to interject to speak in such a setting. But video communication software has made it possible to hold departmental meetings where all members do not have to be gathered in the same location. This technology has transformed communication on a large scale as well, especially on the world stage, as Figure 2.9 shows.

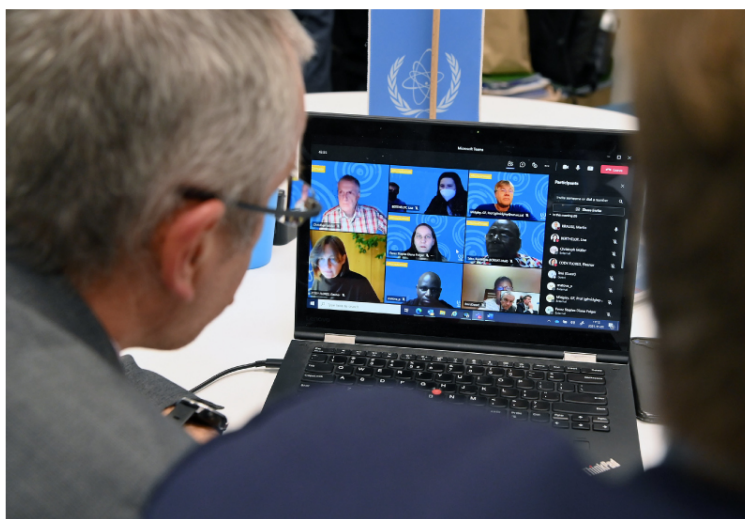


Figure 2.9: Technical Cooperation Members of the COP26 Climate Change Conference hold a virtual meeting in 2021 in Glasgow, Scotland, enabling stakeholders from 200 countries to come together whether in person or over the internet. (credit: "IAEA Staff Behind the Scenes at COP26" by IAEA Imagebank/Flickr, CC BY 2.0)

Communication in the Digitized Office

Effective communication is essential for enhancing organizational performance. Communication is needed from upper management to effectively convey the strategic goals of the organization. Communication among colleagues is needed to ensure that work tasks are being completed in a timely manner. And, finally, external communication of an organization to key stakeholders such as customers or vendors is necessary to increase the customer base or garner additional funding if needed. External communication is essential when marketing your company. WorldCorp can use external communication via a variety of ways (such as a website and emails to potential customers) to raise awareness about a new product line they are offering. With technology today, business can be conducted without the individuals being in the same physical space. It is likely that you will encounter a digitized office environment in your career.

Challenges of Digitized Collaboration

Some challenges of collaboration via technology include:

- Building trust
- Scheduling
- Addressing communication issues
- Overcoming cultural differences

Regular video calls with teams can be an effective way to build trust in an organization. In a digitized business environment, scheduling will need to account for time zone differences and this can be facilitated with the technologies today. Figure 2.10 shows one map of the world time zones that most video conferencing programs will automatically account for when scheduling meetings in multiple countries and continents.

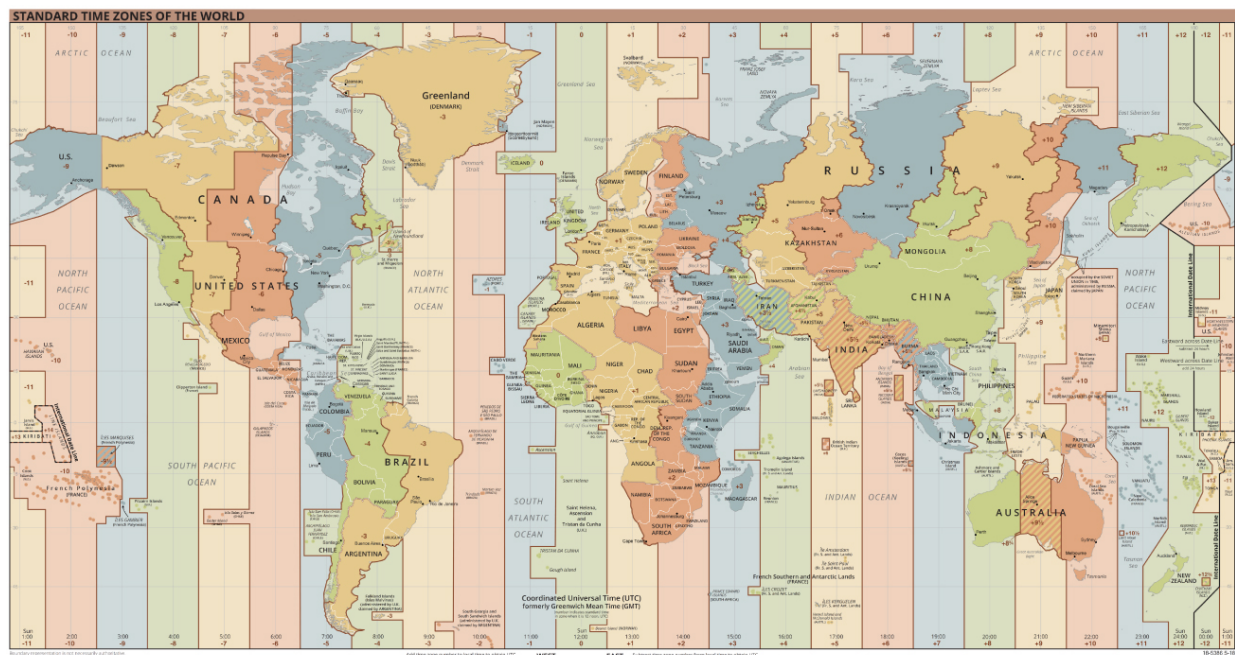


Figure 2.10: An understanding of time zones is important in running video meetings in multinational corporations. (credit: "Standard World Time Zones map (as of August 2015)" by UnaitxuGV/Wikimedia Commons, Public Domain)

Communications issues such as language barriers can be addressed using translation capabilities within some applications. This can allow businesses to recognize cultural differences that may exist within their organization or customer base. Organizations that operate remotely should consider offering training to help overcome some of these cultural differences so that they do not become barriers to effective teamwork. The training could include cultural awareness training or even language classes to assist employees working across borders.

Essentials of Business Communication

Communication in the workplace is an essential part of the day-to-day functions for any employee. Keep in mind that communication conducted using company equipment (even if private) can be recorded and is the property of the company that can be accessed at any time. So keep this in mind when you are communicating while at work. This includes chats, instant messages, emails, video calls, and computer files.

Although the exact content of the communication will vary, there are some best practices to follow to make the communication more effective. First, one of the most important aspects of communicating is to know your audience. The way you communicate with your coworker could be completely different than how you would communicate with a senior level manager in the company. The communication style, needs, and method can vary widely based on the audience. Next, you need to understand your communication objectives: Is the intent to inform or persuade? What are you hoping to achieve with the communication? Knowing the answer to these questions can help you format the content of your communication and clearly articulate the message.

Determining the audience and the purpose of the communication leads to creating the content of the communication. First, consider the level of formality needed in the message. Communicating lunch plans with your coworkers is a different level of formality than communicating quarterly sales results with a manager. You might also consider the timing of communication in your thought process. Sending critical information via email at 5:15 p.m. on a Friday afternoon may not be the best timing for the message to go out. Some applications might give you the ability to schedule delivery of emails at a more appropriate time. Timing is especially important when communicating across time zones. Be sure to spell-check your content and read it out loud for professionalism when appropriate. This is also applicable to all attachments to the communications that you might send.

Communication Applications

WorldCorp uses email, instant messaging, and video applications because it has several employees who work remotely. Technologies of this kind are called communication applications, or software that facilitates communication between individuals or groups.

Email has become its primary means to communicate. Instant messaging also plays a role in the company as a fast way to communicate with coworkers who might not be located in the same office space as you are. Finally, video communication applications work well when not everyone can be in the same place to meet face-to-face. Within each communication type, there are several applications available, and many are integrated into one program. Most of the software for the communication type will have similar functionality. For example, many email applications offer similar tools and capabilities for communicating.

Email

Email is a digital means to send messages, ranging from a short memo to a longer narrative, which can be sent to a single recipient or to thousands (or more). You've most likely used or at least heard of popular email programs such as Outlook, Gmail, Apple Mail, and Yahoo! mail. Emails can also include attachments, such as Word or Excel documents.

Regardless of which email program you use, all emails have certain common elements. The main components of an email include: To, Cc, Bcc, subject, body of the email, and attachments, as shown in Figure 2.11. The To field is where you enter the address of the primary intended recipient(s). You can include multiple recipients for the email; their email addresses will be separated either by a "," or a ";" depending on which program you are using. All carbon copy (Cc) recipients will get the identical email and all recipients will know all that have received the email, but they are merely "copied" on the message to be informed of it. There is no action required by Cc'd recipients. A blind carbon copy (Bcc) means that the recipients in the To and Cc fields will not know the Bcc individual has received the email. This function serves to inform someone else confidentially and usually means there is a crucial need for it. It's not a function to use lightly or liberally.

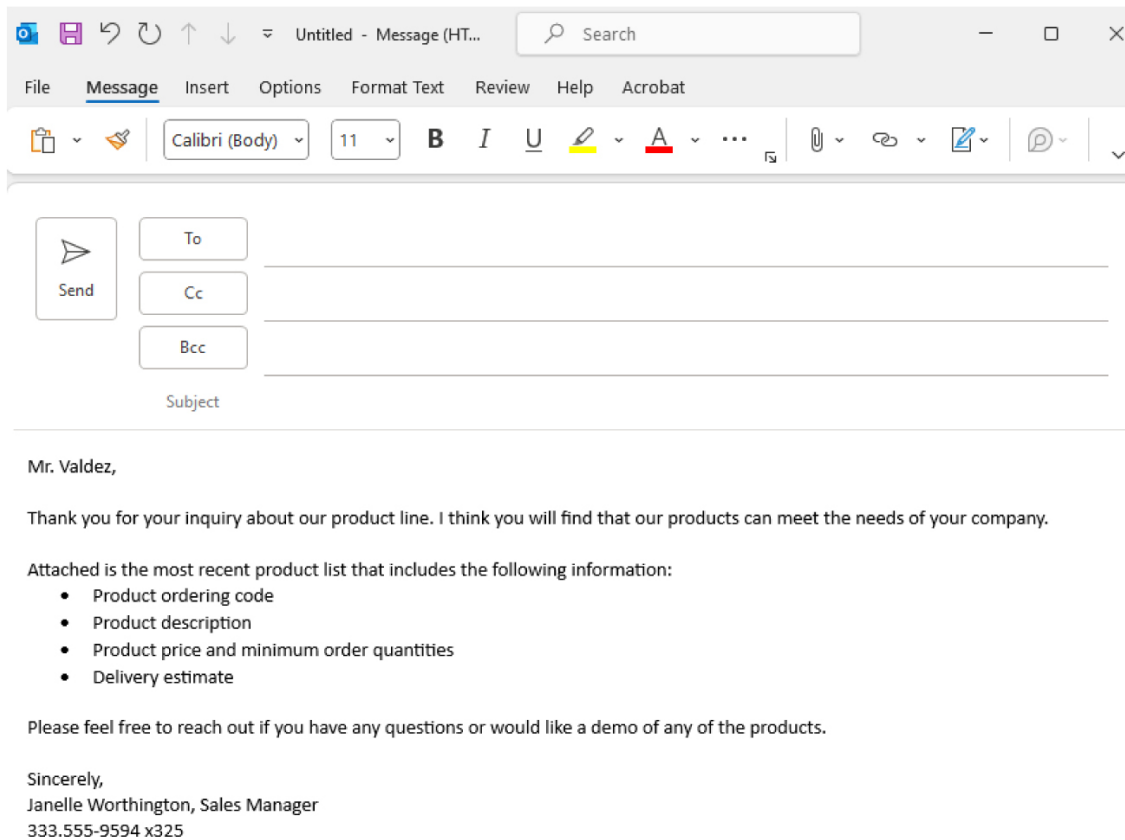
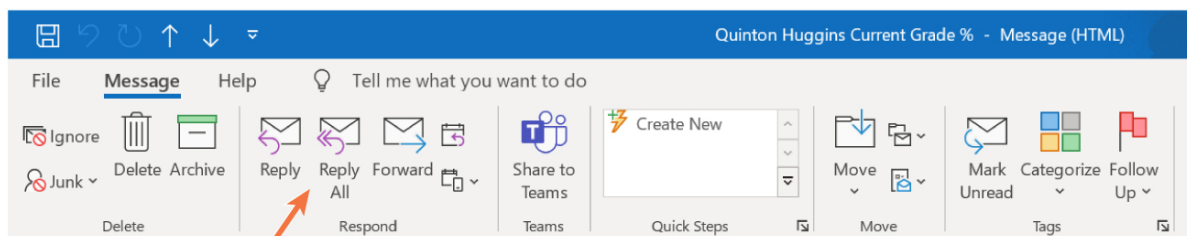


Figure 2.11: When composing a professional email, format the email in a similar manner to a business letter. (Used with permission from Microsoft)

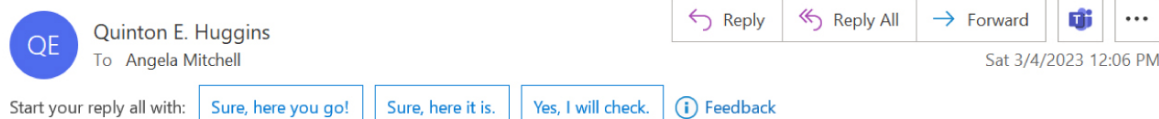
The subject line of the email is a brief description of the content or purpose of the email. The body of the email is composed in the large space. Composing an email in an email application is similar to using word processing software such as Google Docs.

The final component of most emails is attachments. Not all emails have to include attachments, but you may want to include an attachment such as a document to review or an image you want to share. To attach a file to an email, you will usually find a tool or icon that looks like a paper clip. Attachments are just as they sound—additional information that is saved in a computer file outside of the actual email, such as spreadsheets, pictures, and PDFs. These digital files can then be saved by the recipient on their computer for future use.

When responding to an email you have received, you have several options. You can choose Reply, Reply All, or Forward, as Figure 2.12 shows. Reply will allow you to compose a response, which will go to the sender of the email only. When you choose Reply All, everyone who received the original email from the sender will also get your reply. Use caution when choosing Reply All. Make sure you are comfortable with all on the email distribution list reading your response.



Quinton Huggins Current Grade %



Good Afternoon Professor Mitchell,

I am reaching out in regards to seeing if you could tell me what my grade percentages are in Business Stats.

Thank you so much,

Quinton E. Huggins

Figure 2.12: When responding to an email, be careful to choose the appropriate option. As an example, you may not want to choose Reply All when responding to an email that was sent to all employees. (Used with permission from Microsoft)

For example, the human resources (HR) director at WorldCorp has just sent a company-wide email about the upcoming holiday schedule. If you had a question about the schedule and chose Reply All, everyone in the company would get your email with the question. You really intended only to ask the question of the HR director, so you should have used Reply.

Finally, Forward allows you to forward the original email to someone else. You might choose this option if you want to get some input on a topic before responding. Sales personnel at WorldCorp might use the Forward option to send accounts payable receipts for products they have purchased.

Generally, email is not the best communication channel for long discussions that require input from multiple people, because you will get multiple replies that clog your email inbox (more on that later). In general, a business email should take a formal tone. Like a business letter, it should be clear and concise. Emails should include a descriptive subject line that conveys the topic of the message. In fact, some email programs have a security feature that will flag any message without a subject line and will ask you to write one before clicking Send.

Professional business emails should start with a greeting or salutation—something like Dear Mr. Jones, Mr. Jones, or simply Jim, depending on the level of formality you desire.

The body of the email should be brief and concise. Anything longer than a few paragraphs should be put into an attachment file instead. Pay attention to spelling and grammar as you are constructing the email. Finally, end with a closing and your signature. The closing may be a sentence such as “Thank you for your time” or “I look forward to hearing your thoughts.” Some email programs have a built-in feature that allows you to include a preformatted signature on all emails, perhaps including your name, company, position, and contact information.

Common Email Applications

There are many email applications on the market. Your company will have chosen one, but that doesn’t mean you can’t have your own email addresses to use at home. Just be sure to keep those email accounts separate. It is not a good idea to use company email for personal matters because you have no privacy and it is the company’s property first and foremost. Because this text covers Microsoft and Google products, you will learn these email applications, Outlook and Gmail, respectively.

Mac Tip

Visit this [Apple mail support page](#) for information about Apple Mail.

Microsoft Outlook

Outlook is part of the Microsoft suite of applications. It contains many of the same features that you might find in Word or Excel. You can format the email text as you are composing the email. Figure 2.13 shows you the email composition screen in the application. You will notice there are common features in Outlook that you will find in most email applications. You have options to reply to the message, include attachments, and add signatures to your emails. Another handy feature in Outlook is setting a priority for your email. This allows you to give an email that needs immediate attention a high priority label. It can alert the recipient that the email is a “High Priority” email and needs to be addressed quickly.

Other features that you will see in Outlook and many other email applications are identifying emails as spam or junk. You can mark an email as junk and emails from that sender will no longer appear in your inbox. They will instead be immediately sent to the spam or junk folders. When you no longer need an email, you can choose to delete it. When you delete an email, it goes to the Trash folder. You can still access it in the Trash folder for some time based on the settings of Outlook to delete the content of the Trash folder. Finally, you have the ability to add folders to help keep your emails organized. Just as you would for folders on your computer, you can use an organization system that works for your needs. For example, a sales agent at WorldCorp might set up an email folder for each of its customers.

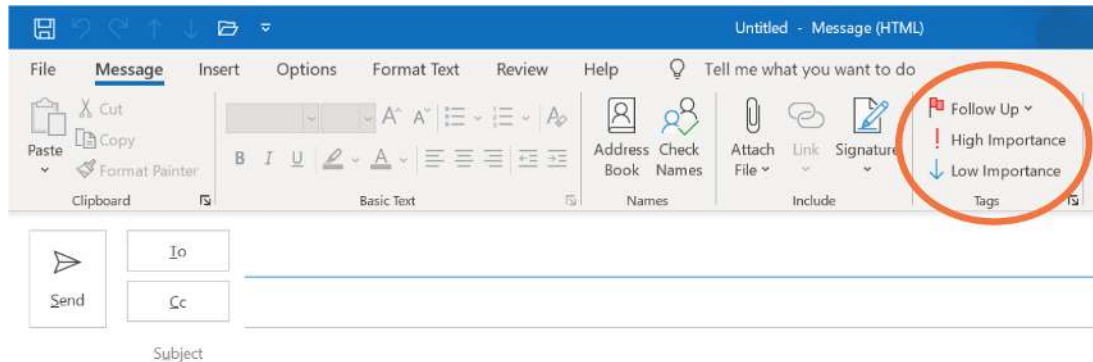


Figure 2.13: If you set the priority to High, recipients can quickly see emails that need immediate attention. (Used with permission from Microsoft)

Gmail

Gmail (see Figure 2.14) is part of the Google suite of applications. You may have experience already using Gmail as many schools will assign Gmail email addresses to their students for use while they are enrolled. In Gmail, you have some ability to format text, but not to the extent that you have with Outlook. The basic setup of the email composition is similar. The functionality of Gmail is similar to that of most email programs. You can add attachments, organize emails into folders, and identify emails as junk or spam.

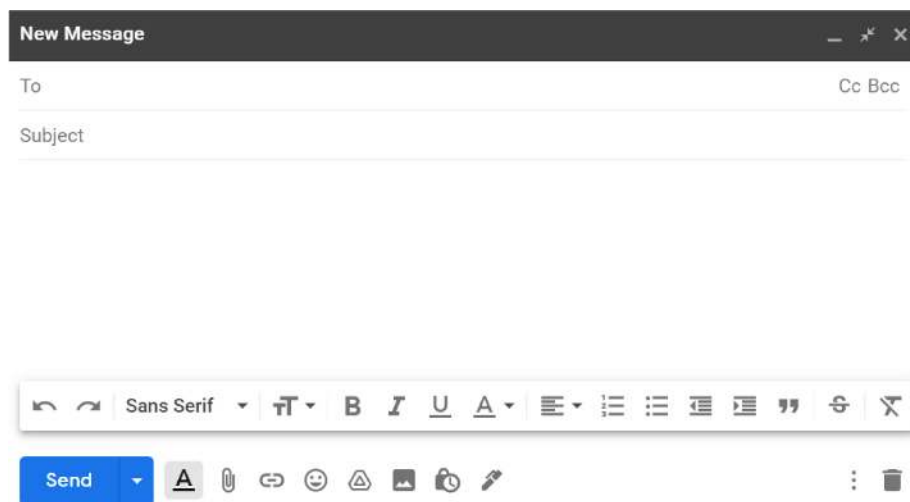


Figure 2.14: Gmail places the Send button at the bottom of the email composition screen. (Gmail is a trademark of Google LLC.)

Link to Learning

Email was invented in 1971 by Ray Tomlinson, a computer engineer who worked for Bolt Beranek and Newman in Massachusetts. Tomlinson developed a system that could send messages between computers using the @ symbol. The first organization to use email was the Department of Defense. Read this [article on the history of email](#) to learn more about how email has evolved since 1971.

- How has email changed the way organizations function?
- How has email changed the way individuals stay connected?

Instant Chat/Messaging (IM) Applications

Instant chat/messaging applications offer users a quick way to send messages in real time, meaning the back and forth is directly on the screen rather than in an email you have to open first to read. Often, these applications are more text based and do not offer some of the same formatting features that you might find in email programs. Many do offer the ability to send files through the instant messaging application. However, the size of the file may be limited. Usually, communicating through instant messaging is less formal than communication in email. Also, you would not expect to format a message in instant messaging applications like a business email. You might also find that users will abbreviate words more when using instant messaging applications. This is like texting via your cell phone.

Some companies offer internal programs for instant messaging. Others use commercially available tools to facilitate communication in the workplace. For example, if you had a quick question to your manager about the format needed for a presentation you are preparing, using an instant messaging application might be a good tool. You could send the message to your manager in a short, concise question and the manager would receive the message directly. Think about instant messaging like having a face-to-face conversation with your manager, but just electronically—an online chat. Instant chat/messaging applications give users the ability to send to multiple people or to create a “chat room.” Most programs also have an indication if a user is online. This will allow you to know whether your message will be viewed when you send it.

Using instant chat/messaging in the workplace can facilitate real-time communication between employees who are not in the same physical location. This can foster team building and foster trust among the employees. It can also reduce the number of emails an employee receives on a daily basis. Instant messaging can be a secure form of communication that can be archived by the information technology department. However, overuse of instant messaging can provide a distraction in the workplace. With instant messaging, we often do not place the same attention to proofreading and making sure we are conveying the message we intend. You might inadvertently send a message in error or with incorrect information. Because of the immediate nature of instant messages, take care to make sure the message is correct before sending.

Also, instant chat/messaging is not appropriate for critical discussions such as hiring decisions, strategic company decisions, or contract discussions. Instant messaging should be viewed as a means to facilitate quick conversations, not as a replacement for

company meetings and other such discussions. Instant messaging, although similar in ways to a face-to-face conversation, cannot take the place of those human interactions. Emotions and body language are not conveyed through messages. Here are the major instant message programs.

Microsoft Teams

Microsoft Teams is a useful tool in business for instant messaging. It is included in the Microsoft suite of programs. Teams also offers video chat capability as well as file sharing. Many organizations today use Teams to conduct team meetings. Teams provides much more than just a chat function. You can take calls, schedule meetings through the calendar function, and much more in the Teams environment. Figure 2.15 shows what the Teams interface looks like with the chat function selected.

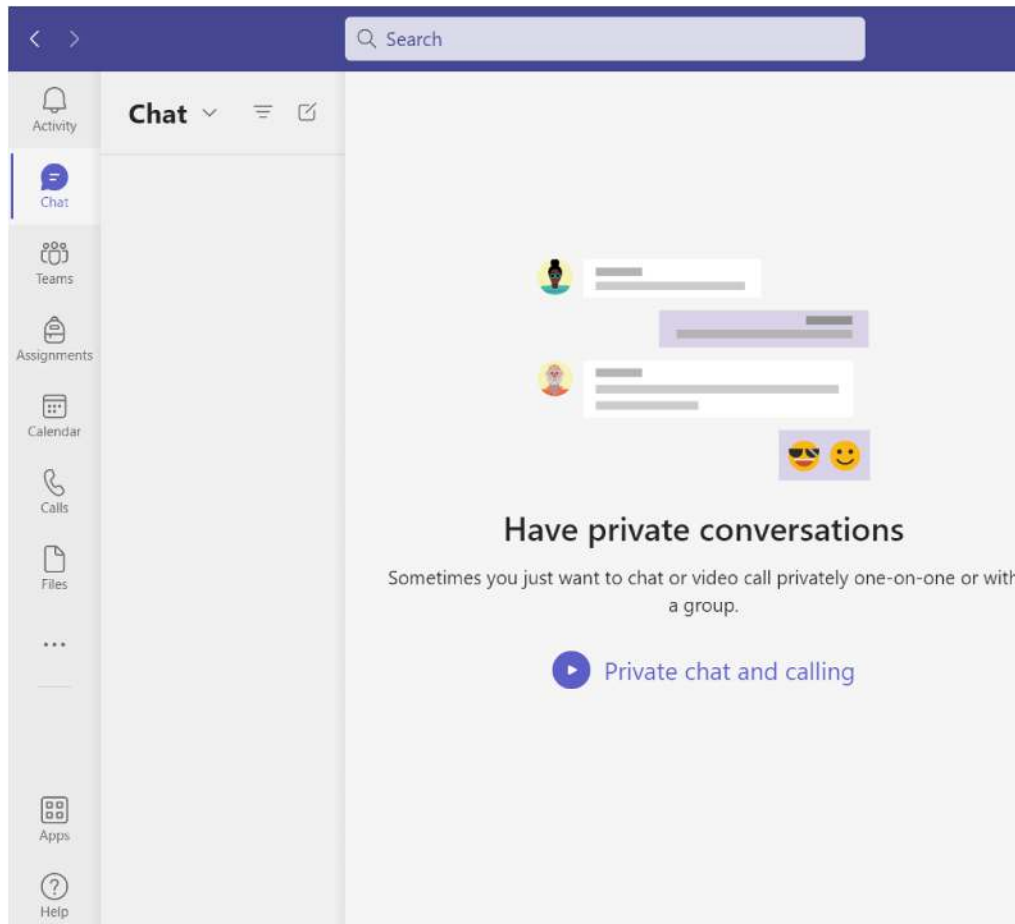


Figure 2.15: The Teams window will display your picture in the upper-right corner with a green check mark to show you are available. (Used with permission from Microsoft)

Slack

Another instant messaging platform, Slack, is a free program with some extra features available for a fee. For example, with the free version, users are limited to view and access only the most recent 10,000 instant messages. This will work for many uses but may be limiting if you try to use the free version for workplace communications, where you may need to recall a conversation that goes back further. Slack is similar in many ways to Teams (see Figure 2.16). It was designed specifically for use in the workplace. Slack allows users to add emojis to messages and to create workspaces for team collaboration. Files can be shared via Slack as they are in Teams. Private and public messages can be exchanged through Slack. Slack integrates well with other programs such as the Google suite of products, including Google Calendar.

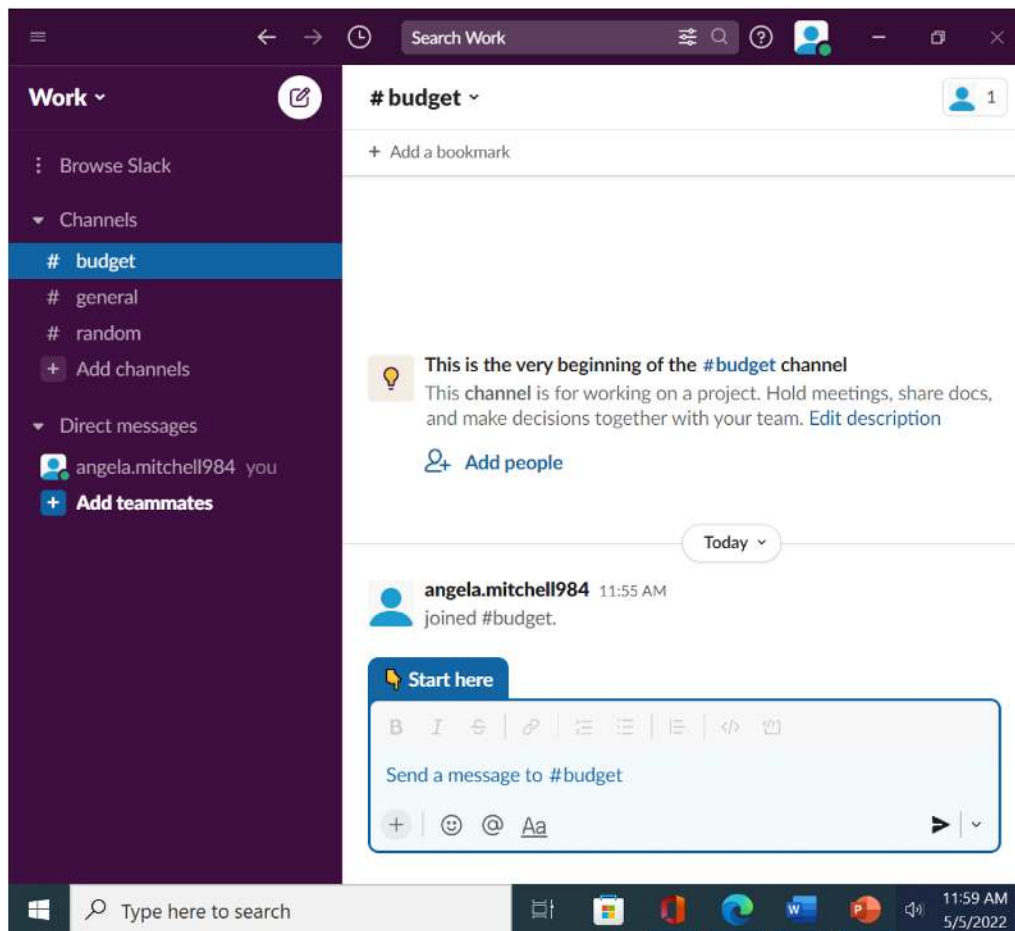


Figure 2.16: Notice that Slack uses the term “channels” to refer to different chats. (Copyright 2023 Slack Technologies, LLC.)

Calendar Applications

There are several applications that can help you keep organized. One such category of applications is calendars. Suites such as Microsoft and Google include calendar applications. One key feature of calendar applications is the ability to have both your personal and business schedules in one place that can be accessed from virtually anywhere. You can integrate the apps with your phone so that you no longer have to carry a separate day planner or schedule book with you. With the sophistication of the calendar apps today, you can enter appointment information into one place and it can be updated across many different programs and even shared to other people.

Calendar Features and Functions

With the availability of various technologies today, many people have moved their calendar to an online format, rather than a more traditional paper planner. Many prefer the convenience of storing their work and personal appointments in a single place. These calendar apps allow users to bring together multiple calendars as well as scheduling meetings and blocking out time when you might be unavailable. Many calendar applications will permit users to determine which items are visible to others or to share your calendar with coworkers and family. You can also use calendar software to allow your customers to set up meetings with you during your available time. If you want to keep your personal appointments hidden from your coworkers, you can easily set this up in the program. The settings in the application also allow users to permit others to add appointments to their calendars.

Calendar applications can also be useful for managing work tasks for project management and setting reminders for key activities. Calendar items can be color coded and/or flagged based on their importance of due date. Calendars are used frequently in organizations to make scheduling easier when including multiple people for a meeting. Using a calendar application can also increase productivity because you can manage your time more efficiently. Many of the calendar apps also integrate well with cell phones so that you can receive notifications of upcoming appointments if you are not at your computer. You may also find when scheduling family or personal appointments such as dentist appointments, those appointments can be directly added to your

calendar by the doctor's office. While some may still prefer the traditional paper planner for keeping their schedule, the convenience of calendar applications has prompted many businesses to adopt them for use in their organization.

Spotlight on Ethics

Adjusting Privacy Settings in Your Electronic Calendar

While electronic calendars are incredibly useful and convenient, we must also recognize that these calendars may be viewed by others, especially if we are using our employer's software. Google Calendar and Outlook/Calendar can be viewed by others easily, requiring us to use privacy options such as adjusting viewing permissions for different individuals. You may want to prevent some people from viewing your calendar entirely, provide only limited information (such as availability) to others, and allow full access to your calendar to some. You can also control what information you can make available on a calendar appointment. For instance, you can make an appointment private and not viewable by anyone; this slot will show up as private with no further details. This is helpful for keeping private appointments or sensitive appointments.

Calendar Integration and Syncing

Syncing calendars stored in other applications is an essential component of getting the best use of a calendar application. You could have a calendar on your phone for personal appointments and reminders, a calendar for your work tasks on your work computer, and then perhaps another calendar to keep track of your extended family birthdays. Through calendar integration, these calendars can be synced into one place. This often involves simple changes to the settings in the software to link all the calendars together. In fact, when you first install a calendar application on your device, you might be prompted to integrate existing calendars during the setup process.

Common Calendar Applications

Figure 2.17 shows the calendar feature in Microsoft Outlook. The calendar function and email are integrated in the program. You cannot delete the calendar application, but you can choose not to use it. There are no preset events in the calendar application. You can set the program to give you notifications of meetings and tasks when you are in the email program. The Outlook Calendar also has a meeting scheduler to assist with scheduling meetings and can even be used to determine if specific meeting spaces are available in the organization. Outlook Calendar has a useful feature to set up recurring meetings that happen at some frequency. For example, if your company has a set meeting each week for sales force updates, you can set this up in Outlook once and it will be added to all attendees' calendars for the time frame you desire.

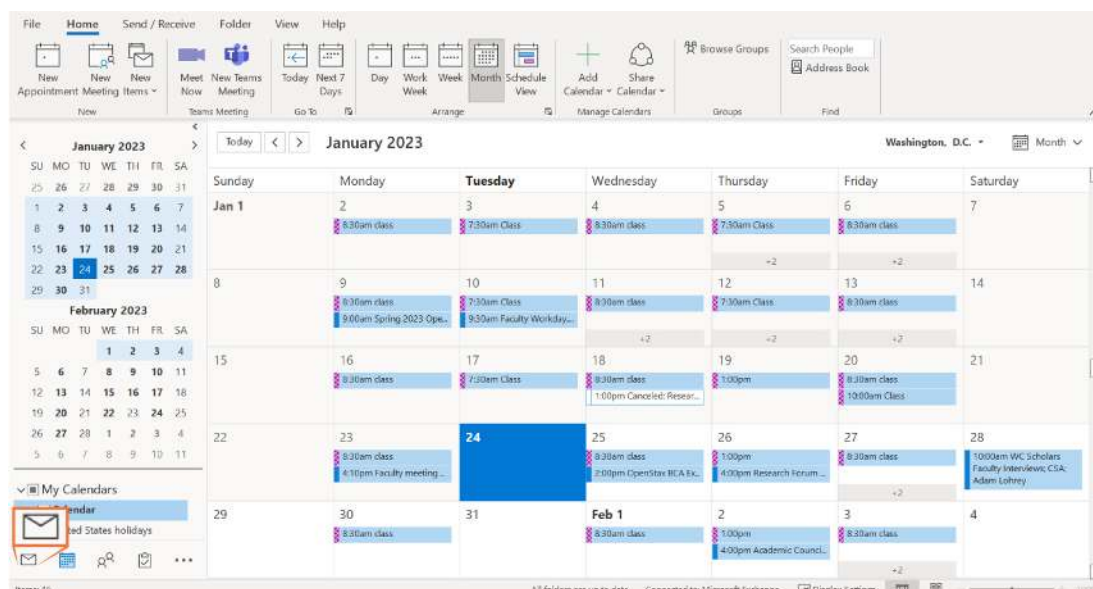


Figure 2.17: To switch back to Outlook Mail, just choose the envelope in the lower-left corner of the screen. (Used with permission from Microsoft)

If you already have a Google account, you have access to Google Calendar. Google Calendar is easy to use and integrates well with a wide variety of platforms. With Google Calendar, you create multiple calendars to manage different events. You can then manage the settings for each of the calendars independently. All the created calendars are integrated into an overall calendar interface. You can use color coding to differentiate the different calendars when viewing in the main calendar view, as Figure 2.18 shows. You access Google Calendar by logging in to your Google account.

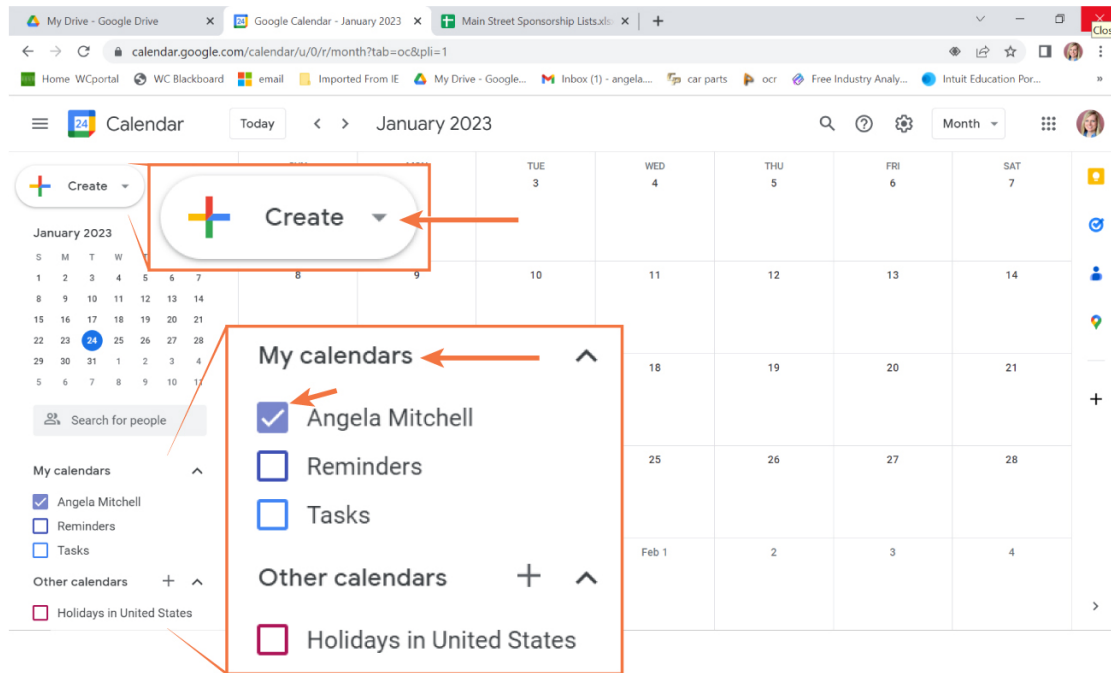


Figure 2.18: To create a new calendar appointment, choose Create. All calendars displayed in the main calendar view are listed in the lower left of the screen. (Google Calendar is a trademark of Google LLC.)

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1.1.6: Collaboration

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Learning Objectives

By the end of this section, you will be able to:

- Discuss the benefits and challenges of collaborating with technology
- Describe professional behavior in collaborative meetings
- Outline how to attend and host a meeting
- Share and collaborate on documents via editing and commenting

Businesses in nearly all industries have benefited from advances in technology that have presented the need for collaboration among workers who are not located in the same geographic area, maybe not even on the same continent. Collaboration is essential in today's business environment and occurs at all levels within an organization. For example, the marketing department uses collaboration to make sure that company products are meeting customer needs. This could include working with product developers in the company to convey key customer preferences. It could also mean working with the accounting and finance departments to make sure that the products have the correct price point and that profit margins are being met for the company's strategic goals.

Collaboration and *teamwork* are often used to mean the same thing, but there is a key difference. Both terms are centered on a group of people working toward a shared goal. With teamwork, however, the group will have a defined leader, whereas with collaboration, there is no leader, and the group is more self-managed. Collaboration and teamwork have become a core part of most business structures. In fact, being a "team player" and being comfortable working with others have become key metrics in job performance evaluations. Also, hiring managers seek out these skills in potential candidates. Effective collaboration takes practice. It requires trust, information sharing, listening, an ability to accept feedback, and strong leadership to work well.

Collaboration in the Digitized Workplace

Reasons for collaboration are numerous. Collaboration provides innovative solutions to problems through the sharing of ideas and ways to solve the issue at hand. But some results of collaboration can be more concrete. For example, through shared resources, cost savings can be realized. Goals can be attained sometimes at a faster pace with collaboration. Collaboration can contribute to enhanced job satisfaction as well as develop employees' skills.

Collaboration does not just happen spontaneously in organizations. Management will need to make an effort to develop the structure and establish the culture of collaboration within the organization. This could mean that management will set up teams or develop other such strategies to encourage the practice of collaboration.

Collaborative Meetings

Meetings are necessary in nearly all types of organizations. Business meetings may be more discussion-based or more centered on making specific decisions. Meetings are used to make decisions, exchange information, announce changes, convey organizational goals, solve a specific problem, meet with stakeholders outside the organization, or celebrate successes. Historically, meetings have occurred face-to-face, either in a traditional conference room setup or in an individual's office. But today's technology enables us to conduct meetings virtually, and this is where collaborative software programs come in handy.

Videoconferencing allows users to have a face-to-face meeting without being in the same room or even the same part of the world. Videoconferencing tools include Google Meet, Zoom, and FaceTime. You can do videoconferencing on a laptop, desktop, phone, or iPad. Meet, as shown in Figure 2.59 is part of the Workspace. If you have a Google account, you have access to Meet.

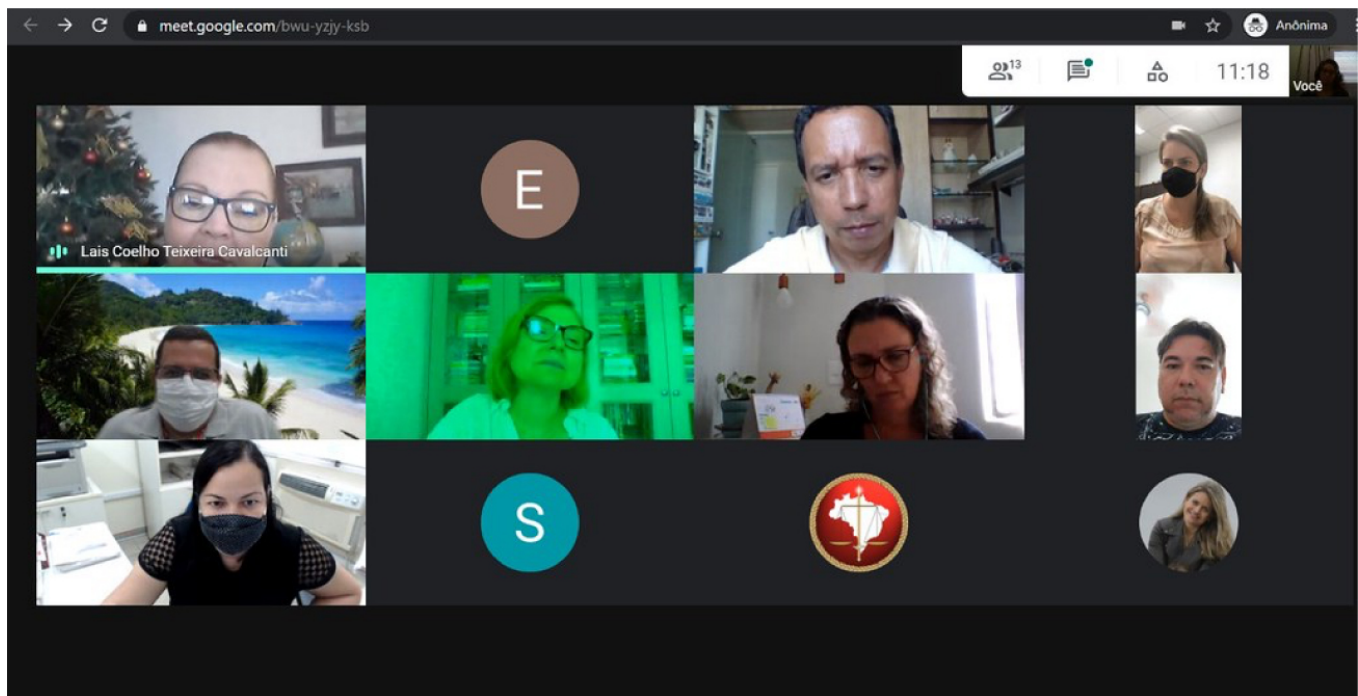


Figure 2.59: Today's technology enables us to meet with coworkers from across the world in a virtual meeting room. Depending on meeting rules and norms, participants have the option of participating without having to turn on their cameras. (credit: "7.12.2020 - Reunião GT – Retomada" by Ministério Público de Pernambuco/Flickr, CC BY 2.0)

Zoom has recently become a leader in videoconferencing. Zoom offers both individual and corporate-level subscriptions. The program has also been used for educational purposes in many schools and colleges.

Skype is a Microsoft product that has been around since 2003. However, it is not as popular as it once was, and Microsoft Teams has taken over much of the functionality that Skype has to offer.

Finally, FaceTime is a video calling interface. FaceTime is an Apple product and is used for personal communication rather than for conducting meetings in a business environment. To use videoconferencing to its full capability, be sure your computer has either an internal camera or a webcam.

Professional Meeting Etiquette

Meeting etiquette for a videoconference should be given the same attention as preparing for an in-person meeting. Although expectations may vary by organizational culture and the context of the meeting, there are some general expectations to keep in mind. First and foremost, be sure to check your technology to make sure you can access the link and that your internet connection is stable. Make sure you are familiar with the software that is being used and know how to use some of the features within the program. Some key items to understand prior to the meeting are:

- How to mute/unmute yourself
- How to turn your camera on/off
- How to participate in the group chat during the meeting if applicable
- How to enter comments
- How to use screen sharing options
- How to share files
- How to use emojis (if available and appropriate) during the meeting

During the meeting, unless you are the speaker, be sure to mute yourself. Also, be sure to be in a quiet place without distractions such as pets and children. Consider what might be on the wall behind you. Some programs offer the ability to customize the background that other participants see behind you.

Be on time for the meeting just as you would be expected to do for a face-to-face meeting. And finally, dress appropriately for being on camera. In business meetings where you are an active participant, you should have your camera on. If instead, it is a large

group presentation, it might be appropriate to turn off the camera. It is a good idea to check with the meeting organizer ahead of time to understand the expectations. For best practices in videoconferencing:

- Make passwords mandatory for all participants to prevent uninvited guests from attending.
- Check meeting links to ensure they are accurate and are sent to the appropriate participants.
- Review security settings on participants' computers to prevent identity theft.

Spotlight on Ethics

Ethical Considerations for Recording

Use of videoconferencing has grown exponentially due to its convenience and fairly straightforward technology. It is quite easy to use, and most conferencing programs come with useful features and tools to augment the experience. One of these conveniences is the ability to record. Recording meetings can be incredibly useful; we can capture what was said for later reference or we can share the recording with those unable to attend. That said, there are considerations to keep in mind when using the record feature. For instance, some videoconferencing tools may record silently, with no indicator that the conversation is being recorded. In most business settings, however, we want to avoid recording without the express approval of all parties. Some applications will request participants accept the recording; failure to accept the recording will usually take you out of the session. In addition, different states have different rules about recording audio, video, or both. It would be wise to inform yourself of your state's laws, as well as the company policy for recording meetings and conversations.

Collaborative Work

One of the biggest differences between Word and Docs is Google's capacity for sharing. Workspace was first in the market for use in offices based on sharing and collaboration. Its biggest advantage is that it allows many people to work on the same document at the same time, with all participants having the document open at once and seamlessly writing and editing different parts of it. Microsoft 365 incorporates some of these capabilities now, but Google has secured a strong market share since its introduction in 2006. Because both Microsoft 365 and Workspace are widely used, it's necessary to learn to use and collaborate in both systems, especially in the file sharing and editing functions.

File Sharing and Transferring

The most popular types of file sharing software are Drive, Microsoft SharePoint and OneDrive, and Dropbox. When sharing and transferring files, you need to have a system. Develop a system that is simple and easy to understand. This might mean that you limit the number of folders or develop a file/folder naming system that is used for all content in the shared drive. You might consider grouping files together by software program or by business function. For example, you could have a folder that contains all relevant marketing PowerPoint presentations or a folder in the drive for Marketing, for Accounting, for Management, and so on.

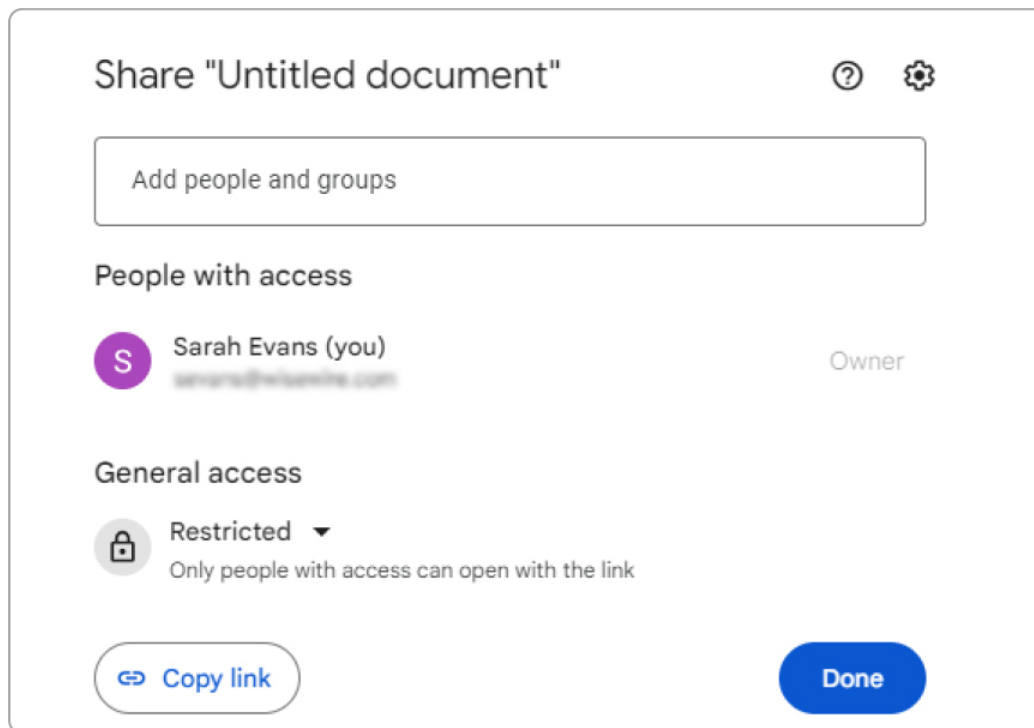
Consider creating a manual or at least a list of expectations and rules associated with the shared information. This could include the file naming process, where to store specific file types, and how to obtain permission to add files or folders. When a new person joins the team, make sure they get training on using the shared drive space. Finally, you should also control access to certain files and/or folders in the shared drive. Not everyone will need access to all documents in the drive. These permissions can be easily managed based on the shared software platform you are using.

Collaborative Writing and Editing

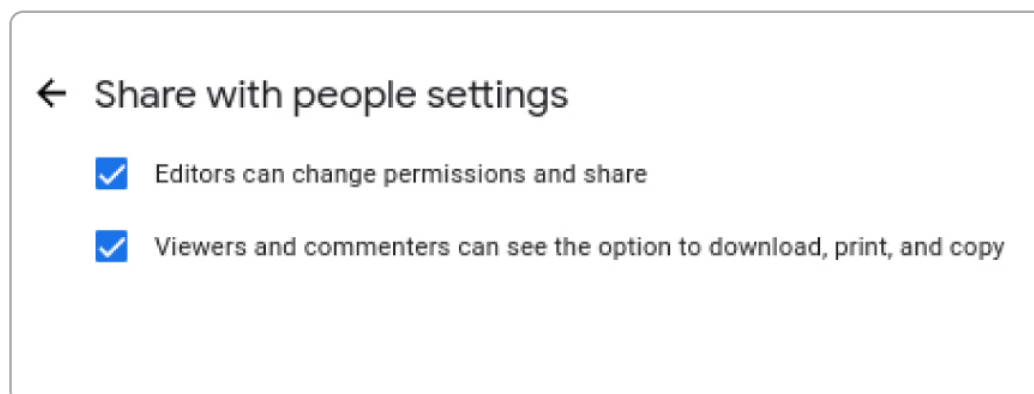
Because Workspace is web-based, all documents are in the cloud, making it easy to collaborate with coworkers. Multiple users can have the same file open at the same time and can make changes together. As one example, this functionality is useful in a small business accounting system that generates many invoices. Sales associates in different locations can update their sales amounts online, all using the same workbook. This type of collaboration was not possible in Office until Microsoft released its online version of Office. Office 365 (now called Microsoft 365) was the first version that allowed collaboration and sharing similar to that in Workspace. The Excel 2016 and 2019 desktop versions now permit collaboration and sharing in real time on files that are saved to OneDrive.

Sharing a Document

In Google, you can choose to send your file to individuals by simply typing in their emails, as shown in Figure 2.60a. There are various restrictions and modifications you can add to your sharing invite. By clicking the drop-down menu next to the person's name, you can choose to make this person a Viewer, Commenter, or Editor. This is the most basic level of adjusting the sharing settings by person. You can also select the gear icon at the upper right of the sharing window and uncheck the options you don't want, as shown in Figure 2.60b. The first choice allows for collaborators to edit and share the Google file; keep it checked if you want them to be able to edit, or unchecked if you don't want the recipients to edit. If you want recipients to just read, uncheck the first option and keep the second option. But if you don't want readers to be able to edit, print, download, or copy the file, you should uncheck both options.



(a)



(b)

Figure 2.60: (a) To share a file, simply type in the recipient's email address to send the invitation. (b) Clicking the gear icon will allow you to manage what collaborators can do with the file. (Google Docs is a trademark of Google LLC.)

You can send people a link to the file without adding them as collaborators. There are more sharing restrictions and options available in the Get Link box, as shown in Figure 2.61a. You can set your link sharing up as a public link or a restricted link. The public link can be configured further, as you can see in Figure 2.61b. Readers will be able to just view, comment, or edit. Or, you could choose Restricted, in which only certain people can open the link. Whichever you choose—public link or sharing to groups or individuals—any changes done by collaborators will be recorded, as mentioned earlier in the Version history feature from Docs. Adding people as collaborators by sharing the file with them means that they get an email notification, and the file is added to their “Shared with me” section of their Drive. This means that those collaborators have a Drive account, whether through Gmail or through Workspace. When you send someone a link only, it’s not added to their “Shared with me” and may be accessed by someone without a Google account, or without logging in to their Google account if they have access to the link to the file.

Share "market trends report draft.docx" ? ⚙

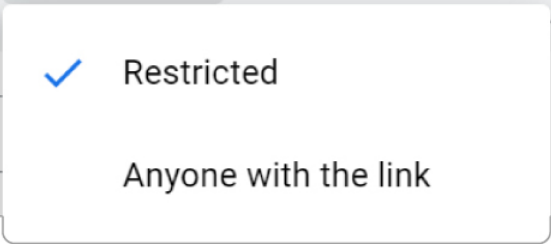
Add people and groups

People with access

 **Angela Mitchell (you)** Owner

General access

 **Restricted** ▼



(a)

Share "market trends report draft.docx" ? ⚙

Add people and groups

People with access

 **Angela Mitchell (you)**

General access

 **Anyone with the link** ▼
Anyone on the internet with the link can view

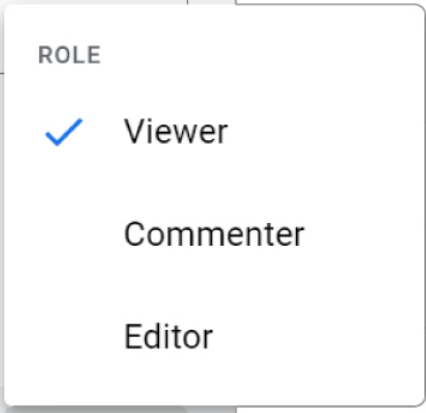
 **Copy link** 



Figure 2.61: (a) You can set up a public link for people to access a file, whether they have a Google account or not. (b) You can also place some restrictions on access to the file. (Google Docs is a trademark of Google LLC.)

Accessing a Saved Document with Drive

(b)

Your options for sharing and viewing files will depend on how you save files in Drive. Drive is the main location from which you will create and save your Docs. However, Drive can also act as simple data storage, where you can keep your Word documents, pictures, PDFs, and many other types of files. Word documents are compatible with Docs to some extent; you can even open a Word document directly from Drive and edit it in your browser. However, you may notice some differences between your original Word file and the way it opens in Docs. For example, some formatting may not seamlessly transfer to the Docs version of your file. Be aware that you may need to make adjustments to clean up any incompatibilities. (Some other file types, like PDFs, may need a separate application to edit.)

There are two ways to access files on your Drive. One is directly through your browser: Simply log in to your Google account and navigate to the Drive app or go to drive.google.com and log in from there. This method requires only an internet connection and an internet browser. When you select a .gdoc file, it will open directly in your browser and you edit it from there. If you select a different type of file, you may want to edit it in-browser or download it to your computer to use with another application.

The other way to access files is to sync your Drive with your computer. If you install Drive on your computer as a network drive, you can access your files from your Windows File Explorer or macOS Finder window, as you would your pictures or other documents. You can create folders or rename files all from File Explorer or Finder. The advantage of this method is that you can open non-Google files, such as Word documents or PDFs, in their native applications. That is, if you open a .docx file from FileStream, it will open in Word, instead of opening the Google-compatible version in your browser. However, if you open a Docs file from FileStream, it will automatically prompt your computer to open your internet browser and open the file there, as .gdoc files do not have a native computer application.

The advantage of the in-browser method of accessing files on Drive is that it offers the user different options for sharing and viewing files. In Figure 2.62, you can see on the right the available options: My Drive, Shared with me, Recent, Starred, and Trash. My Drive contains your personal files: ones that you either created yourself, uploaded from your computer, or copied to your Drive from people who shared files with you. Shared with me contains shared files sent to you for collaboration. Recent contains the most recently opened or edited files. “Starred” is a special category that contains only files that you have deliberately added to it by selecting the “Add to Starred” command. These may be important files that you want to see later or files that have high-priority issues needing to be solved. Trash, like the Windows Recycle Bin, is simply a place where you send files to be deleted. Below these categories, you will see the amount of space you have left in Drive.

There are added benefits of using Drive. The most obvious one is that you can access your files from anywhere in the world, with any device. A second advantage is the online drive’s interactive sharing ability: You can send your file to anyone, either an individual or a select group. Finding and opening a file is as easy as signing into your Google account, going to Drive, and locating your file.

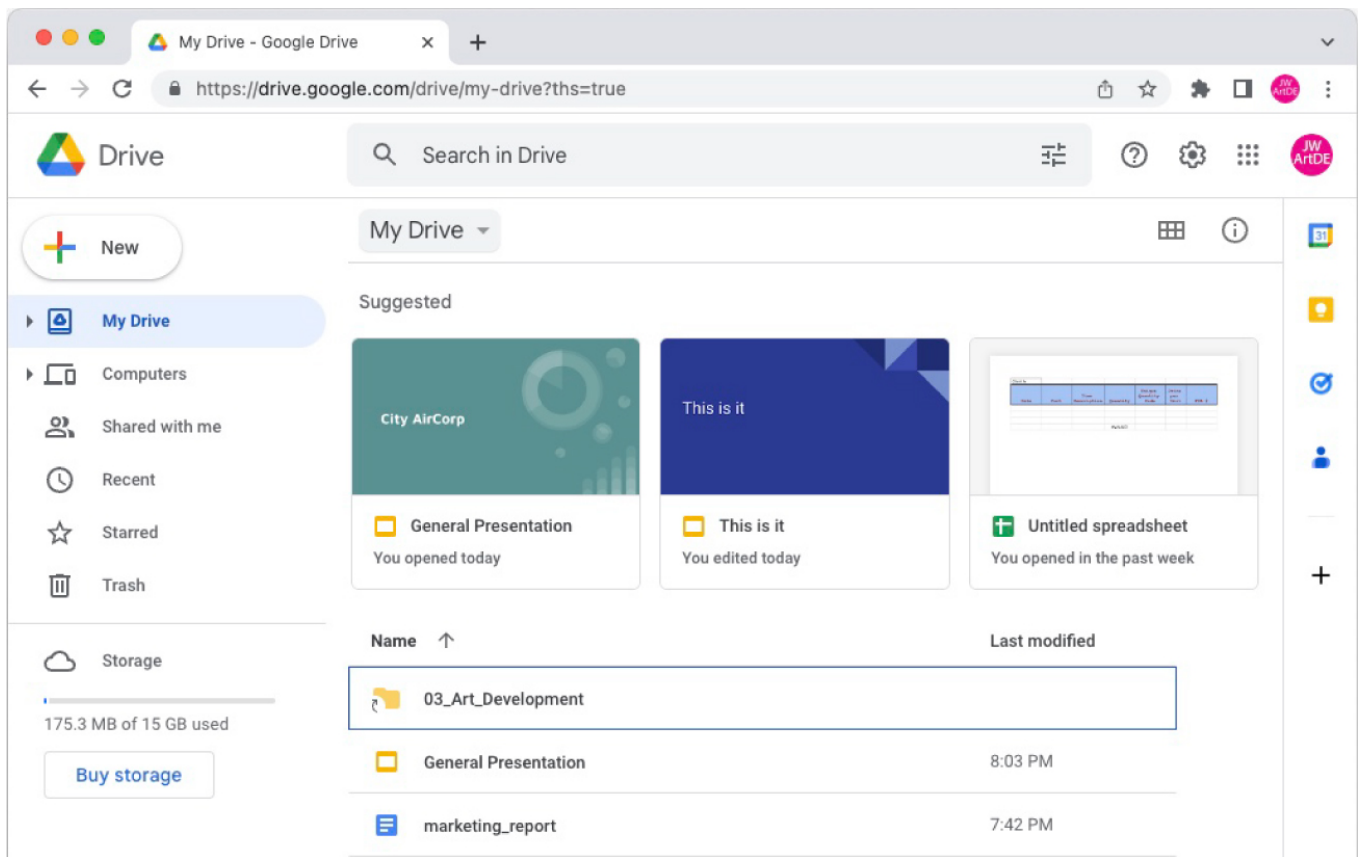


Figure 2.62: Drive is the storage space that customers get on Google's servers. As you pay fees, your storage capacity is increased. (Google Drive is a trademark of Google LLC.)

The one potential drawback of Drive is its reliance on internet access. All files are accessed and saved through the internet.

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1.1.7: Trends in Personal Computing

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

A personal computer is designed to be a general-purpose device, able to solve many different types of problems. As the technologies of the personal computer have become more commonplace, many of the components have been integrated into other devices that previously were purely mechanical. The definition or description of what defines a computer has changed. Portability has been an important feature for most users. Here is an overview of some trends in personal computing.

Portable Computers

Portable computing today includes laptops, notebooks and netbooks, many weighing less than 4 pounds and providing longer battery life. The MacBook Air is a good example of this: it weighs less than three pounds and is only 0.68 inches thick!

Netbooks (short for Network Books) are extremely light because they do not have a hard drive, depending instead on the Internet “cloud” for data and application storage. Netbooks depend on a Wi-Fi connection and can run Web browsers as well as a word processor.

Smartphones

While cell phones were introduced in the 1970s, smartphones have only been around for the past 20 years. As cell phones evolved they gained a broader array of features and programs. Today’s smartphones provide the user with telephone, email, location, and calendar services, just to name a few. They function as a highly mobile computer, able to connect to the Internet through either cell technology or Wi-Fi. Smartphones have revolutionized computing, bringing the one feature PCs and laptops could not deliver, namely mobility. The Apple iPhone was introduced in January 2007 and went on the market in June of that same year. Its ease of use and intuitive interface made it an immediate success and solidified the future of smartphones. The first Android phone was released in 2008 with functionality similar to the iPhone.

Tablet Computers

A tablet computer uses a touch screen as its primary input and is small enough and light enough to be easily transported. They generally have no keyboard and are self-contained inside a rectangular case. Apple set the standard for tablet computing with the introduction of the iPad in 2010 using iOS, the operating system of the iPhone. After the success of the iPad, computer manufacturers began to develop new tablets that utilized operating systems that were designed for mobile devices, such as Android. The Samsung Galaxy and Amazon Fire are both popular competitors to the iPad.

Integrated Computing and Internet of Things (IoT)

Along with advances in computers themselves, computing technology is being integrated into many everyday products. From automobiles to refrigerators to airplanes, computing technology is enhancing what these devices can do and is adding capabilities into our everyday lives thanks in part to IoT.

IoT is a network of billions of devices, each with their own unique network address, around the world with embedded electronics allowing them to connect to the Internet for the purpose of collecting and sharing data, all without the involvement of human beings.[1] Objects ranging from a simple light bulb to a fitness band such as FitBit to a driverless truck are all part of IoT thanks to the processors inside them. A smartphone app can control and/or communicate with each of these devices as well as others such as: electric garage door openers, kitchen appliances, thermostats (like Nest), home security systems, and audio speakers.



Internet of Things (IoT) by Tumisu Pixabay License

Section Footnote Links

1. Ranger, S. (2018, January 19). What is the IoT? ZDNet. <http://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/>. ↵

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CHAPTER OVERVIEW

2: Computer Concepts

Computer Concepts is divided into four sections:

Introduction to Computers and Internet

Personal Computer and Hardware

Software, Security and AI

Computer Concepts Terminology

2.1: Introduction to Computers and Internet

2.1.1: Introduction to Computer Concepts

2.1.2: The Role of Information Systems

2.1.3: The Internet, Cloud Computing, and the Internet of Things

2.1.4: World Wide Web

2.1.5: Searching the Web

2.1.6: Advanced Searching Techniques

2.2: Personal Computer and Hardware

2.2.1: Safety, Security, Privacy, and the Ethical Use of Technology

2.2.2: Information Systems Ethics

2.2.3: Personal Computer Basics

2.2.4: Creating Screenshots and Useful Keyboard Shortcuts

2.2.5: Hardware Basics

2.2.6: Computer Speed Factors and Data

2.3: Software, Security, and AI

2.3.1: Software Basics

2.3.2: Operating and Application Software

2.3.3: Mobile Software

2.3.4: Software- Obtaining and Open Source

2.3.5: Information Systems Security

2.3.6: AI Tools in Modern Business Software

2.4: Computer Concepts Terminology

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SECTION OVERVIEW

2.1: Introduction to Computers and Internet

Topic hierarchy

2.1.1: Introduction to Computer Concepts

2.1.2: The Role of Information Systems

2.1.3: The Internet, Cloud Computing, and the Internet of Things

2.1.4: World Wide Web

2.1.5: Searching the Web

2.1.6: Advanced Searching Techniques

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2.1.1: Introduction to Computer Concepts

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

WorldCorp is a multinational conglomerate that produces and works in consumer goods, health care, and technology. Its functional service areas include research and development, strategy, operations, production and distribution, human resources, information technology and equipment, marketing and sales, finance and accounting, and customer service.



Figure 2.1: Software applications are what allow us to interact with our computer's hardware. It is essential to learn how to use programs like calendars, word processors, and email clients to communicate with others and create documents in the workplace. (credit: "wocintech (microsoft) - 241" by WOCinTech Chat/Flickr, CC BY 2.0)

The corporation has a strong commitment to social responsibility and environmental protection. Employees are encouraged to participate in company-wide and individual charity initiatives, with paid time off to participate in each once a month.

With employees located across the globe, WorldCorp understands a successful workplace is supported by a commitment to equity, diversity, and inclusion (EDI). It has a strong ethics policy that is enforced throughout the company hierarchy, with senior leaders and management expected to serve as models in all actions and interactions.

You have just been hired as a management trainee at the company and will be exposed to all functional areas. In this chapter, you have just been hired and are tasked with learning the basics of the software programs WorldCorp uses to run its operations, most notably Microsoft 365—or more commonly known as its longtime former name, Microsoft Office—and Google Workspace.

Learning Objectives

By the end of this section, you will be able to:

- Explain the components that make up a computer
- Describe how computers process and store data
- Discuss what networks are and how they function
- Understand how to maintain and clean computer components

You do not need to know how to build a computer from scratch to effectively use a mobile device or other computing technology. However, a basic understanding of how computers operate can help you troubleshoot problems, and with some knowledge of computer terminology, you will be a more informed consumer when you are making technology purchases. Although there are technological and programming differences between computers, tablets, gaming consoles, and mobile devices, all are built around the same basic technology. This technology has evolved through innovations in the field to offer users enhanced features, reduced costs, and increased operating speeds.

This section will cover some basic aspects of computing. These concepts will give you a broader understanding of the technology you are using beyond simply operating the computer or tablet for personal or work tasks.

What Is a Computer?

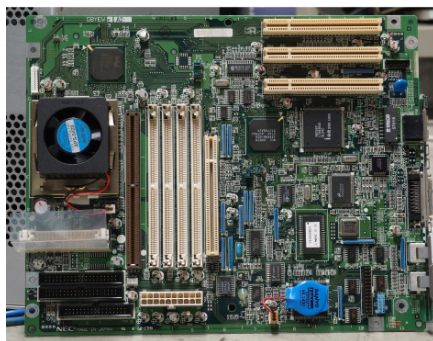
Although today's computers look and behave differently from early efforts, they include the same core features. A computer is simply a programmable machine that can execute predefined lists of instructions and respond to new instructions. A very large computers called a mainframe is capable of great processing speed and data storage. Mainframe computers today typically function as servers. Servers are powerful computers that act as a central hub of the technology needs for the organization. Servers support data storage, sharing of computer programs, and hosting websites. Another name for a computer program (language) or set of programs with the end goal of converting data into processes and actions is software. Software, such as Microsoft Word, allows the user to interface with the computer. Accessories such as a keyboard, mouse, printer, and monitor are called hardware. These input and output devices allow us to communicate with the computer and to extract information from it.

There are many different types of computer systems, including workstations, microcomputers, and supercomputers. A workstation is a powerful single-user computer that is similar to a personal computer but more powerful. They are typically used to manage business operations such as invoicing customers, managing online sales, or ordering inventory for the company. A minicomputer is similar in power to mainframe computers but, as the name implies, is much smaller in size and can be used in midsize organizations that need more power than what a typical personal computer might provide. A supercomputer is extremely powerful and has the fastest processor available. These computers can be used to process highly complex scientific data at fast speeds.

Computers are hard to get away from—they're in all kinds of everyday devices. Appliances, cars, watches, and even the heating and cooling systems in our homes incorporate computer technology that enables us to send and receive information from these devices. Today's smartphones are essentially minicomputers.

How Computers Work

Most computers consist of a few basic elements. The motherboard is the hardware that runs communications for the computer system (Figure 1.20a). It sits within the system unit, which is the container that houses most of the computer's electronic components. The central processing unit (CPU) contains a single chip called a microprocessor (the “brains” of a computer system). A microprocessor (Figure 1.20b) consists of a control and what is known as an arithmetic-logic unit, which performs math and logical operations within the computer system.



(a)



(b)

Figure 1.20: Two essential components of a computer's inner workings are (a) the motherboard and (b) the CPU's microprocessor. (credit a: modification of “Green Motherboard” by Pixabay/Pexels, CC0; credit b: modification of “Intel Core 2 Duo E6750” by Nao Iizuka/Flickr, CC BY 2.0)

Personal Computers and Devices

Numerous types of computers and devices are available for business or personal use today. A personal computer (PC) is a microcomputer that is suitable for individual use, including a desktop computer, laptop, tablet, smartphone, and wearable device such as a smartwatch. Desktop computers are personal workstations that you set up at a fixed location, such as a desk. They are typically equipped with a tower (where components such as the motherboard are housed), a monitor, and other peripheral accessories, such as a keyboard, mouse, and printer. Laptops are portable and lightweight—small enough to fit into most briefcases. The computer and monitor are combined, and peripheral accessories are optional. Tablets, such as the Kindle, are smaller than laptops and have less functionality but are still very powerful, with many features that support everyday personal use. They are even more portable than laptops, and their touch screens, which don't require a mouse, are their distinguishing feature.

Operating Systems

As stated earlier, a computer's operating system is software that is essential to all functionality and use of the computer. It controls the computer's activities, from memory to processes, and ensures that hardware and software components can "speak" to each other. It provides the interface necessary for humans to communicate with the computer and all its components. Here is where the big players enter the computing scene: Microsoft Windows, Apple macOS, and Google's Android OS, to name a few. You will typically interact with Windows and Apple macOS on a laptop or tablet. The programs that we discuss in this text, such as Google Sheets and Microsoft Word, use their respective operating system. The Android and iOS operating systems are used for mobile devices. You are likely to see these operating systems in use daily, both in the workplace and in your personal life.

Information Processing, Storage, and Memory

Businesses take great care in procuring computers that can handle the work that needs to get done. Before selecting computers, they'll investigate some basic functions that have to do with how fast the devices process information and how well they store data. The information processing cycle is the sequence of events involved in processing information—input, processing, storage, and output:

- Input consists of entering the data and information into the computer system.
- Processing involves a series of operations performed by the computer to organize, interpret, or otherwise make use of the information input into the computer.
- Output entails viewing this processed information in a way that makes sense to the user, either through the monitor or as a printout.
- Finally, storage is the process of saving information into the computer for future use.

There are two types of storage, primary storage and secondary storage. Primary storage refers to temporary files that are available only when the computer is on. Primary storage is also known as short-term memory, or random access memory (RAM). This type of memory is not meant to save information for future use but allows the computer to operate and process information quickly as it is being used. Secondary storage is considered permanent storage on a computer system or removable device, such as the old floppy disks. You may also be familiar with another type of memory—cache. The computer's cache holds data that can be retrieved quickly, often including downloads from websites or other information that can be used to load websites faster. The cache operates in the background to help the computer operate more quickly.

A hard disk is considered secondary storage where users can save files and retrieve data and programs. There are two types of hard disks, internal and external. An internal disk drive is housed within the computer unit, and users update and produce copies of all files they need. Figure 1.21 shows a few types of external disk drive. These are portable, allowing the user to save information outside of the computer unit for use elsewhere.

Before an operating system loads and is ready to use, the computer needs hardwired instructions, called read-only memory (ROM). Businesses should be sure to procure computers with sufficient RAM and to make sure that data storage solutions are in place to handle their needs. The amount of RAM impacts the speed at which programs run. Computers with less RAM are slower and can hinder work productivity in the workplace. Often businesses will begin with less RAM and eventually upgrade to higher levels as their business and needs expand.

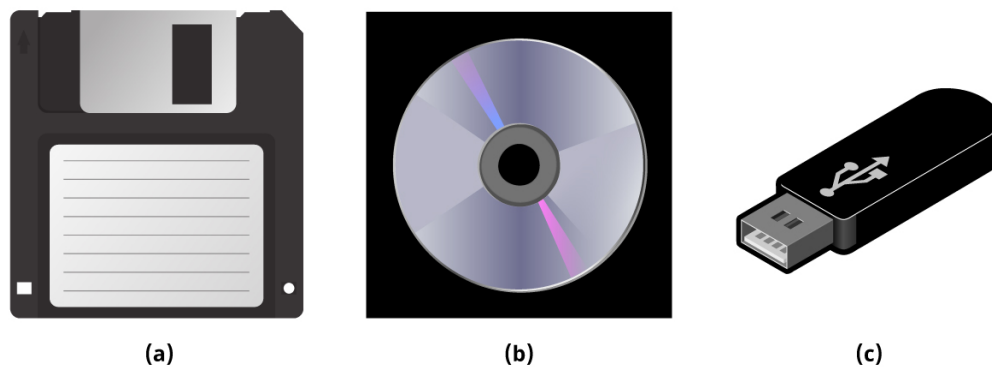


Figure 1.21: Different types of storage devices used over the years include (a) floppy disks, which are no longer used, (b) CD-ROM disks, and (c) flash drives. (credit a: modification of “Floppy Disk Data” by OpenClipart-Vectors/Pixabay, CC0; credit b: modification of “Dvd Cd-Rom Compact Disk” by OpenClipart-Vectors/Pixabay, CC0; credit c: modification of “Usb Disk Disc” by Clker-Free-Vector-Images/Pixabay, CC0)

Networks

Talk about networks is common in the workplace. You will hear that the network “has gone down” or “is running slow.” What does this mean? What is a network, anyway? A network is a connection of two or more computer systems, as well as devices, by either a cable or a wireless connection. Networks may be simple or complex, self-contained within a small area like your home or dispersed over a large geographic area.

These different types of networks are called personal area networks (PANs), local area networks (LANs), and wide area networks (WANs). Personal area networks typically connect personal computers and devices within a small area. Local area networks (LANs) are primarily used by colleges and universities as a way of linking computers and sharing printers and other resources. Wide area networks (WANs) allow access to regional service providers and span distances greater than 100 miles. The internet is a wide area network.

Network Hardware

In order to function properly, networks depend on a router. These devices perform two functions: they direct the data traffic, so to speak, from one network to another, and they allow multiple computers to use the same internet connection. Routers can vary in shape and size and also by performance. Switches coordinate direct flow of data between components. Gateways are devices that allow one local area network to be linked to other LANs or larger networks. The purpose of a hub is to send a received message to all connected devices rather than just the intended ones.

Network Servers

A client is a device that requests and uses resources available from other devices on the same network. For example, if you use a computer at your local library or a computer located on your campus, you are using a client device. In the workplace, the computers that employees have at their workstations are often connected through the network and are clients to that network. A server connects devices and allows for resource sharing across the network. Servers may have different functions. Examples are application servers, communication servers, database servers, file servers, print servers, and web servers.

Network adapter cards connect computers and devices to a network, enabling the sharing of hardware, software, and data across the network. The network adapter card connects the system unit to the network via a network cable. These cards used to be purchased separately in the early days of personal computers, but most computers today come with integrated cards embedded in their motherboard. The devices sending and receiving data are identified by transmission control protocol/internet protocol (TCP/IP), which organizes the information into small packets for transmission through the network and across the internet. One of the most widely used internet protocols, used for web traffic, is hypertext transfer protocol (HTTP). HTTPS is a more secure protocol than HTTP, for users and website owners alike, because users’ information is protected with a “pass” safety inspector embedded within the protocol. Before exchanging confidential information, such as credit card information, online, users should always verify if the website begins with https. And even with this safer and more secure connection, you should always be cautious when sharing information.

Secure File Transfer Protocol (SFTP) is a secure version of file transfer protocol; it provides a secure connection for transferring files. User datagram protocol (UDP) is a communication protocol that works across the internet for time-sensitive transmissions such as video playback. Its main goal is to speed up communication by establishing connection before data is transferred. Another security protocol that uses encryption to help ensure privacy of information and communications across the internet is secure sockets layer (SSL). Cybersecurity is a major concern of computer users, both personally and professionally. As encryption technology has progressed, there have been several iterations of SSL protocols. Today, the encryption is referred to as TLS (transport layer security), but the intent is the same—providing protection of data that is shared via the internet.

Spotlight on Ethics: Secure Information Transfers

One of the most common types of cybercrimes is identity theft, which occurs when a hacker steals an individual's identity for economic gain. The increase of hackers, individuals who gain unauthorized access to computer systems in an attempt to steal someone's information, has become a major issue and has led to the development of such software programs as Norton Antivirus and LifeLock to protect consumers' identities.

Another major safety concern when using computers is the existence of malware and viruses—software that can damage or slow down a computer system by opening an insecure portal into your computer. Malware can also damage files and allow hackers access to files and information stored on your computer. Depending on how these programs are written, they may only damage the computer that initiated the virus/malware, or the malware may flow throughout networks by attaching itself to other files that are exchanged across the network.

Users should be very careful when opening files sent to them in email or when clicking links to unfamiliar websites. Phishing scams are very common. These are attempts by hackers to gain access to your personal information, such as the credentials you may use to access financial and other sensitive accounts. Phishing most often occurs through email that appears to come from a reputable source, or via social media. It is always best to avoid logging into accounts through links sent in email, clicking on links that are not secure or recognizable, or opening files unless you know who the sender is and what is being sent.

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2.1.2: The Role of Information Systems

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

You should now understand that information systems have a number of vital components, some tangible, others intangible, and still others of a personnel nature. These components collect, store, organize, and distribute data throughout the organization. You may have even realized that one of the roles of information systems is to take data and turn it into information, and then transform that information into organizational knowledge. As technology has developed, this role has evolved into the backbone of the organization, making information systems integral to virtually every business. The integration of information systems into organizations has progressed over the decades.

The Mainframe Era

From the late 1950s through the 1960s, computers were seen as a way to more efficiently do calculations. These first business computers were room sized monsters, with several machines linked together. The primary work was to organize and store large volumes of information that were tedious to manage by hand. Only large businesses, universities, and government agencies could afford them, and they took a crew of specialized personnel and dedicated facilities to provide information to organizations. Time-sharing allowed dozens or even hundreds of users to simultaneously access mainframe computers from locations in the same building or miles away. Typical functions included scientific calculations and accounting, all under the broader umbrella of “data processing.”



IBM 704 Mainframe (Copyright: Lawrence Livermore National Laboratory)



The PC Revolution

In 1975, the first microcomputer was announced on the cover of Popular Mechanics: the Altair 8800. Its immediate popularity sparked the imagination of entrepreneurs everywhere, and there were soon dozens of companies manufacturing these “personal computers.” Though at first just a niche product for computer hobbyists, improvements in usability and the availability of practical software led to growing sales. The most prominent of these early personal computer makers was a little company known as Apple Computer, headed by Steve Jobs and Steve Wozniak, with the hugely successful “Apple II.” Not wanting to be left out of the revolution, in 1981 IBM teamed with Microsoft, then just a startup company, for their operating system software and hurriedly released their own version of the personal computer simply called the “PC.” Small businesses finally had affordable computing that could provide them with needed information systems. Popularity of the IBM PC gave legitimacy to the microcomputer and it was named Time magazine’s “Man of the Year” for 1982.



Because of the IBM PC’s open architecture, it was easy for other companies to copy, or “clone” it. During the 1980s, many new computer companies sprang up, offering less expensive versions of the PC. This drove prices down and spurred innovation. Microsoft developed the Windows operating system, with version 3.1 in 1992 becoming the first commercially successful release. Typical uses for the PC during this period included word processing, spreadsheets, and databases. These early PCs were standalone machines, not connected to a network.

Networking Communication

Besides the technology components (hardware, software, and data) which have long been considered the core technology of information systems, it has been suggested that one other component should be added: communication. An information system can exist without the ability to communicate – the first personal computers were stand-alone machines that did not access the Internet. However, in today's hyper-connected world, it is an extremely rare computer that does not connect to another device or to an e-network. Technically, the networking communication component is made up of hardware and software, but it is such a core feature of today's information systems that it has become its own category. Networking will be covered in future sections.

People

When thinking about information systems, it is easy to focus on the technology components and forget to look beyond these tools to fully understand their integration into an organization. A focus on the people involved in information systems is the next step. From the front-line user support staff, to systems analysts, to developers, all the way up to the chief information officer (CIO), the people involved with information systems are an essential element. The people component will be covered as we progress through the book.

Jeff Bezos, Amazon CEO



Process

The last component of information systems is process. A process is a series of steps undertaken to achieve a desired outcome or goal. Information systems are becoming more integrated with organizational processes, bringing greater productivity and better control to those processes. But simply automating activities using technology is not enough – businesses looking to utilize information systems must do more. The ultimate goal is to improve processes both internally and externally, enhancing interfaces with suppliers and customers. Technology buzzwords such as “business process re-engineering,” “business process management,” and “enterprise resource planning” all have to do with the continued improvement of these business procedures and the integration of technology with them. Businesses hoping to gain a competitive advantage over their competitors are highly focused on this component of information systems. The process element in information systems will be discussed as move though the chapters.

The Client Server

In the mid-1980s, businesses began to see the need to connect their computers as a way to collaborate and share resources. Known as “client-server,” this networking architecture allowed users to log in to the Local Area Network (LAN) from their PC (the “client”) by connecting to a central computer called a “server.” The server would lookup permissions for each user to determine who had access to various resources such as printers and files. Software companies began developing applications that allowed multiple users to access the same data at the same time. This evolved into software applications for communicating, with the first popular use of electronic mail appearing at this time. This networking and data sharing all stayed mainly within the confines of each business. Sharing of electronic data between companies was a very specialized function. Computers were now seen as tools to collaborate internally within an organization. These networks of computers were becoming so powerful that they were replacing many of the functions previously performed by the larger mainframe computers at a fraction of the cost. It was during this era that the first Enterprise Resource Planning (ERP) systems were developed and run on the client server architecture. An ERP system is an application with a centralized database that can be used to run a company's entire business. With separate modules for accounting, finance, inventory, human resources, and many more, ERP systems, with Germany's SAP leading the way, represented the state of the art in information systems integration. ERP systems will be discussed in later in the chapters.



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2.1.3: The Internet, Cloud Computing, and the Internet of Things

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Learning Objectives

By the end of this section, you will be able to:

- Explain how the internet has evolved and how it functions in today's world
- Describe how to conduct an effective internet search
- Conduct business research on the internet
- Explain the use of cloud computing for business
- Define the Internet of Things

The internet has dramatically transformed how we access and manage information, both at home and in the business world. For many people, it's almost impossible to go about your day without needing access to the internet. It's in your home—from smart doorbells to TVs, thermostats, and personal assistants. It's on your wrist, in your car, and, of course, on your phone. It's big business and it is integral to just about every business out there.

Established businesses have taken advantage of the ability to reach new customers by selling their products online, while would-be entrepreneurs use the internet to open online storefronts. The internet also enables us to conduct both personal and professional transactions more efficiently—from accessing important health-care documents to filing our tax returns, transferring money between bank accounts, and making payments to individuals online. Many of us practically run our lives through our phones.

Link to Learning

Read this [article on the invention of the internet](#) to learn more. When was the internet first developed and for what purpose? How did it evolve into the internet we use today?

The Internet: From Inception to Today

The internet as we know it today originated in the 1960s with the idea of using a traditional telephone switching circuit to wirelessly connect computers in a network. The telephone system would allow these computers to communicate with one another, exchange data, and run shared programs. Researchers and engineers from both the public and the private sector came together to form the Advanced Research Projects Agency (ARPA) to investigate ways the U.S. military could improve communications, with the goal of protecting the country from unexpected enemy attacks.

In 1969, a new digital packet switching technology was introduced to enable two computers to communicate with each other, replacing the telephone circuit technology. Packet switching happens when computers break down data or information into smaller groups (packets) and transmit several of those packets over the network. When the packets reach the destination computer, they are put back together in their original form. The communication occurred through the traditional phone line system but was transformed into digital data during transmission. The packet technology did not require a dedicated telephone line to network the computers together. This was the origin of the ARPA Network, or ARPANET, and is the same technology used today for the internet. The networked computers were also able to send simple messages to one another, setting the stage for email as we know it today. Figure 1.22 shows an early iteration of the ARPA network.

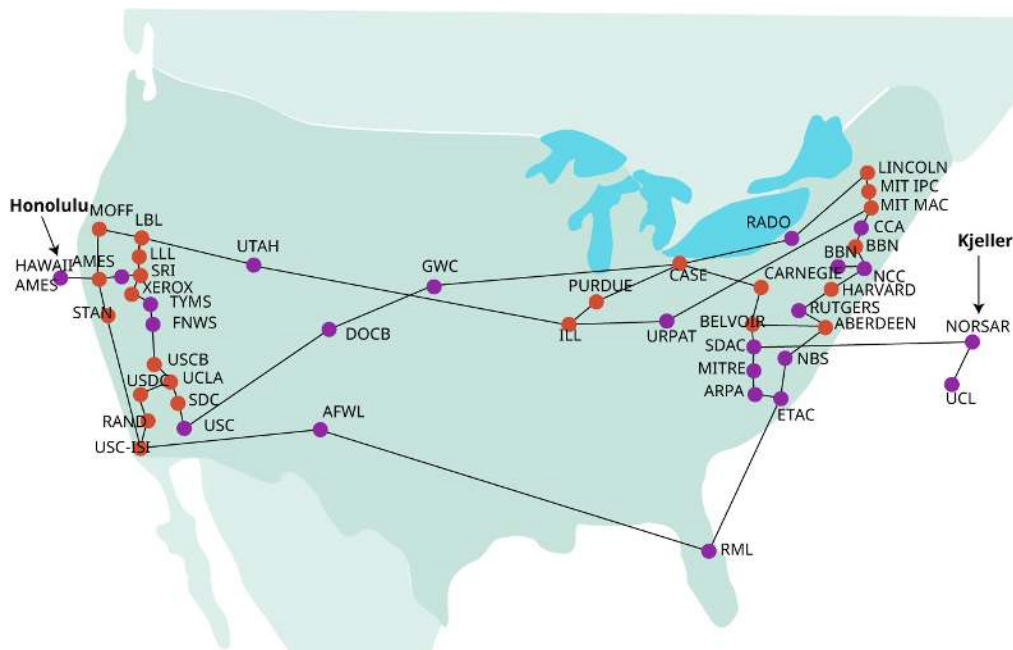


Figure 1.22: In the 1970s, ARPA's network consisted of a series of nodes (connectors) and lines that stretched across the continental United States. (credit: modification of "Arpanet 1974" by Yngvar/Wikimedia Commons, Public Domain)

In less than five years, the network expanded to include thirty different organizations and institutions across the world, and by 1975, ARPA determined that it needed to establish standards for consistency. These rules helped ensure that the interconnected network, or internet, was secure and efficient. The transmission control protocol/internet protocol (TCP/IP) was established to standardize the computer language used between the computers in the network. With these rules, a unique internet protocol address (IP address) allowed users to determine the geographic location of any computer on the network. The IP address was also used to direct the transmitted information to the appropriate destination. Because the IP address is a series of numbers and decimal points that can be hard to remember, the domain name system (DNS) was developed in 1983 to convert IP addresses into simple names. The DNS thus became the phone book for the internet, enabling users to send a message using their name, the symbol @, and the location of the computer as identified by its domain name. With the DNS, the foundation of the World Wide Web (WWW) was put into place. The term *internet* simply refers to the interconnected computers, a network that now extends across the world. The WWW is the content that has been collected over the internet and is available online. By 1981, the network had grown to over 200 hosts. The first domain name was registered in 1985 to a computer manufacturer.

By the mid-1980s, scientists and researchers across the world were working on computer networking technology. With the success of the ARPANET, the ARPA group was charged with working on other, more cutting-edge projects. The ARPANET-connected organizations were predominantly government entities or educational research centers; the system was not available for commercial or personal use. Consequently, the project was moved to the U.S. Department of Defense, where the network continued to expand through various branches, including NASA and the National Science Foundation (NSF). In 1985, the NSF created the structure for a supercomputing center to connect colleges and universities, research centers, and regional networks. By the end of the 1980s, this network had grown to over 30,000 hosts. As a result, ARPANET was decommissioned in 1990.

In 1989, the first dial-up internet service provider (ISP) was established, allowing commercial access to the internet. The term *dial-up internet* emerged to describe how users would use existing telephone technology to "dial up" internet access through a specific provider. Because the internet was established primarily for military use, access to the technology was highly restricted, limited to specific uses such as research. By 1992, Congress had allowed the NSF to grant some access to the network for uses beyond education and research. Then, in 1995, all restrictions on noncommercial uses of the internet were lifted.

In these early days, a good deal of computer knowledge was needed in order to use the network, so the internet was not yet part of mainstream life. But that was about to change. In 1990, hypertext transfer protocol (HTTP), hypertext markup language (HTML), and the uniform resource locator (URL) were developed to give the average person access to the web of information. This really was the birth of the World Wide Web. HTML provides the structure on which web pages are based; it is a series of commands that

describe attributes such as the font size and background colors of the displayed page. The uniform resource locator (URL) is an address—similar to a postal address—that directs the user to a unique location or page on the World Wide Web. These two developments, along with the milestones shown in Figure 1.23 made the web less technically complex and easier for the average person to navigate.

People soon began to see the ease with which web pages could be created. In 1993, the first user-friendly web browser, Mosaic, came on the scene. A web browser provides the interface that you can use to search for the information stored on the WWW. Marc Andreessen, a student at the University of Illinois, developed it. One key feature of Mosaic was the ability to include images as well as text on a web page. Other features included buttons to select for navigating the page, the ability to include video clips, and hyperlinks. A hyperlink is a link that can take the user from one web page to another just by clicking the highlighted link. Initially available as a free download, Mosaic quickly caught on and evolved as more users came on board. Prior to Mosaic, fewer than 200 web pages were available, but in just a few short years by the late 1990s, that number grew to more than 100,000. After graduating, Andreessen formed Netscape Communications and would eventually launch Netscape Navigator, which would grow to over 10 million users globally in just two years. Microsoft was quick to respond with its browser, Internet Explorer, which was bundled with the Windows operating system.

early milestones	Key Layers of the Internet	milestones
1971 - email@ Ray Tomlinson	Content	1987 - HyperCard Bill Atkinson
1990 - Archie Emtage & Deutsch	Search Engine	1998 - Google Brin & Page
1986 - DOS Houdini Neil Larson	Browsers	1993 - Mosaic Marc Andreessen
(Vannevar Bush, Ted Nelson, Douglas Engelbart)	World Wide Web	1990 - http:// Tim Berners-Lee
1969 - ARPANET J.C.R. Licklider	Internet	1975 - TCP/IP Cerf & Kahn
1956 - SAGE George Valley	Networks	1973 - Ethernet Robert Metcalfe
1941- Z3 Konrad Zuse	Computers	1976 - Apple Jobs & Wozniak

Figure 1.23: Major milestones in the creation of the internet came in layers.

Link to Learning

HTML is used to create web pages. The information is contained behind the scenes and is used to format text and the layout of the page. Read this [article about HTML and the process used](#) to learn more. Watch this [video on how HTML is used to build websites](#) to learn more.

By 1998, some big tech names established themselves as internet-based businesses—Hotmail, Amazon, Google, eBay, and Yahoo!, to name a few. The rise of the internet led to what became known as the dot-com bubble, a period when investors poured money into many internet-based ventures that promised high returns. Of course, many of these ventures failed, and their investors lost a good deal of capital. But, despite this, new ideas continued to emerge, and the internet continued to grow. Here are a few internet ventures that came out of the dot-com bubble and are still around today:

- Wikipedia—2001
- Facebook—2004

- YouTube—2005
- Twitter (now X)—2006
- Hulu—2007

Spotlight on Ethics: Inequities in Internet Access

Having access to the internet is almost essential to fully participate in society today. In some instances, without the internet, even routine tasks can seem impossible. For example, some companies can be contacted only via the internet, so you may need internet access to even apply for a job. Because of the global nature of the internet, it might be assumed that everyone has access in some way. But even in the United States, there are large disparities in access to reliable internet connections. In today's electronic world, this is furthering the gap between economic, racial, and ethnic groups; age groups; and socioeconomic groups. It is estimated that on average, nearly 15 percent of households in the United States with school-age children lack access to the internet. But in rural or low-income areas, this percentage could be much higher.

Governments are introducing initiatives to make the internet more accessible to all, often through partnerships with technology firms. For example, in a partnership with Google, the city of Austin, Texas, has been able to provide free internet services for nearly 2,000 lower-income residents. As early as 2006, India established internet access in its rural communities through the use of kiosks. These are just a couple of examples of the efforts worldwide to make the internet more accessible for all.

Using the Internet

Using the internet today is much simpler than it was even as recently as five years ago. It simply entails going to the web browser of our choice and clicking the mouse to launch it. Common browsers in use today include Google Chrome, Apple Safari, Microsoft Edge, and Firefox. The browser, once opened, will take you to where you want to go online. You can go directly to a web page by typing its URL in the navigation bar at the top of the browser. However, many browsers have a default search engine that will automatically launch when you open the browser and will allow you to search the internet for content you want to locate or research. Chrome, for example, will automatically navigate to the Google search engine when you open the Chrome program. Most browsers include a bookmark feature, and it may be helpful to bookmark/favorite pages that you visit frequently or want to remember for quick access later. With Chrome, you will see a star on the right-hand side of the URL to select to bookmark/favorite the page. Figure 1.24 shows these buttons.

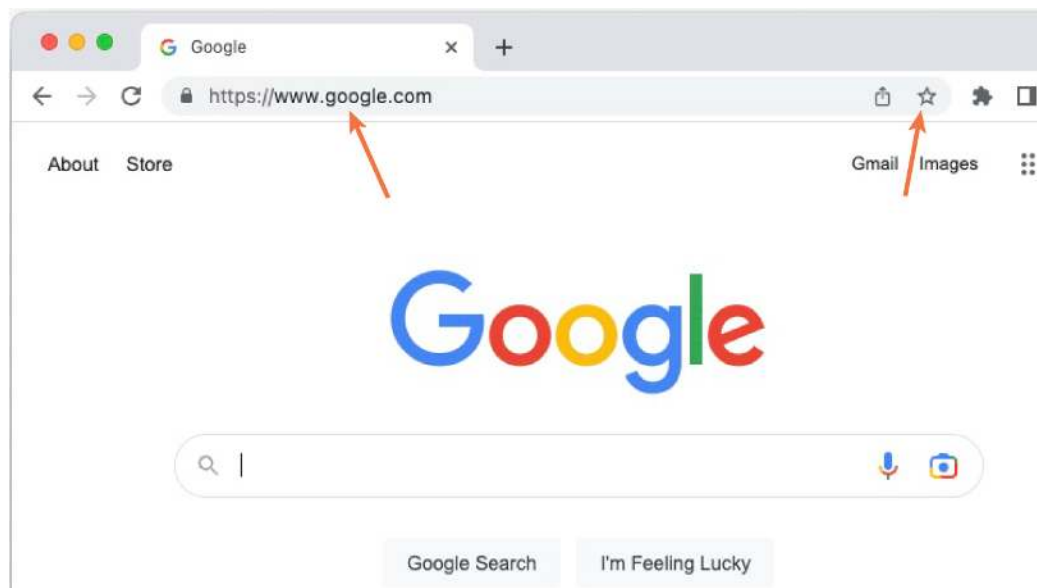


Figure 1.24: To use a browser, type the website URL address into the navigation bar. Here, we've typed `www.google.com` to get to Google's famous search page. You can also bookmark/favorite websites that you frequent for quick access by selecting the star button. (Google Search is a trademark of Google LLC.)

Conducting Effective Searches

Conducting searches on the internet is straightforward, but there are some techniques that will make your searches more effective. Because of the vast amount of information available on the internet, incorporating some simple changes to your search strategies can make a huge difference. You might, for example, want to narrow the number of results that you get from a search to those that are most relevant. When you begin to type in a search term, most engines will display a list of suggested searches. This list of suggestions will give you similar, related searches using the terms that you have begun to type into the search bar. This is often helpful as you try to narrow your search to obtain the desired results, as Figure 1.25 shows.

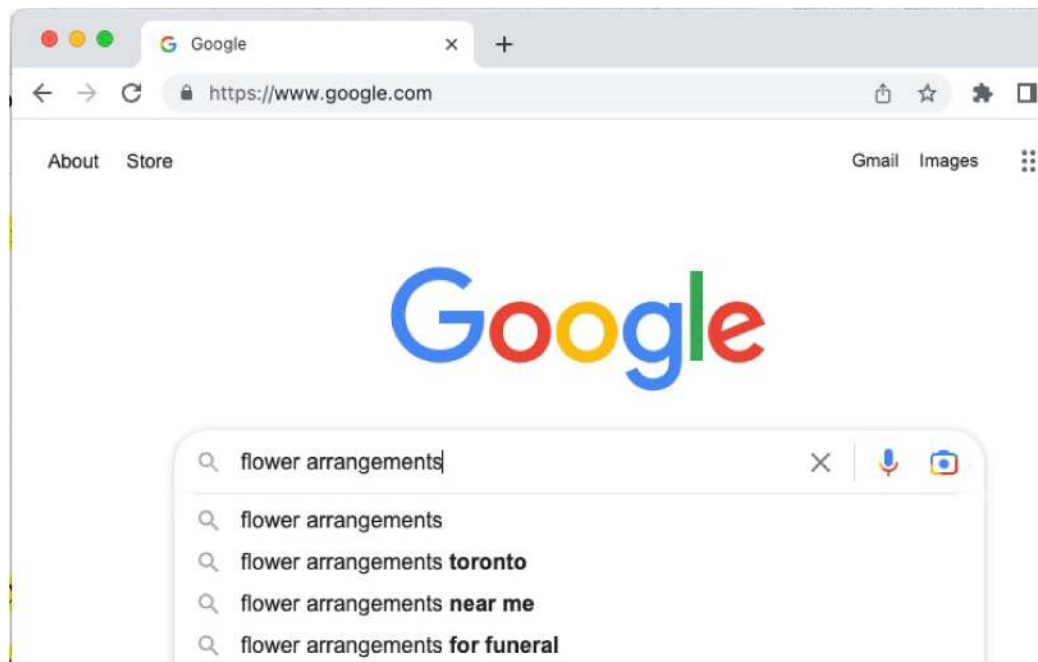


Figure 1.25: When you begin typing into a search engine, not just Google's, most will offer suggested searches based on what you typed, as you can see in the list under the “flower arrangements” entry. (Google Search is a trademark of Google LLC.)

As you conduct your search, it is often helpful to keep a list of search terms that you have successfully used. It is easy to forget that you have already used a particular phrase or word, so a simple list will make it easier to avoid replicating something you have already searched.

For example, suppose your boss at WorldCorp has asked you to search for a local nonprofit organization centered on children to support this year during the holidays. You might choose to search using the word or phrase *children*, *kids*, *not for profit*, *nonprofit*, or *children in need*, as just a few examples.

Search engines also offer the capability to search with an image or with voice instead of text. Once you have entered a search term or phrase, you have some additional options. For example, you can restrict the search to a certain date range or a certain location, or you can change the search to focus only on shopping related to your search term. See Figure 1.26. Keep in mind that once you reach a website, you will often find a search bar within the website itself. This will enable you to search within that specific website instead of conducting a search of the entire internet. A little trick for searching on a page is to use the control (Ctrl) key and the F key at the same time (Ctrl+F). When you press these two keys at the same time, a search window will appear that allows you to search on that specific web page.

Mac Tip

To search within a web page on a Mac, type Command+F.

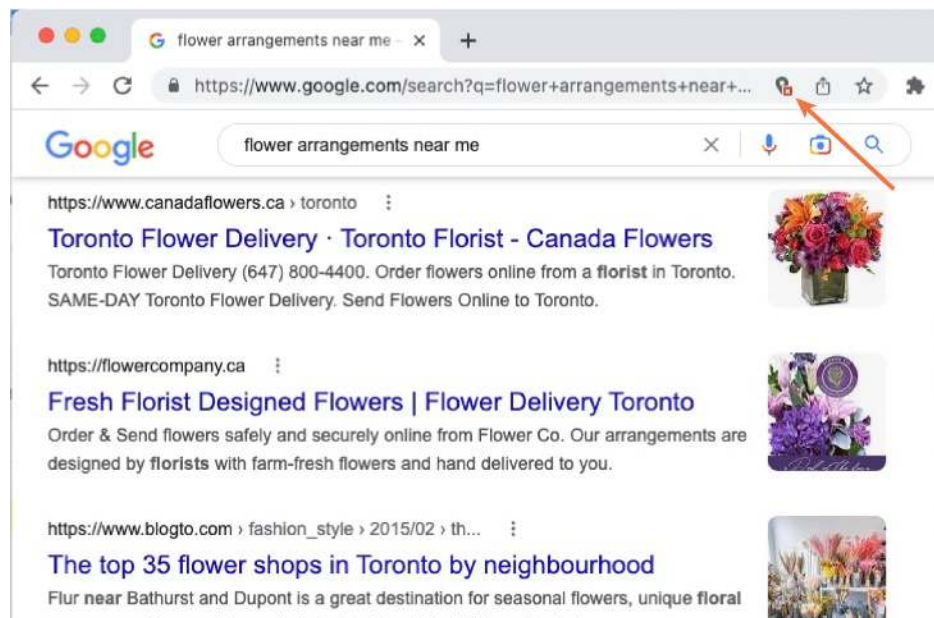


Figure 1.26: Using the advanced search features, you can restrict your search to a location or date range. You can also search using voice or search with an image. (Google Search is a trademark of Google LLC.)

To conduct an internet search, it is best to use specific and unique terms whenever possible. For example, when searching for contact information for a nonprofit organization in your hometown, rather than simply using the term “food bank,” you should use the actual name of the food bank you are searching. Or, if you are unsure of the name of the organization, you might limit the search by combining “food bank” with the name of your town or city. You can add a phrase as well. Being more specific in your searches will lead to more refined results.

In defining your search, avoid using common words such as “a” and “the,” as well as punctuation marks. Also note that most search engines are not case sensitive, so proper capitalization is unimportant. Finally, to get the most results, it may be helpful to focus on the base or root word. For example, instead of searching on “running gear for women,” you might get more results by using “run gear women,” leaving the search open to words such as “runner” in addition to “running.”

Your internet searches can be further refined by adding “+” or “-” in front of a word to either add to the search term or exclude something from the term. If, for example, you are searching for theaters but do not want movie theaters, you can type “theater-movie” to get search results that do *not* include movie theaters. This same approach can be used with “+” to add more terms to your searches. (Note: Some search engines may use NOT or AND instead of the mathematical sign.)

To search for an exact phrase or string of words, enclose the phrase in quotation marks. For example, if you are looking for information about historic theaters, you can search by typing “historic theaters” and then perhaps add a location (city or state) at the end, also in quotation marks, so your search would be “historic theaters” “Atlanta.”

Use the tilde (~) to search for synonyms for the word you type. For example, searching “~coat” might return search results including jackets and sweatshirts. The asterisk (*) can be used to search partial words. This can be very helpful if you want to search for a specific person or location but are not sure of the correct spelling or the complete term. If you are researching nonprofit organizations and want to capture information that might just say “nonprofits” instead of the complete phrase, you can search using “nonprofit*.” Finally, the “|” or OR operator can search on two terms at the same time, giving you results for either of the two terms. Searching “black shoes for sale” | “brown shoes for sale” will return results that satisfy both search phrases. These operators can be combined in various ways to make your searches much more directed. Be careful not to be too restrictive, however, as you might filter out some relevant results. Table 1.1 summarizes the key internet search operators.

Table 1.1: Internet Search Operators Using these operators can make your search more effective.

Operator	Description
+, AND	Include a word in the search
-, NOT	Exclude a word from the search
" "	Search for the exact words contained between the quotation marks
*	Search partial words
~	Search for synonyms
, OR	Search two words at the same time

Conducting Business Research

Conducting business research via the internet enables you to access information quickly at little or no cost. The internet gives you access to a large body of data from a variety of sources across the world. There are both free and fee-based services available on the internet to gather data. In addition, you can access many academic, peer-reviewed research using specialized databases. The first step is to narrow your search by determining what information you need and making a list of the data needed. As you work through your search, be sure to record relevant search terms, the website URL, and other pertinent information for you to access later if needed. A good strategy might be to keep a notepad by the computer or keep an electronic record in Microsoft Word or Google Docs.

Some common sources of information for business research can be readily accessed:

- Google Scholar is a search engine for peer-reviewed academic research. Here, you will find journal articles (often full-text .pdf files) for nearly all disciplines. This source can be handy if you are looking for targeted information based on a specific academic discipline.
- Microsoft has a similar search engine called Microsoft Academic.
- Science.gov is a website that provides access to data from nearly twenty U.S. federal agencies.
- Census.gov is an excellent source of demographic information.
- If you are searching for financial information for companies, Yahoo! Finance or Google Finance is a great place to start.
- More detailed information about specific industries and sectors is available at CSImarket.com.

When conducting research on the internet, there always will be some question of the credibility of the information you find. Because virtually anyone can create a website or post information on the internet, you should read with a critical eye. There is a wealth of quality information available, but it is just as easy to stumble upon unreliable data. Wikipedia is a commonly searched source for information. Wikipedia is an online encyclopedia built organically by users (it isn't owned by a person or organization). It was founded in 2001 as a nonprofit organization with the goal of giving free access to information for everyone. Wikipedia is the fifth most visited site on the internet. Users submit content to pages and check one another for accuracy. They are given guidelines to follow for fact checking and editorial changes. In most cases, however, using Wikipedia as the primary source for research is frowned upon because of the lack of authentic reliability checks for the information.

With any research, it is good practice to use triangulation: To verify the credibility of a piece of research, you should find at least three sources that are in agreement. By using multiple sources, you are minimizing the risk of uncertainty of the information found. It is also good practice to follow additional guidelines when evaluating the credibility of information found on the internet. By looking a little deeper into the research, you may uncover some hidden biases or questionable conclusions that were not readily apparent.

- Who is the author and what is their affiliation?
- Who paid for the research?
- What is the date of the information?
- Has the website been updated recently, and do the hyperlinks work?
- Are any clear biases or opinions expressed?
- Is there a way to contact the author or request more information?

By taking the time to dive a little deeper into the information retrieved, you can better ensure the data is credible and suitable for your needs.

Globalization

The internet has broken down many geographic barriers. Business transactions can easily happen from points across the globe, products can be ordered and efficiently shipped to destinations thousands of miles away, and individuals can readily access information related to current events in other countries. The global nature of the internet has opened up the world, but there is little consistency between countries in their management of this technology. There are distinct differences from country to country in the laws and regulations governing internet use. For example, Facebook and Google are banned in some countries, such as Iran and North Korea, because these sites are seen as contradictory to local traditions and customs. In China, the government plays a major role in monitoring what citizens can access and view on the internet. There are nearly 100 regulations specifically centered on the internet and its use in China.

Internet regulations across the world generally fall into one of four categories:

- Encouragement of self-regulation and voluntary use of filters for illegal material
- Punitive actions for making material available online that is unsuitable for children
- Required blocking of government-selected materials
- Prohibition on public access to the internet

Many countries have enacted some type of legislation, policy, or governmental oversight with the goal of managing internet content. This governmental involvement began as early as 1996 and continues to be amended today. As you enter the workplace, you should be aware of the specific legislation that might impact the industry that you are working in. This could include protecting user information through specific privacy controls to managing content on a social media site for appropriateness. You do not have to be a legal expert, but having a general awareness of governmental involvement in the information shared over the internet is important.

Communication, Collaboration, and Social Media

Through the internet and the software programs available today, we can stay connected to colleagues and family across great distances. Email, the Google Workspace of programs, Microsoft 365, and social media sites have all had a significant impact on business and personal productivity. Email first became a reality with the ARPANET. Today, we have many options when it comes to our email service. Gmail from Google and Outlook by Microsoft led the email market. These programs are directly integrated into their other products to aid in communication and collaboration between users. The enhanced capabilities of email programs today allow easy sharing of photos, documents, video, and large files. Just the ability to connect to colleagues who are outside of your general geographic area on a regular basis greatly improves productivity and connectivity.

We also now have several options for videoconferencing. Many people use these tools outside the workplace to spend time with out-of-town family and friends. The traditional telephone conference call where several people sit around a conference table while another colleague calls in on a speaker phone is a rare sight in today's office. Now, we can gather around a virtual table and use a videoconferencing program to conduct an important business meeting (Figure 1.27). We can use the same program to have a virtual meal with a family member who lives miles away. Some of the leading videoconferencing tools today include Zoom, Microsoft Teams, Skype, WebEx, and Google Meet. All have basically the same functionality, with features such as recording the meeting and providing a transcript of the discussion. These features have been valuable as part of a widespread shift to remote working conditions for many companies. The shift to greater use of remote working environments occurs for various reasons, ranging from global issues such as a public health emergency to more localized reasons like increasing employee satisfaction by assisting in work/life balance.



Figure 1.27: Videoconferencing tools such as Zoom make telecommuting easier than ever before. *Forbes* credited Zoom's quick rise in use to its ease in navigation. (credit: modification of "VFRÖ - Zoom Meeting 3/2020" by Radiofabrik/Flickr, CC BY 2.0)

Another tool people use to connect and collaborate with others is social media. Social media is digital technology that allows users (individuals and organizations) to share information about themselves such as posts, photos, or videos. More than 40 percent of the global population use social media. Social media sites had their origin in connecting friends and families. However, as the number of users increased, businesses started to see the value in connecting with their customers via these social media sites. Many businesses have a distinct presence on social media as active users, not simply advertising through the site. Today, about 70 percent of businesses have a social media presence. The line between personal and business has blurred significantly. Very few people use social media solely for connecting and sharing with friends and family. Most will interact with businesses such as retail outlets and even banks on their social media sites. Many people follow a specific brand or company that they like. Personal and business social media sites are intertwined and connected across sites.

This phenomenon has shifted how businesses manage relationships with their customers. Many banks, for example, have a social media site where they share financial tips and banking products/promotions available to their customers. Consumer products companies can use the sites to get feedback on product attributes or advertising strategies. Small businesses can use social media sites to offer promotions to bring more foot traffic into the store—whether online or brick-and-mortar.

The leading social media sites vary by age to some extent, with older generations leaning more toward Facebook and LinkedIn while younger people tend to gravitate to platforms such as TikTok, Instagram, Snapchat, and X (Twitter). Other popular social media sites include Pinterest and Reddit.

Privacy is a concern when dealing with any interaction on the internet, but especially with social media sites, where individuals often share personal information and pictures that could open them up to cyberattacks. You should regularly check and update the privacy settings on the social media sites you use. You might consider changing your password routinely to prevent hackers from accessing your information. Never share personal information through the site or through messages within the site. You should be wary of friend/follower requests from people who are unknown to you or your other connections. Avoid being controversial or posting overly personal content. Employers now are checking applicants' social media profiles and, in some cases, monitoring employees' activity.

Finally, as a user, it is easy to get pulled into clicking on advertisements that either show up in the margins or in the social media feed. Clicking leaves a virtual footprint of your activity that both legitimate advertisers and spammers can use to target advertisements and compel you to visit their sites. Often, you can limit your exposure through the site privacy settings, but the risk of exposure of personal information probably cannot be totally mitigated unless you avoid using social media sites altogether.

Personally identifiable information (PII) may include items that directly reveal your identity, such as your address or Social Security number. But other identifiable information can also be gathered, such as race, gender, or religion. You should be cautious when sharing information on the internet via social media and other websites. Useful precautions include regularly changing your passwords, not using the same passwords for multiple sites, providing limited personal information on social media sites or putting privacy settings at a high level, and, finally, being cautious about clicking links or advertisements from unknown sources.

Libraries and Media

The internet has changed the way that libraries operate and store/share information. Many libraries still house extensive collections of books, reference materials, magazines, and the like. In fact, you may be surprised to learn that reading print books still outpaces reading electronic books. Some college students have reaped the benefits of e-books by purchasing their textbooks in (often cheaper) electronic formats. Unlike a traditional print copy of the same material, these textbooks are interactive, enabling the publisher to include updated information and links to relevant extra materials that cannot be included in the print edition. With the availability of the internet and today's technology, students can also rent electronic textbooks, which can save a good deal of money over time. Currently, electronic textbooks hold about 30 percent of the total market.

Many libraries now have online services that allow users to place a hold on materials. When the item becomes available, the patron is notified via text or email. Libraries are also moving some of their resources to a digital format. For example, some of the historical archives housed in libraries have been cataloged digitally to provide broader access. Libraries will still have a good supply of DVDs or books on CD for patrons to check out, but many resources can now be accessed electronically by using your library card.

Many states have library systems that allow patrons in one city to utilize materials owned by another library in a different city. With apps such as OneDrive and Hoopla, users can gain access to thousands of digital materials, including books and media. These apps are typically compatible with the leading e-reader apps, such as Kindle, Kobo, and Libby. Also, libraries have become a central access point and technology hub for those lacking these resources at home, as Figure 1.28 shows. Nearly 96 percent of all rural public libraries offer free access to the internet for their cardholders. In all these ways, the digital revolution has altered the way libraries think about the services they provide.



Figure 1.28: Many libraries today have computer workstations where users can access the internet and conduct research. (credit: modification of “Vancouver Public Central Library” by GoToVan/Flickr, CC BY 2.0)

Libraries can be a source of research that might otherwise be unavailable to you. For example, the popular genealogy site Ancestry.com has agreements with libraries to provide some of its exclusive material free of charge to users of the site's library edition. Libraries also provide free access to other databases that are centered on business research, including LexisNexis, BizMiner, Business Source Complete, and IbisWorld. These databases provide a wealth of information that is not readily obtained with a simple internet search.

Web Applications

A web application is a software program that is not installed directly onto the user's computer. Instead, the program and data associated with it are stored on the internet, and the application is accessed through a browser or app rather than through an installed program on the computer. In the past, users had to purchase a license key to install programs directly onto their computer. This takes up memory and storage space on the computer and presents limitations on updates to the program. The user would generally have to purchase the program on a regular basis to get the most updated version or purchase an upgrade. Web-based applications give users access to the most up-to-date version of the software while sometimes freeing up essential storage on the networks and allowing seamless collaboration between users in real time. Companies pay monthly or annual subscription fees for these programs, often based on the number of user licenses they want to purchase. Throughout this text, you will become familiar with the Google Workspace of products and Microsoft 365, so that you can develop basic computing skills for the work world.

E-commerce

Electronic commerce, or e-commerce, refers to conducting business transactions online—buying and selling goods or services in an online environment rather than in a traditional brick-and-mortar storefront. The first e-commerce transaction was in 1994, but it is helpful to think of e-commerce as a modern-day version of the catalog sales (Sears, JCPenney, Montgomery Ward) of times past, except that the ordering is done over a computer rather than over a telephone or by filling out a form and mailing it through the post office.

E-commerce transactions can occur between all customers in the marketing mix. In a business-to-business transaction, one business might purchase office supplies from another business. In a business-to-customer transaction, an individual purchases a product from a retailer online and has it delivered to their home. Consumer-to-consumer purchases can also be made through e-commerce—for example, when an individual purchases a product directly from another individual through a resale website.

E-commerce does not necessarily involve shipping the purchased items; for instance, you may purchase and download an electronic product, such as an e-book or music. E-commerce simply means that the purchase transaction occurs online rather than in person. Today, virtually all products or services can be purchased online. Some entrepreneurs have started exclusively online businesses with virtual storefronts and no physical inventory. Today, e-commerce makes up about 15 percent of all retail sales across the world, with over twenty million e-commerce sites worldwide, representing nearly \$4 trillion in sales. E-commerce jobs are expected to reach nearly 500,000 by the end of the 2020s; it is predicted that by 2040, 95 percent of purchases will be through e-commerce.

Real-World Application: A New Kind of Entrepreneurship

Crowdfunding is a concept wherein many people contribute to fund a particular product launch or cause. Kickstarter is one such online platform where entrepreneurs can post their business idea and ask for contributions to make it happen. Some products have raised millions of dollars to fund their ideas. Pebbletime Smartwatch and the Coolertime Cooler garnered \$20 million, \$13.3 million respectively from Kickstarter donations.

The Cloud and Cloud Computing

Technological advances have made working remotely, or telecommuting, a possibility for many employees. In fact, one recent survey estimated that nearly 90 percent of U.S. employees would like to work remotely. Today, there are almost five million workers in the United States (nearly 40 percent of the U.S. workforce) who telecommute. Since 2015, the number of businesses that have allowed telecommuting has increased over 40 percent. Even for those who do not telecommute full time, access to the internet and such technologies as cloud computing in the workplace enable many employees to work from home at least once per month, with nearly 50 percent doing so once a week.

With cloud computing many of the resources that were traditionally stored on individual computers, including software programs, data management and storage systems, and networking tools, are moved to internet servers. This technological advance was prompted by the need to store large amounts of information and data and to enable collaboration by individuals across the world. The resources and their associated data are stored in a data center that is managed by a cloud service provider (CSP). The benefits of cloud computing are that it can handle larger amounts of data than any physical storage device can, and it also allows users to access their data from any computer, no matter the location, and from any device, as Figure 1.29 illustrates.



Figure 1.29: Cloud computing enables you to store much more data than can be kept on any physical computing device. (credit: “Cloud-Computing” by Learntek/Flickr, Public Domain)

The cloud is the term used to describe servers that are located at different locations and that are accessed via the internet. These servers are housed in data centers to provide storage and computer processing operations. The term *cloud* was first used in 1996 by a researcher at Compaq, and the first cloud computing service was Amazon Web Services (AWS), which launched in 2002 as a public cloud system. The cloud offers some distinct cost advantages to businesses. Companies can save money by not having to constantly upgrade individual users’ storage capacity, and they can lower their IT costs because the subscription fee for use of the cloud service includes many troubleshooting and technical assistance functions. When we use the cloud for storage, we no longer need to store and maintain CDs with backups of the system or flash drives to transport documents from one computer to another. Cloud computing increases the speed of computing and gives all users real-time access to information stored in the cloud. Use of the cloud allows greater security for information storage as well as speedy distribution of new software and software upgrades. Finally, the cloud offers flexibility that enables businesses to operate more efficiently.

The security of information stored in the cloud can be of concern, but due diligence by individual users and the company can mitigate these risks. Here are some basic steps for ensuring the security of information:

1. Select a CSP that encrypts its data. Computers use the process of encryption to rewrite readable information into a code that can be deciphered only by using the key to the code, similar to solving a word puzzle that uses a secret code (see Figure 1.30). Encryption is an important step in ensuring the security of the information transmitted and stored in the cloud.

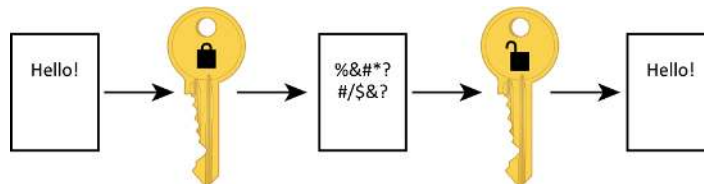


Figure 1.30: Each key has the code to the secret (encrypted) information, allowing messages to be sent safely.

2. Back up information regularly. Most CSPs will include this with the services they provide.
3. Use strong passwords and change the passwords regularly. Some businesses will set up a system that requires a password change at set time intervals.
4. Use two-factor authentication. This means that to access the system, you will need two pieces of identification, typically your username and password as well as one additional means of identification, such as an email to verify your identity, a code sent to your cell phone, or an answer to a personal question.
5. Make sure your system is protected by antivirus/antimalware software. These programs prevent unauthorized attempts to gain access to the system.
6. Avoid using public Wi-Fi access points to conduct critical business or personal transactions. Using public Wi-Fi exposes users to the potential for personal information to be compromised.

Cloud Computing in Business

Some companies set up a cloud-based intranet—a private network for internal company use. Unlike the internet, it is not available to the public and typically requires authorized users to enter a username and password. Many companies also require employees to make use of a virtual private network (VPN) to gain access to the company's intranet when they are off-site.

Link to Learning

The use of virtual private networks enables businesses to control who gains access to their computer network. Using cloud services can offer some of the same security advantages for business. Read this [article on VPN and cloud computing](#) to learn how the two are related and some differences between the two.

Many businesses today use cloud computing to manage their information technology needs. Through the cloud, businesses can more efficiently analyze, manage, and store data. They are able to deliver software to their employees on demand and make updates to programs more rapidly. Finally, cloud computing enables seamless collaboration between business units that may be located miles apart.

Three types of clouds are involved in cloud computing:

1. The public cloud is managed by a CSP. All of their services are delivered via the internet, and they charge for their service. The resources are owned and maintained by the CSP. Microsoft Azure and IBM Cloud Services are examples of public cloud service providers.
2. A private cloud is used within a single business or organization. Its resources, which are owned by the business and maintained within the organization, are stored on a private network, or the company can pay a third party to host the private cloud. With a private cloud, there are often restrictions on who can use it and what permissions are given to the users. Businesses that use sensitive information, such as financial institutions or health-care providers, prefer private clouds because they offer more security than a public cloud system.
3. The final type of cloud system is a hybrid cloud—a blend of public and private. Some resources are utilized through a public cloud and others are secured through a private cloud.

Cloud Computing for Personal Use

You are probably using the cloud already in your professional or personal life, even if you are unaware that you are doing so. For example, cloud computing is used behind the scenes for Google and Microsoft programs, so if you are using Gmail or Outlook, you are using the cloud. Likewise, if you use Google Photos to store family memories, you are using the cloud. And if your family members play video games, stream movies, or listen to music on the internet, they are more than likely using the cloud. The cloud is working behind the scenes with much of the work we do both personally and professionally. This is a natural outgrowth of advances in internet capabilities and computing power to enable us to manage information more efficiently, conveniently, and cost-effectively.

Internet of Things (IoT): Integration and Collaboration

The Internet of Things (IoT) refers to the extension of internet connectivity beyond computers, to enable the transfer of information between machines and other objects, people, and animals by connecting them to the internet in some way. With the IoT, the physical connects to the virtual. Today, many consumers seek out products that connect to the internet, and some simple adjustments enable many nontechnical, inanimate objects, from light bulbs to dishwashers, to be part of the IoT.

As businesses see the value of the additional data that is gathered through IoT, many companies are marketing these technologies to consumers to make their lives easier and to save money. Having a reminder to put the laundry in the dryer or having the house thermostat adjust automatically based on outside temperature is more than a novelty—these features can save time and money, allowing consumers to feel more secure, better equipped to handle life's demands, and able to focus more on their pleasures in life. Businesses, too, can realize distinct improvements using real-time data and analytics, performance tracking, inventory/cost controls, and the automation of simple tasks. These capabilities can also allow businesses to adapt to challenging times.

Real-World Application: Pivoting during the Pandemic

COVID-19 drastically affected in-person business and services, many of whose owners found themselves struggling just to keep their businesses afloat. Some businesses chose to start offering their products or services online while some began or greatly enhanced their delivery operations. Others decided to close their business in the short term. Some businesses, such as Spotify and Netflix, put more resources into creating original content (podcasts, movies, series shows) rather than relying primarily on the sale of ads as a major revenue stream. Small restaurants offered delivery services and meal subscription services to keep their business thriving even during the pandemic. And larger corporations found that remote work allowed their employees to stay healthy while still meeting the needs of the business.

Web 2.0

As the world recovered from the dot-com bust, the use of technology in business continued to evolve at a frantic pace. Websites became interactive. Instead of just visiting a site to find out about a business and then purchase its products, customers wanted to be able to customize their experience and interact online with the business. This new type of interactive website, where you did not have to know how to create a web page or do any programming in order to put information online, became known as Web 2.0. This new stage of the Web was exemplified by blogging, social networking, and interactive comments being available on many websites. The new Web 2.0 world, in which online interaction became expected, had a major impact on many businesses and even whole industries. Many bookstores found themselves relegated to a niche status. Video rental chains and travel agencies simply began going out of business as they were replaced by online technologies. The newspaper industry saw a huge drop in circulation with some cities such as New Orleans no longer able to support a daily newspaper. Disintermediation is the process of technology replacing a middleman in a transaction. Web 2.0 allowed users to get information and news online, reducing dependence of physical books and newspapers. As the world became more connected, new questions arose. Should access to the Internet be considered a right? Is it legal to copy a song that had been downloaded from the Internet? Can information entered into a website be kept private? What information is acceptable to collect from children? Technology moved so fast that policymakers did not have enough time to enact appropriate laws. Ethical issues surrounding information systems will be covered in later chapters.

The Post-PC World, Sort of

Ray Ozzie, a technology visionary at Microsoft, stated in 2012 that computing was moving into a phase he called the post PC world. Now six years later that prediction has not stood up very well to reality. As you will read in future chapters, PC sales have dropped slightly in recent years while there has been a precipitous decline in tablet sales. Smartphone sales have accelerated, due largely to their mobility and ease of operation. Just as the mainframe before it, the PC will continue to play a key role in business, but its role will be somewhat diminished as people emphasize mobility as a central feature of technology. Cloud computing provides users with mobile access to data and applications, making the PC more of a part of the communications channel rather

than a repository of programs and information. Innovation in the development of technology and communications will continue to move businesses forward.

Era	Hardware	Operating System	Applications
Mainframe(1970s)	Terminals connected to mainframe computer	Time- sharing (TSO) on Multiple Virtual Storage (MVS)	Customs- written MRP software
PC: (Mid-1980s)	IBM PC or compatible. Sometimes connected to mainframe computer via network interface card.	MS-DOS	WordPerfect Lotus 1-2-3
Client- Server (Late 80s to early 90s)	IBM PC " clone" on a Noveli Network	Windows for Workgroups	Microsoft Word, Microsoft Excel
World WId e Web (mid-90s to early 2000s)	IBM PC " clone " connected to company intranet	Windows XP	Microsoft, Office, Internet Explorer
Web 2.0 (mid- 2000s- present)	Laptop connected to company WI-FI	Windows 10	Microsoft Office
Post PC: (today and beyond)	Smartphones	Android, iOS	Mobile-friendly websites, mobile apps

Can Information Systems Bring Competitive Advantage?

It has always been the assumption that the implementation of information systems will bring a business competitive advantage. If installing one computer to manage inventory can make a company more efficient, then it can be expected that installing several computers can improve business processes and efficiency. In 2003, Nicholas Carr wrote an article in the Harvard Business Review that questioned this assumption. Entitled “I.T. Doesn’t Matter.” Carr was concerned that information technology had become just a commodity. Instead of viewing technology as an investment that will make a company stand out, Carr said technology would become as common as electricity – something to be managed to reduce costs, ensure that it is always running, and be as risk-free as possible. The article was both hailed and scorned. Can I.T. bring a competitive advantage to an organization? It sure did for Walmart (see sidebar). Technology and competitive advantage will be discussed later in the book.

Case Study: Walmart Uses Information Systems to Become the World's Leading Retailer

Walmart is the world’s largest retailer, earning 8.1 billion for the fiscal year that ended on January 31, 2018. Walmart currently serves over 260 million customers every week worldwide through its 11,700 stores in 28 countries. In 2018 Fortune magazine for the sixth straight year ranked Walmart the number one company for annual revenue as they again exceeded \$500 billion in annual sales. The next closest company, Exxon, had less than half of Walmart’s total revenue. Walmart’s rise to prominence is due in large part to making information systems a high priority, especially in their Supply Chain Management (SCM) system known as Retail Linking \$14.3 billion on sales of \$30.



This system, unique when initially implemented in the mid-1980s, allowed Walmart’s suppliers to directly access the inventory levels and sales information of their products at any of Walmart’s more than eleven thousand stores. Using Retail Link, suppliers can analyze how well their products are selling at one or more Walmart stores with a range of reporting options. Further, Walmart requires the suppliers to use Retail Link to manage their own inventory levels. If a supplier feels that their products are selling out too quickly, they can use Retail Link to petition Walmart to raise the inventory levels for their products. This has essentially allowed Walmart to “hire” thousands of product managers, all of whom have a vested interest in the products they are managing.

This revolutionary approach to managing inventory has allowed Walmart to continue to drive prices down and respond to market forces quickly.

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Today Walmart continues to innovate with information technology. Using its tremendous market presence, any technology that Walmart requires its suppliers to implement immediately becomes a business standard. For example, in 1983 Walmart became the first large retailer to require suppliers to use Uniform Product Code (UPC) labels on all products. Clearly, Walmart has learned how to use I.T. to gain a competitive advantage.

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2.1.4: World Wide Web

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Introduction



The **World Wide Web** (**www**, **W3**) is an information space where documents and other web resources are identified by URIs,

interlinked by hypertext links, and can be accessed via the Internet. It has become known simply as *the Web*. Hypertext documents are commonly called *web pages*, which are primarily text documents formatted and annotated with the Hypertext Markup Language (HTML). Webpages may contain links to images, video, and software components that are rendered to users of a web browser application, running on the user's computer, as coherent pages of multimedia content. Embedded hyperlinks permit users to navigate between web pages. When multiple web pages are published with a common theme or within a common domain name, the collection is usually called a *web site*.

British computer scientist Tim Berners-Lee is the inventor of the Web. As a CERN employee, Berners-Lee distributed a proposal on 12 March 1989 for what would eventually become the World Wide Web. The initial proposal intended a more effective CERN communication system, but Berners-Lee also realized the concept could be implemented throughout the world. Berners-Lee and Belgian computer scientist Robert Cailliau proposed in 1990 to use hypertext “to link and access information of various kinds as a web of nodes in which the user can browse at will”, and Berners-Lee finished the first website in December of that year. The first test was completed around 20 December 1990 and Berners-Lee reported about the project on the newsgroup *alt.hypertext* on 7 August 1991.

History



The NeXT Computer used by Tim Berners-Lee at CERN.

On March 12, 1989, Tim Berners-Lee issued a proposal to the management at CERN that referenced [ENQUIRE](#), a database and software project he had built in 1980, and described a more elaborate information management system based on links embedded in readable text: “Imagine, then, the references in this document all being associated with the network address of the thing to which they referred, so that while reading this document you could skip to them with a click of the mouse.” Such a system, he explained, could be referred to using one of the existing meanings of the word *hypertext*, a term that he says was coined in the 1950s. There is no reason, the proposal continues, why such hypertext links could not encompass multimedia documents including graphics, speech and video, so that Berners-Lee goes on to propose the term *hypermedia*.

With help from Robert Cailliau, he published a more formal proposal (on 12 November 1990) to build a “Hypertext project” called “WorldWideWeb” (one word, also “W3”) as a “web” of “hypertext documents” to be viewed by “browsers” using a client-server architecture. This proposal estimated that a read-only web would be developed within three months and that it would take six months to achieve “the creation of new links and new material by readers, [so that] authorship becomes universal” as well as “the

automatic notification of a reader when new material of interest to him/her has become available.” While the read-only goal was met, accessible authorship of web content took longer to mature, with the wiki concept, WebDAV, blogs, Web 2.0 and RSS/Atom.

The proposal was modeled after the SGML reader Dynatext by Electronic Book Technology, a spin-off from the Institute for Research in Information and Scholarship at Brown University. The Dynatext system, licensed by CERN, was a key player in the extension of SGML ISO 8879:1986 to Hypermedia within HyTime, but it was considered too expensive and had an inappropriate licensing policy for use in the general high energy physics community, namely a fee for each document and each document alteration.



The CERN data center in 2010 housing some WWW servers

A NeXT Computer was used by Berners-Lee as the world’s first web server and also to write the first web browser, WorldWideWeb, in 1990. By Christmas 1990, Berners-Lee had built all the tools necessary for a working Web: the first web browser (which was a web editor as well); the first web server; and the first web pages, which described the project itself.

The first web page may be lost, but Paul Jones of UNC-Chapel Hill in North Carolina announced in May 2013 that Berners-Lee gave him what he says is the oldest known web page during a 1991 visit to UNC. Jones stored it on a magneto-optical drive and on his NeXT computer.

On 6 August 1991, Berners-Lee published a short summary of the World Wide Web project on the newsgroup *alt.hypertext*. This date also marked the debut of the Web as a publicly available service on the Internet, although new users only accessed it after 23 August. For this reason this is considered the internaut’s day. Several news media have reported that the first photo on the Web was published by Berners-Lee in 1992, an image of the CERN house band Les Horribles Cernettes taken by Silvano de Gennaro; Gennaro has disclaimed this story, writing that media were “totally distorting our words for the sake of cheap sensationalism.”

The first server outside Europe was installed at the Stanford Linear Accelerator Center (SLAC) in Palo Alto, California, to host the SPIRES-HEP database. Accounts differ substantially as to the date of this event. The World Wide Web Consortium says December 1992, whereas SLAC itself claims 1991. This is supported by a W3C document titled *A Little History of the World Wide Web*.

The underlying concept of hypertext originated in previous projects from the 1960s, such as the Hypertext Editing System (HES) at Brown University, Ted Nelson’s Project Xanadu, and Douglas Engelbart’s oN-Line System (NLS). Both Nelson and Engelbart were in turn inspired by Vannevar Bush’s microfilm-based *memex*, which was described in the 1945 essay “As We May Think”.

Berners-Lee’s breakthrough was to marry hypertext to the Internet. In his book *Weaving The Web*, he explains that he had repeatedly suggested that a marriage between the two technologies was possible to members of *both* technical communities, but when no one took up his invitation, he finally assumed the project himself. In the process, he developed three essential technologies:

- a system of globally unique identifiers for resources on the Web and elsewhere, the universal document identifier (UDI), later known as uniform resource locator (URL) and uniform resource identifier (URI);
- the publishing language HyperText Markup Language (HTML);
- the Hypertext Transfer Protocol (HTTP).

The World Wide Web had a number of differences from other hypertext systems available at the time. The Web required only unidirectional links rather than bidirectional ones, making it possible for someone to link to another resource without action by the owner of that resource. It also significantly reduced the difficulty of implementing web servers and browsers (in comparison to earlier systems), but in turn presented the chronic problem of *link rot*. Unlike predecessors such as HyperCard, the World Wide Web was non-proprietary, making it possible to develop servers and clients independently and to add extensions without licensing restrictions. On 30 April 1993, CERN announced that the World Wide Web would be free to anyone, with no fees due. Coming two

months after the announcement that the server implementation of the Gopher protocol was no longer free to use, this produced a rapid shift away from Gopher and towards the Web. An early popular web browser was ViolaWWW for Unix and the X Windowing System.



Robert Cailliau, Jean-François Abramatic of IBM, and Tim Berners-Lee at the 10th anniversary of the World Wide Web Consortium.

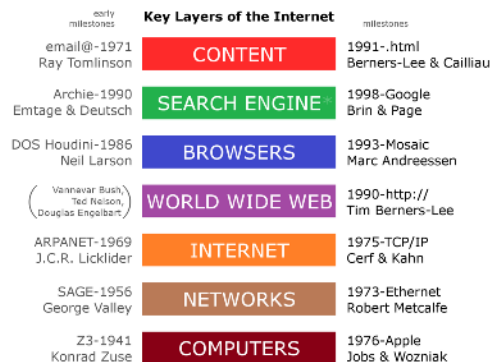
Scholars generally agree that a turning point for the World Wide Web began with the introduction of the Mosaic web browser in 1993, a graphical browser developed by a team at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign (NCSA-UIUC), led by Marc Andreessen. Funding for Mosaic came from the U.S. *High-Performance Computing and Communications Initiative* and the *High Performance Computing and Communication Act of 1991*, one of several computing developments initiated by U.S. Senator Al Gore. Prior to the release of Mosaic, graphics were not commonly mixed with text in web pages and the web's popularity was less than older protocols in use over the Internet, such as Gopher and Wide Area Information Servers (WAIS). Mosaic's graphical user interface allowed the Web to become, by far, the most popular Internet protocol.

The World Wide Web Consortium (W3C) was founded by Tim Berners-Lee after he left the European Organization for Nuclear Research (CERN) in October 1994. It was founded at the Massachusetts Institute of Technology Laboratory for Computer Science (MIT/LCS) with support from the Defense Advanced Research Projects Agency (DARPA), which had pioneered the Internet; a year later, a second site was founded at INRIA (a French national computer research lab) with support from the European Commission DG InfSo; and in 1996, a third continental site was created in Japan at Keio University. By the end of 1994, the total number of websites was still relatively small, but many notable websites were already active that foreshadowed or inspired today's most popular services.

Connected by the existing Internet, other websites were created around the world, adding international standards for domain names and HTML. Since then, Berners-Lee has played an active role in guiding the development of web standards (such as the markup languages to compose web pages in), and has advocated his vision of a Semantic Web. The World Wide Web enabled the spread of information over the Internet through an easy-to-use and flexible format. It thus played an important role in popularizing use of the Internet. Although the two terms are sometimes conflated in popular use, *World Wide Web* is not synonymous with *Internet*. The Web is an information space containing hyperlinked documents and other resources, identified by their URIs. It is implemented as both client and server software using Internet protocols such as TCP/IP and HTTP.

Tim Berners-Lee was knighted in 2004 by Queen Elizabeth II for "services to the global development of the Internet".

Function



The World Wide Web functions as a layer on top of the Internet, helping to make it more functional. The advent of the Mosaic web browser helped to make the web much more usable.

The terms *Internet* and *World Wide Web* are often used without much distinction. However, the two things are not the same. The Internet is a global system of interconnected computer networks. In contrast, the World Wide Web is one of the services transferred over these networks. It is a collection of text documents and other resources, linked by hyperlinks and URLs, usually accessed by web browsers, from web servers.

Viewing a web page on the World Wide Web normally begins either by typing the URL of the page into a web browser, or by following a hyperlink to that page or resource. The web browser then initiates a series of background communication messages to fetch and display the requested page. In the 1990s, using a browser to view web pages—and to move from one web page to another through hyperlinks—came to be known as ‘browsing,’ ‘web surfing,’ (after channel surfing), or ‘navigating the Web’. Early studies of this new behavior investigated user patterns in using web browsers. One study, for example, found five user patterns: exploratory surfing, window surfing, evolved surfing, bounded navigation and targeted navigation.

The following example demonstrates the functioning of a web browser when accessing a page at the URL http://example.org/wiki/World_Wide_Web. The browser resolves the server name of the URL (*example.org*) into an Internet Protocol address using the globally distributed Domain Name System (DNS). This lookup returns an IP address such as *203.0.113.4*. The browser then requests the resource by sending an HTTP request across the Internet to the computer at that address. It requests service from a specific TCP port number that is well known for the HTTP service, so that the receiving host can distinguish an HTTP request from other network protocols it may be servicing. The HTTP protocol normally uses port number 80. The content of the HTTP request can be as simple as two lines of text:

```
GET /wiki/World_Wide_Web HTTP/1.1
Host: example.org
```

The computer receiving the HTTP request delivers it to web server software listening for requests on port 80. If the web server can fulfill the request it sends an HTTP response back to the browser indicating success:

```
HTTP/1.0 200 OK
Content-Type: text/html; charset=UTF-8
```

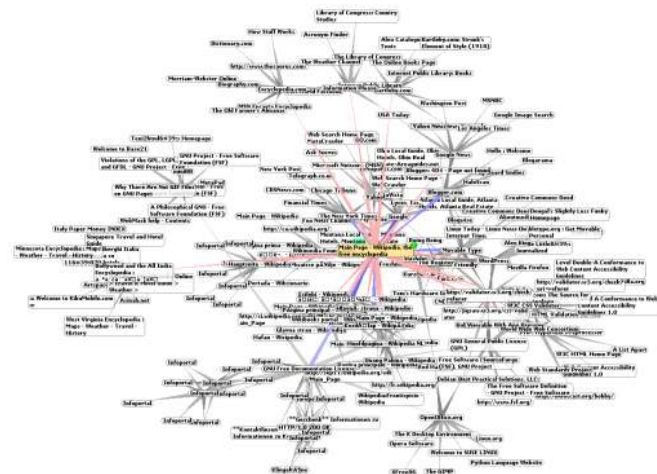
followed by the content of the requested page. The Hypertext Markup Language for a basic web page looks like `<html> <head> <title>Example.org – The World Wide Web</title> </head> <body> <p>The World Wide Web, abbreviated as WWW and commonly known ...</p> </body> </html>`

The web browser parses the HTML and interprets the markup (`<title>`, `<p>` for paragraph, and such) that surrounds the words to format the text on the screen. Many web pages use HTML to reference the URLs of other resources such as images, other embedded media, scripts that affect page behavior, and Cascading Style Sheets that affect page layout. The browser makes

additional HTTP requests to the web server for these other Internet media types. As it receives their content from the web server, the browser progressively renders the page onto the screen as specified by its HTML and these additional resources.

Linking

Most web pages contain hyperlinks to other related pages and perhaps to downloadable files, source documents, definitions and other web resources. In the underlying HTML, a hyperlink looks like `<a href="http://example.org/wiki/Main_Page">Example.org, a free encyclopedia</a>`



Graphic representation of a minute fraction of the WWW, demonstrating hyperlinks.

Such a collection of useful, related resources, interconnected via hypertext links is dubbed a *web* of information. Publication on the Internet created what Tim Berners-Lee first called the *WorldWideWeb* (in its original CamelCase, which was subsequently discarded) in November 1990.

The hyperlink structure of the WWW is described by the webgraph: the nodes of the webgraph correspond to the web pages (or URLs) the directed edges between them to the hyperlinks.

Over time, many web resources pointed to by hyperlinks disappear, relocate, or are replaced with different content. This makes hyperlinks obsolete, a phenomenon referred to in some circles as link rot, and the hyperlinks affected by it are often called dead links. The ephemeral nature of the Web has prompted many efforts to archive web sites. The Internet Archive, active since 1996, is the best known of such efforts.

Dynamic updates of web pages

JavaScript is a scripting language that was initially developed in 1995 by Brendan Eich, then of Netscape, for use within web pages. The standardised version is ECMAScript. To make web pages more interactive, some web applications also use JavaScript techniques such as Ajax (asynchronous JavaScript and XML). Client-side script is delivered with the page that can make additional HTTP requests to the server, either in response to user actions such as mouse movements or clicks, or based on elapsed time. The server's responses are used to modify the current page rather than creating a new page with each response, so the server needs only to provide limited, incremental information. Multiple Ajax requests can be handled at the same time, and users can interact with the page while data is retrieved. Web pages may also regularly poll the server to check whether new information is available.

WWW prefix

Many hostnames used for the World Wide Web begin with *www* because of the long-standing practice of naming Internet hosts according to the services they provide. The hostname of a web server is often *www*, in the same way that it may be *ftp* for an FTP server, and *news* or *nntp* for a USENET news server. These host names appear as Domain Name System (DNS) or subdomain names, as in *www.example.com*. The use of *www* is not required by any technical or policy standard and many web sites do not use it; indeed, the first ever web server was called *nxoc01.cern.ch*. According to Paolo Palazzi, who worked at CERN along with Tim Berners-Lee, the popular use of *www* as subdomain was accidental; the World Wide Web project page was intended to be published at *www.cern.ch* while *info.cern.ch* was intended to be the CERN home page, however the DNS records were never switched, and

the practice of prepending `www` to an institution's website domain name was subsequently copied. Many established websites still use the prefix, or they employ other subdomain names such as `www2`, `secure` or `en` for special purposes. Many such web servers are set up so that both the main domain name (e.g., `example.com`) and the `www` subdomain (e.g., `www.example.com`) refer to the same site; others require one form or the other, or they may map to different web sites.

The use of a subdomain name is useful for load balancing incoming web traffic by creating a CNAME record that points to a cluster of web servers. Since, currently, only a subdomain can be used in a CNAME, the same result cannot be achieved by using the bare domain root.

When a user submits an incomplete domain name to a web browser in its address bar input field, some web browsers automatically try adding the prefix “`www`” to the beginning of it and possibly “.com”, “.org” and “.net” at the end, depending on what might be missing. For example, entering ‘microsoft’ may be transformed to <http://www.microsoft.com/> and ‘openoffice’ to <http://www.openoffice.org>. This feature started appearing in early versions of Mozilla Firefox, when it still had the working title ‘Firebird’ in early 2003, from an earlier practice in browsers such as Lynx. It is reported that Microsoft was granted a US patent for the same idea in 2008, but only for mobile devices.

In English, `www` is usually read as *double-u double-u double-u*. Some users pronounce it *dub-dub-dub*, particularly in New Zealand. Stephen Fry, in his “Podgrammes” series of podcasts, pronounces it *wuh wuh wuh*. The English writer Douglas Adams once quipped in *The Independent* on Sunday(1999): “The World Wide Web is the only thing I know of whose shortened form takes three times longer to say than what it’s short for”. In Mandarin Chinese, *World Wide Web* is commonly translated via a phono-semantic matching to *wàn wéi wǎng* (万维网), which satisfies `www` and literally means “myriad dimensional net”, a translation that reflects the design concept and proliferation of the World Wide Web. Tim Berners-Lee’s web-space states that *World Wide Web* is officially spelled as three separate words, each capitalised, with no intervening hyphens.

Use of the `www` prefix is declining as Web 2.0 web applications seek to brand their domain names and make them easily pronounceable. As the mobile web grows in popularity, services like Gmail.com, MySpace.com, Facebook.com and Twitter.com are most often mentioned without adding “`www`.” (or, indeed, “.com”) to the domain.

Scheme specifiers

The scheme specifiers `http://` and `https://` at the start of a web URI refer to Hypertext Transfer Protocol or HTTP Secure, respectively. They specify the communication protocol to use for the request and response. The HTTP protocol is fundamental to the operation of the World Wide Web, and the added encryption layer in HTTPS is essential when browsers send or retrieve confidential data, such as passwords or banking information. Web browsers usually automatically prepend `http://` to user-entered URIs, if omitted.

Web security

For criminals, the web has become the preferred way to spread malware. Cybercrime on the web can include identity theft, fraud, espionage and intelligence gathering. Web-based vulnerabilities now outnumber traditional computer security concerns, and as measured by Google, about one in ten web pages may contain malicious code. Most web-based attacks take place on legitimate websites, and most, as measured by Sophos, are hosted in the United States, China and Russia. The most common of all malware threats is SQL injection attacks against websites. Through HTML and URIs, the Web was vulnerable to attacks like cross-site scripting (XSS) that came with the introduction of JavaScript and were exacerbated to some degree by Web 2.0 and Ajax web design that favors the use of scripts. Today by one estimate, 70% of all websites are open to XSS attacks on their users. Phishing is another common threat to the Web. “SA, the Security Division of EMC, today announced the findings of its January 2013 Fraud Report, estimating the global losses from phishing at \$1.5 Billion in 2012.” Two of the well-known phishing methods are Covert Redirect and Open Redirect.

Proposed solutions vary to extremes. Large security vendors like McAfee already design governance and compliance suites to meet post-9/11 regulations, and some, like Finjan have recommended active real-time inspection of code and all content regardless of its source. Some have argued that for enterprise to see security as a business opportunity rather than a cost center, “ubiquitous, always-on digital rights management” enforced in the infrastructure by a handful of organizations must replace the hundreds of companies

that today secure data and networks. Jonathan Zittrain has said users sharing responsibility for computing safety is far preferable to locking down the Internet.

Privacy

Every time a client requests a web page, the server can identify the request's IP address and usually logs it. Also, unless set not to do so, most web browsers record requested web pages in a viewable *history* feature, and usually cache much of the content locally. Unless the server-browser communication uses HTTPS encryption, web requests and responses travel in plain text across the internet and can be viewed, recorded, and cached by intermediate systems.

When a web page asks for, and the user supplies, personally identifiable information—such as their real name, address, e-mail address, etc.—web-based entities can associate current web traffic with that individual. If the website uses HTTP cookies, username and password authentication, or other tracking techniques, it can relate other web visits, before and after, to the identifiable information provided. In this way it is possible for a web-based organisation to develop and build a profile of the individual people who use its site or sites. It may be able to build a record for an individual that includes information about their leisure activities, their shopping interests, their profession, and other aspects of their demographic profile. These profiles are obviously of potential interest to marketers, advertisers and others. Depending on the website's terms and conditions and the local laws that apply information from these profiles may be sold, shared, or passed to other organisations without the user being informed. For many ordinary people, this means little more than some unexpected e-mails in their in-box, or some uncannily relevant advertising on a future web page. For others, it can mean that time spent indulging an unusual interest can result in a deluge of further targeted marketing that may be unwelcome. Law enforcement, counter terrorism and espionage agencies can also identify, target and track individuals based on their interests or proclivities on the Web.

Social networking sites try to get users to use their real names, interests, and locations. They believe this makes the social networking experience more realistic, and therefore more engaging for all their users. On the other hand, uploaded photographs or unguarded statements can be identified to an individual, who may regret this exposure. Employers, schools, parents, and other relatives may be influenced by aspects of social networking profiles that the posting individual did not intend for these audiences. On-line bullies may make use of personal information to harass or stalk users. Modern social networking websites allow fine grained control of the privacy settings for each individual posting, but these can be complex and not easy to find or use, especially for beginners.



Photographs and videos posted onto websites have caused particular problems, as they can add a person's face to an on-line profile. With modern and potential facial recognition technology, it may then be possible to relate that face with other, previously anonymous, images, events and scenarios that have been imaged elsewhere. Because of image caching, mirroring and copying, it is difficult to remove an image from the World Wide Web.

Standards

Many formal standards and other technical specifications and software define the operation of different aspects of the World Wide Web, the Internet, and computer information exchange. Many of the documents are the work of the World Wide Web Consortium (W3C), headed by Berners-Lee, but some are produced by the Internet Engineering Task Force (IETF) and other organizations.

Usually, when web standards are discussed, the following publications are seen as foundational:

- Recommendations for markup languages, especially HTML and XHTML, from the W3C. These define the structure and interpretation of hypertext documents.
- Recommendations for stylesheets, especially CSS, from the W3C.
- Standards for ECMAScript (usually in the form of JavaScript), from Ecma International.
- Recommendations for the Document Object Model, from W3C.

Additional publications provide definitions of other essential technologies for the World Wide Web, including, but not limited to, the following:

- *Uniform Resource Identifier (URI)*, which is a universal system for referencing resources on the Internet, such as hypertext documents and images. URIs, often called URLs, are defined by the IETF's RFC 3986 / STD 66: *Uniform Resource Identifier (URI): Generic Syntax*, as well as its predecessors and numerous URI scheme-defining RFCs;
- *HyperText Transfer Protocol (HTTP)*, especially as defined by RFC 2616: *HTTP/1.1* and RFC 2617: *HTTP Authentication*, which specify how the browser and server authenticate each other.

Accessibility

There are methods for accessing the Web in alternative mediums and formats to facilitate use by individuals with disabilities. These disabilities may be visual, auditory, physical, speech related, cognitive, neurological, or some combination. Accessibility features also help people with temporary disabilities, like a broken arm, or aging users as their abilities change. The Web receives information as well as providing information and interacting with society. The World Wide Web Consortium claims it essential that the Web be accessible, so it can provide equal access and equal opportunity to people with disabilities. Tim Berners-Lee once noted, "The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect." Many countries regulate web accessibility as a requirement for websites. International cooperation in the W3C Web Accessibility Initiative led to simple guidelines that web content authors as well as software developers can use to make the Web accessible to persons who may or may not be using assistive technology.

Internationalization

The W3C Internationalization Activity assures that web technology works in all languages, scripts, and cultures. Beginning in 2004 or 2005, Unicode gained ground and eventually in December 2007 surpassed both ASCII and Western European as the Web's most frequently used character encoding. Originally RFC 3986 allowed resources to be identified by URI in a subset of US-ASCII. RFC 3987 allows more characters—any character in the Universal Character Set—and now a resource can be identified by IRI in any language.

Statistics

Between 2005 and 2010, the number of web users doubled, and was expected to surpass two billion in 2010. Early studies in 1998 and 1999 estimating the size of the Web using capture/recapture methods showed that much of the web was not indexed by search engines and the Web was much larger than expected. According to a 2001 study, there was a massive number, over 550 billion, of documents on the Web, mostly in the invisible Web, or Deep Web. A 2002 survey of 2,024 million web pages determined that by far the most web content was in the English language: 56.4%; next were pages in German (7.7%), French (5.6%), and Japanese (4.9%). A more recent study, which used web searches in 75 different languages to sample the Web, determined that there were over 11.5 billion web pages in the publicly indexable web as of the end of January 2005. As of March 2009, the indexable web contains at least 25.21 billion pages. On 25 July 2008, Google software engineers Jesse Alpert and Nissan Hajaj announced that Google Search had discovered one trillion unique URLs. As of May 2009, over 109.5 million domains operated. Of these, 74% were commercial or other domains operating in the generic top-level domain *com*.

Statistics measuring a website's popularity are usually based either on the number of page views or on associated server 'hits' (file requests) that it receives.

Speed issues

Frustration over congestion issues in the Internet infrastructure and the high latency that results in slow browsing has led to a pejorative name for the World Wide Web: the *World Wide Wait*. Speeding up the Internet is an ongoing discussion over the use of peering and QoS technologies. Other solutions to reduce the congestion can be found at W3C. Guidelines for web response times are:

- 0.1 second (one tenth of a second). Ideal response time. The user does not sense any interruption.

- 1 second. Highest acceptable response time. Download times above 1 second interrupt the user experience.
- 10 seconds. Unacceptable response time. The user experience is interrupted and the user is likely to leave the site or system.

Web caching

A web cache is a server computer located either on the public Internet, or within an enterprise that stores recently accessed web pages to improve response time for users when the same content is requested within a certain time after the original request.

Most web browsers also implement a browser cache for recently obtained data, usually on the local disk drive. HTTP requests by a browser may ask only for data that has changed since the last access. Web pages and resources may contain expiration information to control caching to secure sensitive data, such as in online banking, or to facilitate frequently updated sites, such as news media. Even sites with highly dynamic content may permit basic resources to be refreshed only occasionally. Web site designers find it worthwhile to collate resources such as CSS data and JavaScript into a few site-wide files so that they can be cached efficiently.

Enterprise firewalls often cache Web resources requested by one user for the benefit of many. Some search engines store cached content of frequently accessed websites.

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2.1.5: Searching the Web

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Databases, electronic resources, web, World Wide Web, the internet, online are all terms people sometimes use interchangeably. If your instructors have told you not to use online sources or that you must use scholarly databases, what are they talking about? The best thing to do is ask since the definition of these terms blur in conversation and might be used interchangeably. Let's go through these terms.

Databases

A database is an organized grouping of records. This could be a database at your school that holds all your school records, at your healthcare provider that holds thousands of people's medical records, or a list of what your library owns (library catalog), a huge collection of articles (a database offered by your library) or a massive collection of links to pages on the World Wide Web (such as that offered by Google).

Electronic resources

Electronic resources include information that takes electricity to access. This could be a CD, DVD, database, or what you find on the internet. Electronic resources include e-books and library databases.

Online resources

Online resources are anything that is accessed via the internet. Online resources include e-books, articles in databases and other information sources in library databases.

The Web

The Web or the World-Wide Web is made up of the pages to which search engines, such as Google and Bing, link. The web is a part of the internet and is accessed via internet connections. It is the web that we care about in this book and is discussed in this section. The web includes e-books and library databases and more.

The internet

The internet includes the Web, but also includes all of the communication capabilities such as twitter, email and so on. The internet also includes information that can only be accessed if you know its address or how to get to it such as pages found through file transfer protocols (FTP) and other mechanisms. The internet is huge and contains much more than the World Wide Web. Since the Web includes e-books and library databases, and the Web is part of the internet, the internet includes e-books and library databases. Since many people use these terms interchangeably, if your professor asks you not to use internet sources, ask specifically if you can use library databases and e-books. Chances are you the answer will be "Yes".

Google

Most of us will say we have used Google. What does that mean? It means we have used a database, created by Google, of links to websites. We do not search all the computers attached to the internet when you use Google. Currently, and this might change from time to time, there are two ways to get to the advanced search screen in Google: 1) click settings in the bottom right or 2) after you do a search, the settings tab will appear. When you click on that, you will have an option for Advanced Search as well.

The first section on Google's advanced search page offers phrase searching and the Boolean AND, OR and Not. Read the field labels and it will become apparent what Google calls the different Boolean operators. Google translates the Boolean operators as follows (repeated above)

- AND: All of these words (that you have typed in)
- OR: Any of these words (that you have typed in)
- NOT: None of the words (that you have typed in)

Examine the page for other ways to search the Google database.

A very powerful search you can do is to limit to a specific domain. In lay-persons language, domains are what we call .edu .gov, .mil, .com, .net, .org, and so on.

Domain	Meaning	Domain	Meaning
.edu	Education	.com	Commercial *
.gov	Government	.net	Sites about the internet *
.mil	Military	.org	Sites about the internet *

* .com, .net and .org were originally intended for these specific kinds of websites but now designate just about any kind of website.

It can be very useful to limit to either a government or an educational website to help retrieve good sources. .edu while most often retrieves valuable results could also retrieve less than valuable results. For example, if you want to retrieve solid information from experts in academia on your topic (e.g. moons of Jupiter), and you therefore limit a Google search to .edu sites, you might retrieve, Ms. Edelson's 3rd grade class (Spielberg, 1997) reports on humanoid life on the moons of Jupiter, which might be entertaining if they existed, but not particularly good for an academic paper. Perhaps a medical school student has a website about her dreams of going to the moons of Jupiter. A medical doctor would not be an expert on the moons of Jupiter so you would want to be wary about using that information for an academic paper/project as well.

If you indeed wanted to find education or government website on the moons of Jupiter you would type this into a Google search.

- Jupiter moon* site:.edu
- Jupiter moon* site:.gov

Both of those searches retrieve way too many results. But you know what to do when you get too many results. Review your search strategy! Remember, the database has to combine your terms in some way. How do you think Google combines the terms *Jupiter moons*?

Google searches don't reach deeply into the web. Rather Google skims the surface. Beneath the surface are many free and useful databases. To find a database on the web that you can use, search for "searchable database*" and your topic. For example, type the following into Google.



Sometimes you have to hunt around on the website to find the database or perhaps they are simply talking about a database and not giving you access. This kind of search, however, can return great results.

Google Scholar

Searching Google Scholar is not the same as using the regular Google web search. Google Scholar returns results that Google has identified as scholarly but they may not be peer reviewed or in full text. They may be from a variety of sources such as freely accessible journals, items in the public domain, items for purchase or databases at your local college or university library. The latter will probably require a username and password to access the databases remotely (from home). If you create an account with Google, you might be able to change the options so that you will be able to directly access your library via Google Scholar. Some libraries have a Google Scholar link on their website which uses the Google Scholar interface to search some or all that institutions

databases at one time. This is much like the federated searches described in 5C above. While Google Scholar can be useful, just like a Google web search can be, it is not a replacement for college or university library databases.

Google is just one of many search engines. A few others are *Bing* by Microsoft, *Yahoo's* engine, *Dogpile* (which is apparently enjoying a comeback) and *Duck Duck Go*. The latter is simple and clean and, unlike most others like Google, does **not** retain your search history so each time you search it is as it is your first time.

Don't confuse search engines with browsers. Browsers read computer talk and turn it into pages we can read. A few examples of browsers are Internet Explorer (IE), Firefox, Chrome and Edge.

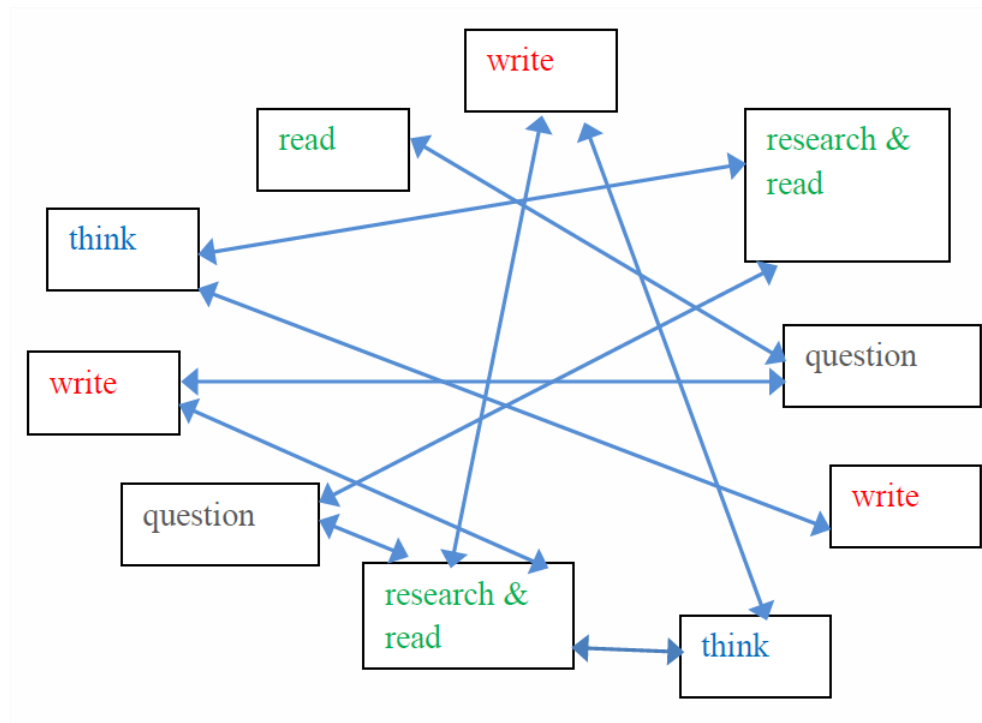
Always use your evaluation skills for website just as you would use them for articles and books. In addition to applying all previously discussed evaluation tools to web pages, consider these strategies. Back up the uniform resource locator (URL). Erase everything after the domain (.com, .edu, .net, .mil...) of the URL to move to or closer to the main home page. In the first example below, erase everything after the .gov. In the second example, everything after the .edu. Erase the parts of the URLs that are in italics.

1. <https://www.nasa.gov/vision/earth/ev...urningman.html> .
2. <https://americanart.si.edu/exhibitions/burning-man>

If you did not know what nasa or si was and their webpages did not clearly define who they were, backing up the URL by erasing after the domain can be useful. It usually works.

Another way to investigate a web page is to see who links to it. This can give you a little insight into how the site is perceived by others. To do that, in Google, type the URL after link:. For example, type link:<https://americanart.si.edu/exhibitions/burning-man>. Your results will be a list of website that link to <https://americanart.si.edu/exhibitions/burning-man>.

Remember



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2.1.6: Advanced Searching Techniques

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Advanced Searching

All of the searching we've done in this class and that you probably do on a regular basis is general keyword searching. But, there are many tips and tricks hidden in databases and Internet search engines that can help you become an advanced-level searcher. That's what the next several tabs are about and you'll have a chance to practice some of these techniques in this week's assignments.

Boolean Operators

One way to limit a database search is to use Boolean operators; words you can add to a search to narrow or broaden your search results.

Boolean operators are the words And, Or, and Not. You can usually find these words and the searching technique in the advanced search query area of a database. You can still use Boolean operators without being in an advanced search screen, but, **this is important:** in most databases, in order for Boolean operators to work properly in a keyword search box, the operators must be in all caps. That is why I have kept the operators in all caps throughout this section, so that you understand the importance of remembering to use all caps when using the Boolean operators searching technique.

AND

AND will narrow your search. For example, if you are interested in fresh water fishing you would enter the terms “fish and freshwater.” Your results would then include records that contained **both** of these words. In the image below, your results are represented by the green area where the two circles intersect.

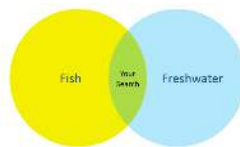


Figure 2.1.6.1: Venn Diagram (Copyright; College of the Sequoias)

OR

The Boolean operator OR will broaden your search and is usually used with synonyms (different words that have the same meaning). If you are interested in finding information on mammals found in the Atlantic Ocean, you could enter the terms “whales or dolphins.”

The circles below represent the OR search. All of the records that contain one, or another, or both of your search terms will be in your results list.



Figure 2.1.6.1: Venn Diagram (Copyright; College of the Sequoias)

NOT

The Boolean operator NOT will eliminate a term from your results. If you were looking for information on all Atlantic Ocean fish **except** Bluefish, you would enter “fish not bluefish.”

The larger green circle represents the results that you would retrieve with this search. Notice how Bluefish is excluded from the results.



Figure 2.1.6.1: Venn Diagram (Copyright; College of the Sequoias)

Remember Sarah and her team researching women painters from last week? Let's apply Boolean operators to Sarah and her team's research. They've started their research by looking for sources about the women creating Impressionist art and they've identified two search strings:

- women painters
- women artists

They could do two separate searches by typing one or the other of the search strings into the search box of whatever tool they are using, but they'd end up with two separate result lists and have the added headache of trying to identify unique items from the lists.

They could also lump everything together and search on the phrase:

- women painters AND women artists

But once you understand Boolean operators, that last strategy won't make as much sense as it seems to.

There are three Boolean operators: AND, OR, and NOT.

AND is used to get the intersection of all the terms you wish to include in your search. With this example:

women painters AND women artists

Sarah's team is asking the database to retrieve both of those search strings, meaning all the results would include women painters AND women artists. If a source only has one string, it won't show up in the results.

This isn't what the team had in mind. They are interested in both artists and painters, but because they don't know which term might be used, they want to search both.

Instead, OR would be a better choice.

OR is used when you want at least one of the terms to show up in the search results. If both do, that's fine too, but it isn't a condition of the search. The OR Boolean operator makes a lot more sense for this search:

women painters OR women artists

Now, the team could get fancy with this search, and use both AND as well as OR:

women AND (painters OR artists)

The parentheses mean that these two concepts, painters and artists, should be searched as a unit, and the search results should include all items that use one word or the other. The results will then be limited to those items that contain the word women.

When using parentheses for appropriate searches, make sure that the items contained within those parenthesis are related in some way. With OR, as in the previous example, it means either of the terms will work. With AND, it means that both terms will appear in the source.

Try this out on your own. Type both of these searches in [Google Scholar](https://scholar.google.com/) and compare the results (please note, you must capitalize OR when using it as a Boolean operator in Google products). Were they the same? If not, can you determine what happened? Which result list looked better?

Truncation

Using Boolean operators isn't the only way you can create more useful searches. This and the next few tabs will give you more tools for your searching tool box.

Advanced Web Searching

Advanced web searching allows you to refine your search query and prompts you for ways to do this. Consider the basic [Google.com](https://www.google.com) search box.



Figure 2.1.6.1: Venn Diagram (Copyright; College of the Sequoias)

It is very minimalist, but that minimalism is deceptive. It gives the impression that searching is easy and encourages you to just enter your topic, without much thought. You certainly do get many results. But are they really good results? Simple search boxes aren't always the best way to go.

Advanced search screens show you many of the special searching options available to you to refine your search, and, therefore, get more manageable numbers of better items. Many web search engines and research databases include advanced search

screens. Advanced search screens will vary from resource to resource and from web search engine to research database, but they often let you search using

- Implied Boolean operators (for example, the “all the words” option is the same as using the Boolean and)
- Limiters for date, domain (.edu, for example), type of resource (articles, book reviews, patents)
- Field (a field is a standard element, such as title of publication or author’s name)
- Phrase (rather than entering quote marks)

Explore on Your Own

Go to the [advanced search option in Google](#). Did you even know this page existed?!

Take a look at the options Google provides to refine your search. Compare this to the basic Google search box. One of the best ways you can become a better searcher for information is to use the power of advanced searches, either by using these more complex search screens or by remembering to use Boolean operators, phrase searches, truncation, and other options available to you in most search engines and databases.

While many of the text boxes at the top of the Google Advanced Search page mirror concepts already covered in this week's reading (for example, “this exact word or phrase” allows you to omit the quotes in a phrase search), the options for narrowing your results can be powerful.

You can limit your search to a particular domain (such as .edu for items from educational institutions) or you can search for items you can reuse legally (with attribution, of course!) by making use of the “usage rights” option.

However, be careful with some of the options, as they may excessively limit your results. If you aren't certain about a particular option, try your search with and without using it and compare the results. If you use a search engine other than Google, check to see if it offers an advanced search option, many do.

The CRC Library has an [online searching tips guide](#) that covers all the searching tips included in this week's reading. You might want to bookmark this web address:

<https://researchguides.crc.losrios.edu/searchtips>

The guide will be available even after you have completed this course.

Scenario

Harry is feeling overwhelmed by one of his class assignments. Harry would have been happy if the assignment was to write a traditional research paper, but his professor has asked the class to solve a real life problem.

The professor has asked the class to imagine a small city undergoing a natural disaster such as a flood or a tornado. Each group in the class is required to plan a hypothetical information command center for this city. The professor explains that the government needs to obtain accurate, up-to-date information on the scope of the damage and injuries sustained due to the disaster. This information is vital for the city to be able to provide adequate emergency and medical assistance to its citizens.

Harry can see that this is an important function for any city in the midst of a crisis but he is not sure about where to get reliable information to help him construct a plan for the city.

Harry and his classmates do some brainstorming and decide to approach this assignment as if they were actually producing a research paper. Their first step will be to research recent disasters. They reason that this will provide some information about the way some cities have gathered information during disasters.

If an information gathering strategy worked for other cities, it will work for their hypothetical city. There certainly have been a lot of natural disasters recently, so it shouldn't be too hard to find some information. Super Storm Sandy and Hurricane Irene are two events that have happened in recent years. The group starts to research Super Storm Sandy with Google and Wikipedia.

Gather Pillar

Harry and his classmates are engaging in the Gather pillar of the Seven Pillars of Information Literacy model. Just as municipalities needed to gather reliable information in order to provide vital services to their citizens, Harry and his group members need to gather information that will help them complete this assignment.

These information needs are components of the Gather pillar, which states that the information literate individual understands:

- How information and data are organized
- How libraries provide access to resources
- How digital technologies provide collaborative tools to create and share information
- The issues involved in collection of new data
- The different elements of a citation
- The use of abstracts
- The need to keep up to date

They are able to:

- Use a range of retrieval tools and resources effectively
- Construct complex searches appropriate to different digital and print resources
- Access full text information, both print and digital, read and download online material and data
- Use appropriate techniques to collect new data
- Keep up to date with new information
- Engage with their community to share information
- Identify when the information need has not been met
- Use online and printed help and can find personal, expert help
- The abilities connected with the Gather pillar overlap, in some aspects, with those in other chapters. Where this is the case, those abilities are not addressed in this chapter.

The following is a graphic representation of the bulleted list that describes the Gather Pillar:

- The difference between free and paid resources
- The risks involved in operating in a virtual world
- The importance of appraising and evaluating search result

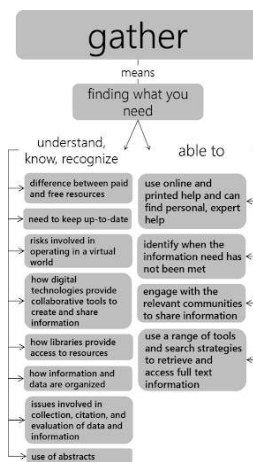


Figure 2.1.6.1: Venn Diagram (Copyright; College of the Sequoias)

Information and the Internet

Traditionally, information has been organized in different formats, usually as a result of the time it took to gather and publish the information. For example, the purpose of news reporting is to inform the public about the basic facts of an event. This information needs to be disseminated quickly, so it is published daily in print, online, on broadcast television, and radio media. More in-depth treatment of information takes longer to research, write, and publish and traditionally was published in scholarly journals and books.

Today, information is still published in traditional formats as well as in newly evolving formats on the Internet. These new information formats are loosely defined as Web 2.0 formats and can include electronic journals, books, news websites, blogs, Twitter, Facebook, and location postings. The coexistence of all of these information formats is messy and chaotic. The process for finding relevant information is not always clear.

One way to make some sense out of the current information universe is to thoroughly understand traditional information formats. We can then understand the concepts inherent in the information formats found online. There are some direct correlations such as books and journal articles, but there are also some newer formats like tweets that didn't exist until recently.

Let's look at the news industry. Many traditional newspapers are shutting down and those that remain are retrenching. While there are many reasons for this, one of the major trends has been the rise of the Internet. In the United States, [more than 50 percent of the population reads the news online](#).

Indeed, online news sites provide a different and, some might argue, a more relevant experience for the reader. They offer video and sound, up-to-the-minute updates on breaking news, and the ability to interact with the content by posting comments. Another important feature of online news is that search engines can deliver content from the site in response to a query. In other words, readers don't have to visit a site such as the New York Times in order to read its content.

This has both positive and negative consequences. The positive consequence is that readers can quickly and conveniently obtain information from a variety of sources on a topic or event. The negative consequence is that it is more difficult to evaluate the credibility of the sources. We'll be exploring evaluating sources more later in this unit.

For Harry and his group, all of this means they will have to research many different kinds of information resources in order to create an effective information command center.

Twitter and Blog Postings

Many of the group's Google results are from Twitter feeds and blog postings. These did not provide a lot of information. After all, a tweet consists of only 280 characters. However, these resources did help Harry's group by suggesting key people, cities, technologies, and other resources associated with Super Storm Sandy to research.

Often a blog posting will provide a link to a longer, more useful resource. The students' review of blogs and tweets also provided an otherwise unthought-of insight. As Harry and his group were reviewing Twitter feeds posted during Super Storm Sandy, they noted that people were using Twitter to inform their friends and relatives about their whereabouts, their health, and the conditions

of their surroundings. Since electricity was not available, most televisions and radios did not work, but mobile technologies like Twitter served as effective communication tools. Once Harry realized this, a Twitter feed was quickly incorporated into his command center's communication plan.

Newspaper Articles

One of the members of Harry's group suggested they should consult a newspaper to see what role the newspaper played to help the city understand the destruction caused by the storm. The group chose the New York Times. The New York Times can be accessed online and articles from the day of the storm can be viewed.

However, the group found that more useful information was published in the New York Times in the days after the storm. Harry's initial search of the New York Times for articles containing the phrase super storm Sandy published on October 29, 2012 resulted in some blog postings from reporters and many stories about damage from the storm. But when Harry reentered his search without a date limit, he retrieved articles that analyzed how the region's municipalities performed during the storm. It takes time to conduct this type of analysis, so looking for information that was published days, weeks, or months after the storm took place was a good strategy.

One limitation Harry encountered was a paywall on the New York Times website. He was able to access a few articles for free, but after viewing five articles, the website restricted access without a New York Times subscription. This is where library databases can become extremely valuable. Your college will subscribe to databases that give you access to important newspaper content, including the New York Times, which is included in the [US Major Dailies](#) and [Opposing Viewpoints](#) databases.

Primary Sources

Another member of Harry's group recalled that he had cousins in New York City who experienced Super Storm Sandy firsthand. He offered to interview his cousins about their experiences during the storm. This type of information is known as a primary information or source. Primary sources are accounts from a person or persons who have firsthand knowledge of an event. Speeches, photographs, diaries, autobiographies, and interviews are all primary sources.

In this case, the primary source is still alive and is accessible to Harry's group. However, some researchers are not so fortunate. If this is the case, primary sources can still be found in a variety of locations and formats. There are many online sites that have created digitized collections of copies of diaries and letters from historical events. It is important to remember that primary sources are not limited to a single format. You may find them in books, journals, newspapers, email, websites, and artwork.

The CRC Library has a [guide to source types](#) (bookmark this page - it will remain published even after you finish this course) that can help you differentiate the kind of source you're using.

Scholarly Articles

The results of the research that Harry and his group has done are useful, but Harry is concerned that there might be too much focus on Super Storm Sandy. He wants to find more information on crisis and disaster management in general. Harry thinks that there might be general standards or practices that should be incorporated into his group's plan. Journal articles and books might provide this information.

Harry starts his search for journal articles by using a multidisciplinary database because he is not sure which specific disciplines will cover the information he seeks. He constructs and executes a search query and finds that the abstracts included in the results help him choose several peer-reviewed, or scholarly, articles to read.

Scholarly journal articles usually include an abstract at the beginning of the article. An abstract summarizes the contents of the article. In an abstract, key points as well as conclusions are briefly described. Abstracts are often included in the database record.

Researchers find this information helpful when deciding whether or not to retrieve the whole article.

Most of the articles that Harry chooses are available in PDF format from the database, but there are a few articles that look very relevant that don't have links to a PDF. Harry really wants to read these articles so he decides to try to find out if there is another way to obtain the full text. He consults a librarian who instructs him to look for the title of the journal (not the article) in the online catalog. The catalog record will provide information on whether the journal is available online from another database.

Journals, and the articles they contain, are often quite expensive. Libraries spend a large part of their collection budget subscribing to journals in both print and online formats. You may have noticed that a Google Scholar search will provide the citation to a journal article but will not link to the full text. This happens because Google does not subscribe to journals. It only searches and retrieves freely available web content.

However, libraries do subscribe to journals and have entered into agreements to share their journal and book collections with other libraries. If you are affiliated with a library as a student, staff, or faculty member, you have access to many other libraries' resources, through a service called interlibrary loan. Do not pay the large sums required to purchase access to articles unless you do not have another way to obtain the material, and you are unable to find a substitute resource that provides the information you need.

There is one more feature Harry found while searching in databases: some offer the option of an alert service. This feature allows Harry to enter the most productive search strings, as well as his email address. When new items are added to the database that fit his search, he receives an alert. Harry found this to be a great way to keep up to date with new articles on his topic without having to initiate a new search.

Books

Next, Harry's group looks for books on the topic. They search the library's online catalog using search terms that were successful in their database searches. They find some great titles and head to the library book cases to retrieve them.

Most academic libraries use the [Library of Congress classification system](#) to organize their books and other resources. The Library of Congress classification systems divides a library's collection into 21 classes or categories. A specific letter of the alphabet is assigned to each class. More detailed divisions are accomplished with two and three letter combinations. Book shelves in most academic libraries are marked with a Library of Congress letter-number combination to correspond to the Library of Congress

letter-number combination on the spines of library materials. This is often referred to as a call number and it is noted in the catalog record of every physical item on the library shelves.

Harry uses the call numbers to locate some books that he found in the catalog. He is happily surprised to find that there are also some really useful books sitting on the shelf right next to the books he previously identified. This is a handy way to find additional information resources on a topic. It is more efficient to first search the online catalog to locate relevant resources and then search the shelves.

Conclusions

Harry and his classmates have spent time gathering information to help them create a realistic and accurate crisis command center. They accessed and used Web 2.0 information sources in the form of Twitter feeds and blogs. They used online newspapers and the library's online databases to find journal articles. They even gathered some very useful hard copy books.

During this process, the students learned about different ways that information is organized including the Library of Congress classification system. Harry was amazed at the wealth of quality information he was able to gather. It took him a while and the process was more complicated than just searching the web, but Harry now feels more confident about acing the assignment. He also feels that he learned more than how to set up a command center. He learned how to engage in academic research!



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SECTION OVERVIEW

2.2: Personal Computer and Hardware

Topic hierarchy

[2.2.1: Safety, Security, Privacy, and the Ethical Use of Technology](#)

[2.2.2: Information Systems Ethics](#)

[2.2.3: Personal Computer Basics](#)

[2.2.4: Creating Screenshots and Useful Keyboard Shortcuts](#)

[2.2.5: Hardware Basics](#)

[2.2.6: Computer Speed Factors and Data](#)

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2.2.1: Safety, Security, Privacy, and the Ethical Use of Technology

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Computer security is a branch of information technology known as information security which is intended to protect computers. Computer security has three main goals:

- Confidentiality: Making sure people cannot acquire information they should not (keeping secrets)
- Integrity: Making sure people cannot change information they should not (protecting data)
- Availability: Making sure people cannot stop the computer from doing its job.

Computer security involves telling computers what they are not to do. This makes computer security unique because most programming makes computers do things. Security takes much of a computer's power.

Basic computer security methods (in approximate order of strength) can be:

- Limit access to computers to “safe” users.
- Peripherals which block any “unsafe” activity.
- Firewall and antivirus software.

An example of complexity and pervasiveness of the issue is vending machines, per [Hackers Lurking in Vents and Soda Machines](#) April 7, 2014 New York Times

Learning Objectives

By the end of this section, you will be able to:

- Describe the importance of practicing responsible computer safety and security
- Identify common computer security issues
- List measures to prevent computer security breaches
- Describe the importance of privacy in a digital world

At WorldCorp, you've realized how the evolution of computing has led to your present-day status as a new employee. You're getting the hang of how computers are put together, how they have changed the business landscape, and how you need to understand their basic components to thrive in your industry. Another part of that understanding is learning how to safely navigate the computer world, both in the company's internal systems and in external systems on the internet and the World Wide Web.

The Importance of Computer Safety and Security

The protection of computer systems and information that prevents unauthorized use is referred to as computer security. Computer ethics are guidelines for the morally acceptable use of computers in society. Any criminal offense that involves a computer and a network is referred to as cybercrime. One of the most common types of cybercrimes is identity theft, which occurs when an unauthorized user steals an individual's personal information, such as a Social Security number or credit card information for economic gain. An increase in the number of hackers—individuals who gain unauthorized access to computer systems in an attempt to steal someone's information—has prompted the development of software programs designed to protect consumers' identities, such as LifeLock.

There are strategies you can employ that will keep your computer, and the information you have saved on it, safe and secure from theft and hacking. These include:

- using security suites that can protect user privacy and security while on the internet
- using a firewall, which is a barrier between a network that is secured and one that is not secured, to provide additional security
- setting up password-protected network access
- avoiding logging in to accounts on an open network (one that is not password protected)
- using encryption to make it impossible for unauthorized individuals to gain access

Data and Identity Theft

In addition to hackers who target individual users, corporate espionage (also known as industrial, economic, or corporate spying) is conducted for commercial or financial gain by targeting businesses, government agencies, energy companies, and even schools. Corporate espionage can take the form of unethical or illegal acquisition of intellectual property (such as customer data, pricing, or research and development information) or trade secrets through theft, bribery, or blackmail. Examples of corporate espionage include:

- trespassing on a competitor's property and/or gaining unauthorized access to files
- wiretapping—the secret interception of electronic communications
- domain hacking, which occurs when another entity steals the original party's domain name
- phishing to lure competitors' employees to open emails, thereby exposing information

Attempts to get users to interact with an email or website that appears to be legitimate but is actually fake is called phishing. Phishing lures users to provide their personal information and login credentials through these hoax sites and emails. This is usually through the use of spoofing. Spoofing is communication (usually an email) that on the surface looks to be legitimate from a trusted source. These emails have become much more sophisticated and are designed to look more and more like real correspondence from a company or even a government agency such as the IRS. Something that has grown increasingly common is ransomware, malicious software that encrypts computer data, rendering it useless and inaccessible, and forcing the owner to pay a ransom to regain access. Software that is designed with the purpose of damaging a user's computer system once it has access to that system is called malware.

Password Management and Biometrics

For all of these threats to online security, there are protective steps you can take. A set of principles and best practices for storing and managing passwords in a manner that is likely to prevent unauthorized access is called password management. You may password protect your computer, as well as various accounts you may access through your computer and the internet. Having a strong password will ensure that hackers cannot figure out your password easily. Many organizations today use multifactor authentication to provide an additional layer of security. For example, when accessing your bank account on your phone or your laptop, you may be asked to enter a specific code that is sent via email or text. This now provides two layers of security—first, entering the correct password, then correctly entering the code that was sent to you. Multifactor authentication can also be used by businesses when accessing the company software or computer network.

Real-World Application: Please Pass the Password

Some tips for creating a strong password include:

- Avoid using a real name (either your own or the company's) as your password.
- Use a combination of letters and numbers with at least eight characters.
- Do not use a complete word such as "password."
- Do not reuse passwords.
- Use a combination of uppercase and lowercase letters.
- Incorporate special symbols instead of letters or numbers (such as an exclamation point or dollar sign instead of a numeral).

In addition to passwords, you can also use biometrics to protect your computer and information. Unique physical markers of an individual that can be used to restrict access to only those who match these physical characteristics, such as retinal scans and fingerprints, are called biometrics. Biometrics are much harder to hack as they cannot be guessed or stolen.

Internet and Web Privacy

The internet is pervasive and omnipresent. It is part of all you do in business and in your everyday life. How people conduct themselves online, what they share, and what they visit—all this information is captured and saved in various places, from internet providers' servers to browser companies such as Google to different social media sites. This information is captured and saved even if deleted from your computer or account. It is important to consider how to represent yourself and what to share to maintain your privacy.

Cookies

After you have searched for a product on the internet, do you notice that you suddenly start receiving advertisements for that product, or that a store website now displays that product on its front page? For that, you can thank cookies. Small data files that are deposited on user hard disks from websites you visit are called cookies. They keep track of your browsing and search history, collecting information about your potential interests to tailor advertisements and product placement on websites. These cookies can be either blocked or accepted, depending on a company's privacy policy. The potential risk of cookies is that they can store information about the user, user preferences, and user browsing habits. That said, they can also save time by storing users' login information and browsing preferences, allowing internet pages to load faster than if you had loaded them the first time. Regardless of convenience, it is a good idea to clear cookies from time to time and to restrict cookies on certain sites depending on your own preferences.

Browsing History

Your browsing history includes all websites you may have visited, as well as any actions you may have taken on those websites. It is typically saved locally on your computer within the browser application, as well as with the company that provides the browser. Your internet or data provider may also keep track of your browsing history. While this information is handy to have for future reference, consider clearing your browsing history from your personal computer on a regular basis. Be aware that your employer may also collect this information; while using a work computer, you should avoid visiting websites that do not support your work function. Both Google analytics and your company can theoretically store browsing data for a long time, even after you delete it.

Temporary Files

As the name implies, temporary files are created by a program to allow it to complete a task or tasks. These files are handy to have in case of a sudden shutdown, as they may help to recover a file that might otherwise be lost. Many temporary files are automatically deleted once the task is complete or the file is saved permanently. But others may stick around; these files are saved in your temp folder. On a Windows computer, you can access your temp folder by typing %temp% in the Windows search bar at the bottom left of your screen.

Mac Tip

On a Mac, open the Finder and select Go >> Go to Folder. In the search bar, type ~/Library/Caches/ and then click Go to run the command. A window will open with a list of all the generated temp files saved on your Mac. You can easily select and delete these files.

Posting on Social Media

According to Pew Research, “seven-in-ten Americans use social media to connect with one another, engage with news content, share information and entertain themselves.” Some of the most popular platforms today are TikTok, Facebook, YouTube, Instagram, and WhatsApp. Figure 1.31 shows the sites adults in the United States use most. The United States and China have the most social media users of all countries worldwide. Social media has exploded in popularity and is used widely for both personal and business purposes. Businesses and individuals must be mindful of what they post on social media. Even the most private accounts can have data breaches, allowing others to save and/or share private content. It is important to consider what you post, as well as any potential unintended consequences that might arise from social media use. You must also be aware of spoof accounts that present as a reputable person, when in fact they are attempting to con or mislead an individual. Similarly, AI and bots may interact with users, posing as real people when in fact they are nothing more than a computer algorithm.

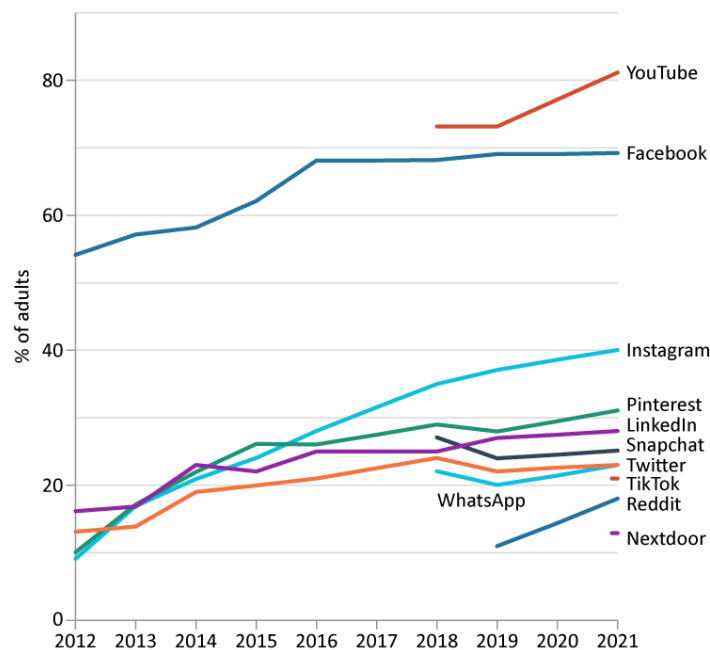


Figure 1.31: YouTube, Facebook, and Instagram were the top three social media sites among U.S. adults in 2021 for both personal and professional use. (data source: PEW Research Center, <https://www.pewresearch.org/internet...a-use-in-2021/>)

Ultimately, you should be sure to present a positive self-image on the internet, particularly on networking social media platforms such as LinkedIn. When considering how you want to represent yourself online, answer these questions: (1) Is this information accurate? (2) Will this post be potentially detrimental to my schooling and/or career? (3) Is the information hurtful or detrimental to someone else?

Ensuring Privacy

Privacy involves practices related to the collection and use of data about an individual. Many companies will have privacy policies when you sign up as a customer or purveyor of their content. It is important to read these policies to ensure you are not inadvertently providing permission to use your data and information in a way that you do not actually approve of. In addition, many companies will disclose they sell your information to other companies seeking similar customers. It is important to decline these permissions to avoid circulation of your contact information.

Minimal Data Collection from Customers

Collecting data from customers allows organizations to determine their needs and identify niche markets. Companies must ensure they are collecting the most minimal amount of data necessary from their customers to achieve these goals. Collecting too much data places both the company and the customer at risk. The company is responsible for ensuring that information is used responsibly and within the parameters of its privacy agreement; any data breach puts the company at risk of liability. Similarly, customers have the right to know how their information is used by the company and may request compensation if it is used inappropriately. Therefore, companies must ensure that they collect only the most minimal amount of data required to meet their business needs.

Data Security

Data security involves protecting digital information (data) from being accessed or used by parties who should not have access, or for purposes it should not be used for. Just as individuals must ensure they protect their information from hackers and malicious intent, companies are responsible for ensuring they use the most up-to-date data security measures to protect both customer information and proprietary company information and data.

Companies must ensure both internal and external security. Internally, a company should establish policies and protocols to ensure employees are abiding by data security measures. A company should also limit employee access to certain information. Keeping technologies up to date, with the most current security software, is also important. Depending on the size of the company, it may be worthwhile to establish a cybersecurity branch that employs qualified professionals dedicated to data security.

There are a number of strategies a company can use to keep data secure. Encrypting the data will render information unreadable to unauthorized users. Without the access key, encrypted information presents as nothing more than a meaningless string of characters. Companies, like individuals, can also take steps to delete files, software, and data that is no longer of use. And they can take it a step further by practicing data erasure, wherein the information is not only deleted but overwritten as well. In another approach, data masking, personally identifiable information is removed from the data, allowing the company to make decisions about its customers without associating the data with an individual's personal information. By taking these steps, companies ensure they can recover from a data breach quickly, reinforcing their data resiliency.

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2.2.2: Information Systems Ethics

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

The term ethics means “a set of moral principles” or “the principles of conduct governing an individual or a group.”¹ Since the dawn of civilization, the study of ethics and their impact has fascinated mankind. But what do ethics have to do with information systems? The introduction of new technology can have a profound effect on human behavior. New technologies give us capabilities that we did not have before, which in turn create environments and situations that have not been specifically addressed in an ethical context. Those who master new technologies gain new power while those who cannot or do not master them may lose power. In 1913 Henry Ford implemented the first moving assembly line to create his Model T cars. While this was a great step forward technologically and economically, the assembly line reduced the value of human beings in the production process. The development of the atomic bomb concentrated unimaginable power in the hands of one government, who then had to wrestle with the decision to use it. Today’s digital technologies have created new categories of ethical dilemmas.

For example, the ability to anonymously make perfect copies of digital music has tempted many music fans to download copyrighted music for their own use without making payment to the music’s owner. Many of those who would never have walked into a music store and stolen a CD find themselves with dozens of illegally downloaded albums. Digital technologies have given us the ability to aggregate information from multiple sources to create profiles of people. What would have taken weeks of work in the past can now be done in seconds, allowing private organizations and governments to know more about individuals than at any time in history. This information has value, but also chips away at the privacy of consumers and citizens.

In early 2018 Facebook acknowledged a data breach affecting 87 million users. The app “thisisyourdigitallife”, created by Global Science Research, informed users that they could participate in a psychological research study. About 270,000 people decided to participate in the research, but the app failed to tell users that the data of all of their friends on Facebook would be automatically captured as well. All of this data theft took place prior to 2014, but it did not become public until four years later. In 2015 Facebook learned about Global Science Research’s collection of data on millions of friends of the users in the research. Global Science Research agreed to delete the data, but it had already been sold to Cambridge Analytica who used it in the 2016 presidential primary campaign. The ensuing firestorm resulted in Mark Zuckerberg, CEO of Facebook, testifying before the U.S. Congress in 2018 on what happened and what Facebook would do in the future to protect users’ data. Congress is working on legislation to protect user data in the future, a prime example of technology advancing faster than the laws needed to protect users. More information about this case of data privacy can be found at Facebook and Cambridge Analytical.



Facebook logo

Code of Ethics

A code of ethics is one method for navigating new ethical waters. A code of ethics outlines a set of acceptable behaviors for a professional or social group. Generally, it is agreed to by all members of the group. The document details different actions that are considered appropriate and inappropriate. A good example of a code of ethics is the Code of Ethics and Professional Conduct of the Association for Computing Machinery,³ an organization of computing professionals that includes academics, researchers, and practitioners. Here is a quote from the preamble: Commitment to ethical professional conduct is expected of every member (voting members, associate members, and student members) of the Association for Computing Machinery (ACM). This Code, consisting of 24 imperatives formulated as statements of personal responsibility, identifies the elements of such a commitment. It contains many, but not all, issues professionals are likely to face. Section 1 outlines fundamental ethical considerations, while Section 2 addresses additional, more specific considerations of professional conduct. Statements in Section 3 pertain more specifically to individuals who have a leadership role, whether in the workplace or in a volunteer capacity such as with organizations like ACM. Principles involving compliance with this Code are given in Section 4.

In the ACM's code you will find many straightforward ethical instructions such as the admonition to be honest and trustworthy. But because this is also an organization of professionals that focuses on computing, there are more specific admonitions that relate directly to information technology:

- No one should enter or use another's computer system, software, or data files without permission. One must always have appropriate approval before using system resources, including communication ports, file space, other system peripherals, and computer time.
- Designing or implementing systems that deliberately or inadvertently demean individuals or groups is ethically unacceptable.
- Organizational leaders are responsible for ensuring that computer systems enhance, not degrade, the quality of working life. When implementing a computer system, organizations must consider the personal and professional development, physical safety, and human dignity of all workers. Appropriate human-computer ergonomic standards should be considered in system design and in the workplace.

One of the major advantages of creating a code of ethics is that it clarifies the acceptable standards of behavior for a professional group. The varied backgrounds and experiences of the members of a group lead to a variety of ideas regarding what is acceptable behavior. While the guidelines may seem obvious, having these items detailed provides clarity and consistency. Explicitly stating standards communicates the common guidelines to everyone in a clear manner.

A code of ethics can also have some drawbacks. First, a code of ethics does not have legal authority. Breaking a code of ethics is not a crime in itself. What happens if someone violates one of the guidelines? Many codes of ethics include a section that describes how such situations will be handled. In many cases repeated violations of the code result in expulsion from the group.

In the case of ACM: "Adherence of professionals to a code of ethics is largely a voluntary matter. However, if a member does not follow this code by engaging in gross misconduct, membership in ACM may be terminated." Expulsion from ACM may not have much of an impact on many individuals since membership in ACM is usually not a requirement for employment. However, expulsion from other organizations, such as a state bar organization or medical board, could carry a huge impact.

Another possible disadvantage of a code of ethics is that there is always a chance that important issues will arise that are not specifically addressed in the code. Technology is quickly changing and a code of ethics might not be updated often enough to keep up with all of the changes. A good code of ethics, however, is written in a broad enough fashion that it can address the ethical issues of potential changes to technology while the organization behind the code makes revisions.

Finally, a code of ethics could also be a disadvantage in that it may not entirely reflect the ethics or morals of every member of the group. Organizations with a diverse membership may have internal conflicts as to what is acceptable behavior. For example, there may be a difference of opinion on the consumption of alcoholic beverages at company events. In such cases the organization must make a choice about the importance of addressing a specific behavior in the code.

Acceptable Use Policies

Many organizations that provide technology services to a group of constituents or the public require agreement to an Acceptable User Policy (AUP) before those services can be accessed. Similar to a code of ethics, this policy outlines what is allowed and what is not allowed while someone is using the organization's services. An everyday example of this is the terms of service that must be agreed to before using the public Wi-Fi at Starbucks, McDonald's, or even a university. Here is an example of an acceptable use policy from Virginia Tech.

Just as with a code of ethics, these acceptable use policies specify what is allowed and what is not allowed. Again, while some of the items listed are obvious to most, others are not so obvious:

- "Borrowing" someone else's login ID and password is prohibited.
- Using the provided access for commercial purposes, such as hosting your own business website, is not allowed.
- Sending out unsolicited email to a large group of people is prohibited.

As with codes of ethics, violations of these policies have various consequences. In most cases, such as with Wi-Fi, violating the acceptable use policy will mean that you will lose your access to the resource. While losing access to Wi-Fi at Starbucks may not have a lasting impact, a university student getting banned from the university's Wi-Fi (or possibly all network resources) could have a large impact.

Intellectual Property

One of the domains that has been deeply impacted by digital technologies is intellectual property. Digital technologies have driven a rise in new intellectual property claims and made it much more difficult to defend intellectual property. Intellectual property is defined as “property (as an idea, invention, or process) that derives from the work of the mind or intellect.”⁴ This could include creations such as song lyrics, a computer program, a new type of toaster, or even a sculpture.

Practically speaking, it is very difficult to protect an idea. Instead, intellectual property laws are written to protect the tangible results of an idea. In other words, just coming up with a song in your head is not protected, but if you write it down it can be protected.

Protection of intellectual property is important because it gives people an incentive to be creative. Innovators with great ideas will be more likely to pursue those ideas if they have a clear understanding of how they will benefit. In the US Constitution, Article 8, Section 8, the authors saw fit to recognize the importance of protecting creative works: Congress shall have the power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.

An important point to note here is the “limited time” qualification. While protecting intellectual property is important because of the incentives it provides, it is also necessary to limit the amount of benefit that can be received and allow the results of ideas to become part of the public domain. Outside of the US, intellectual property protections vary. You can find out more about a specific country’s intellectual property laws by visiting the World Intellectual Property Organization. The following sections address three of the best-known intellectual property protections: copyright, patent, and trademark.

Copyright

Copyright is the protection given to songs, computer programs, books, and other creative works. Any work that has an “author” can be copyrighted. Under the terms of copyright, the author of a work controls what can be done with the work, including:

- Who can make copies of the work.
- Who can make derivative works from the original work.
- Who can perform the work publicly.
- Who can display the work publicly.
- Who can distribute the work.

Many times, a work is not owned by an individual but is instead owned by a publisher with whom the original author has an agreement. In return for the rights to the work, the publisher will market and distribute the work and then pay the original author a portion of the proceeds. Copyright protection lasts for the life of the original author plus seventy years. In the case of a copyrighted work owned by a publisher or another third party, the protection lasts for ninetyfive years from the original creation date. For works created before 1978, the protections vary slightly. You can see the full details on copyright protections by reviewing the Copyright Basics document available at the US Copyright Office’s website.

Fair Use

Another important provision within copyright law is that of fair use. Fair use is a limitation on copyright law that allows for the use of protected works without prior authorization in specific cases. For example, if a teacher wanted to discuss a current event in class, copies of the copyrighted new story could be handed out in class without first getting permission. Fair use is also what allows a student to quote a small portion of a copyrighted work in a research paper.

Unfortunately, the specific guidelines for what is considered fair use and what constitutes copyright violation are not well defined. Fair use is a well-known and respected concept and will only be challenged when copyright holders feel that the integrity or market value of their work is being threatened. The following four factors are considered when determining if something constitutes fair use:

1. The purpose and character of the use, including whether such use is of commercial nature or is for nonprofit educational purposes;
2. The nature of the copyrighted work;
3. The amount and substantiality of the portion used in relation to the copyrighted work as a whole;

4. The effect of the use upon the potential market for, or value of, the copyrighted work.

If you are ever considering using a copyrighted work as part of something you are creating, you may be able to do so under fair use. However, it is always best to check with the copyright owner to be sure you are staying within your rights and not infringing upon theirs.

The Digital Millennium Copyright Act

As digital technologies have changed what it means to create, copy, and distribute media, a policy vacuum has been created. In 1998, the US Congress passed the Digital Millennium Copyright Act (DMCA), which extended copyright law to take into consideration digital technologies. Two of the best-known provisions from the DMCA are the anti-circumvention provision and the “safe harbor” provision.

- The anti-circumvention provision makes it illegal to create technology to circumvent technology that has been put in place to protect a copyrighted work. This provision includes not just the creation of the technology but also the publishing of information that describes how to do it. While this provision does allow for some exceptions, it has become quite controversial and has led to a movement to have it modified.
- The “safe harbor” provision limits the liability of online service providers when someone using their services commits copyright infringement. This is the provision that allows YouTube, for example, not to be held liable when someone posts a clip from a copyrighted movie. The provision does require the online service provider to take action when they are notified of the violation (a “takedown” notice). For an example of how takedown works, here’s how YouTube handles these requests: YouTube Copyright Infringement Notification.

Many think that the DMCA goes too far and ends up limiting our freedom of speech. The Electronic Frontier Foundation (EFF) is at the forefront of this battle. In discussing the anti-circumvention provision, the EFF states: Yet the DMCA has become a serious threat that jeopardizes fair use, impedes competition and innovation, chills free expression and scientific research, and interferes with computer intrusion laws. If you circumvent DRM [digital rights management] locks for noninfringing fair uses or create the tools to do so you might be on the receiving end of a lawsuit.

Information Systems and Intellectual Property

The rise of information systems has resulted in rethinking how to deal with intellectual property. From the increase in patent applications swamping the government’s patent office to the new laws that must be put in place to enforce copyright protection, digital technologies have impacted our behavior.

Privacy

The term privacy has many definitions, but for purposes here, privacy will mean the ability to control information about oneself. The ability to maintain our privacy has eroded substantially in the past decades, due to information systems.

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2.2.3: Personal Computer Basics

[Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Learning Objectives

- Comparing and Contrasting Personal Computers
- Identifying Computer System Components
- Classifying Various Peripheral Devices
- Creating Screenshots
- File Management
- Useful Keyboard Shortcuts

Personal Computer Basics

[Comparing and Contrasting Personal Computers](#)

[Identifying Computer System Components](#)

[Classifying Various Peripheral Devices](#)

[Creating Screenshots](#)

[File Management](#)

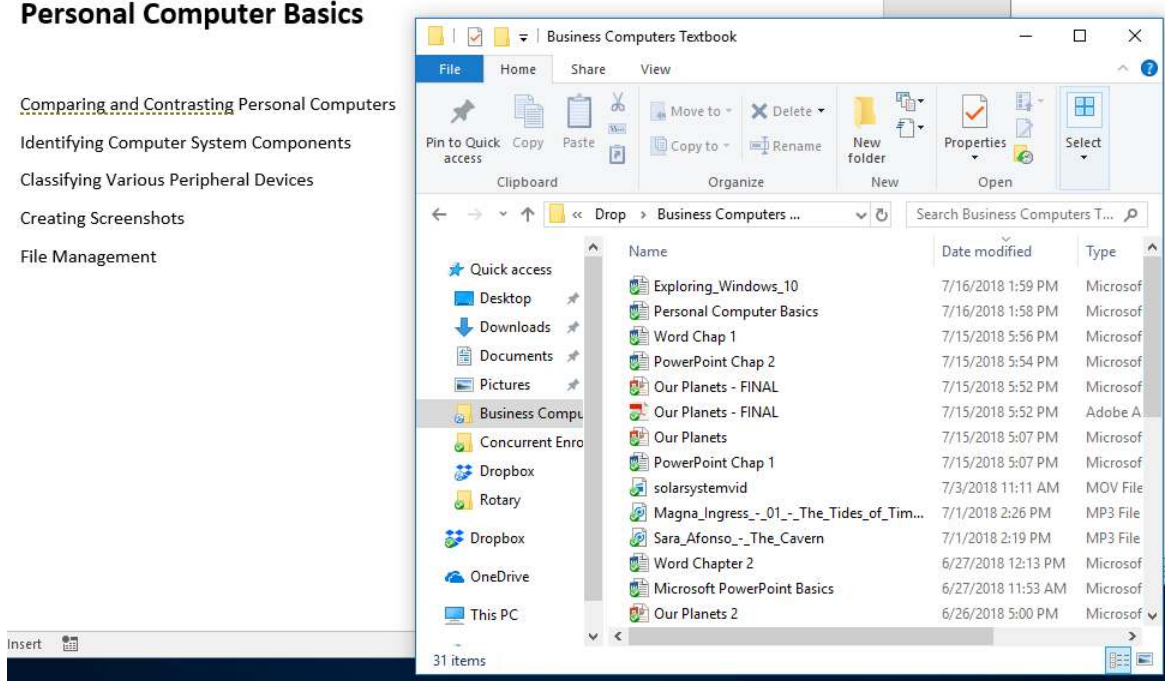


Figure 2.2.3.1: File Management

Comparing and Contrasting Personal Computers

Computers were originally created for military, scientific, government and corporations – organizations with one common characteristic – large budgets! Fortunately, since the early days of computing, computers have simultaneously become more user-friendly and affordable giving rise the era of personal computing.

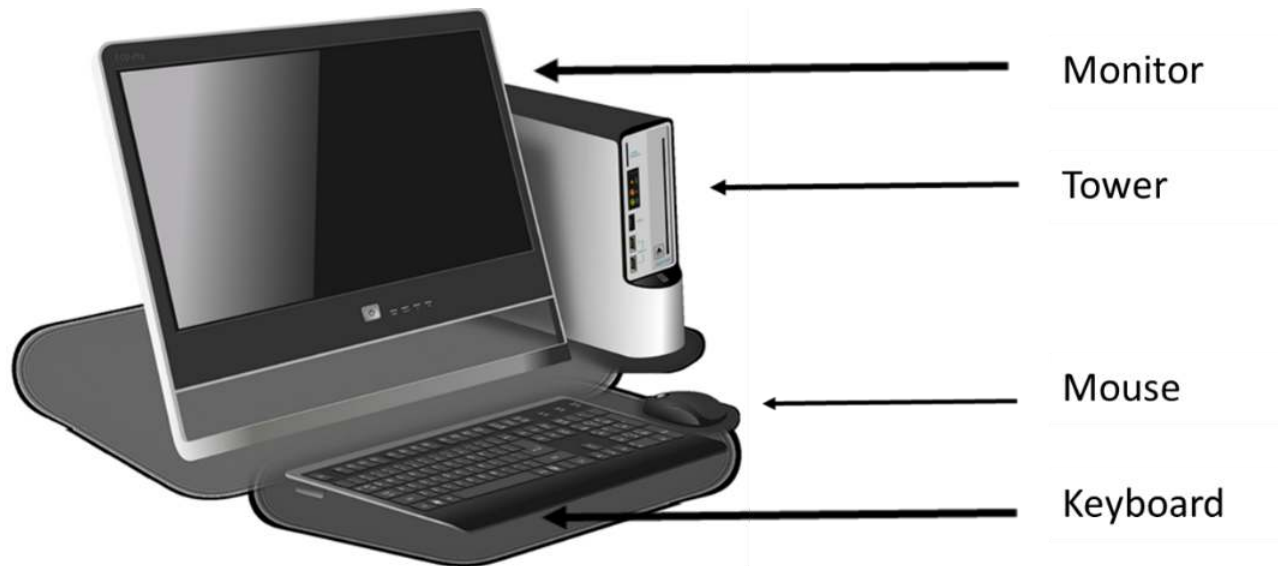
In 1977 Steve Wozniak and Steve Jobs debuted the Apple-II personal computer. However, it wasn't until the early 1980's that IBM introduced their personal computer (PC), and the personal computing era really became legitimate.

Personal Computers (PCs) are best described as small, inexpensive computers designed for individual use. Each of the following are examples of personal computers:

- **Desktop computers** – designed to utilize a consistent source of electric power, these computers fit on or beneath a desk, and therefore are not intended to be portable. Most desktops contain several peripheral input and output devices intended to extend the computing functionality.
- **Laptop and Notebook computers** – portable computers that utilize a battery for power. Consist of a separate display screen and keyboard in a single unit. Contains a hinged lid that closes the screen onto the keyboard for easy portability. Some screens

are touch-activated displays.

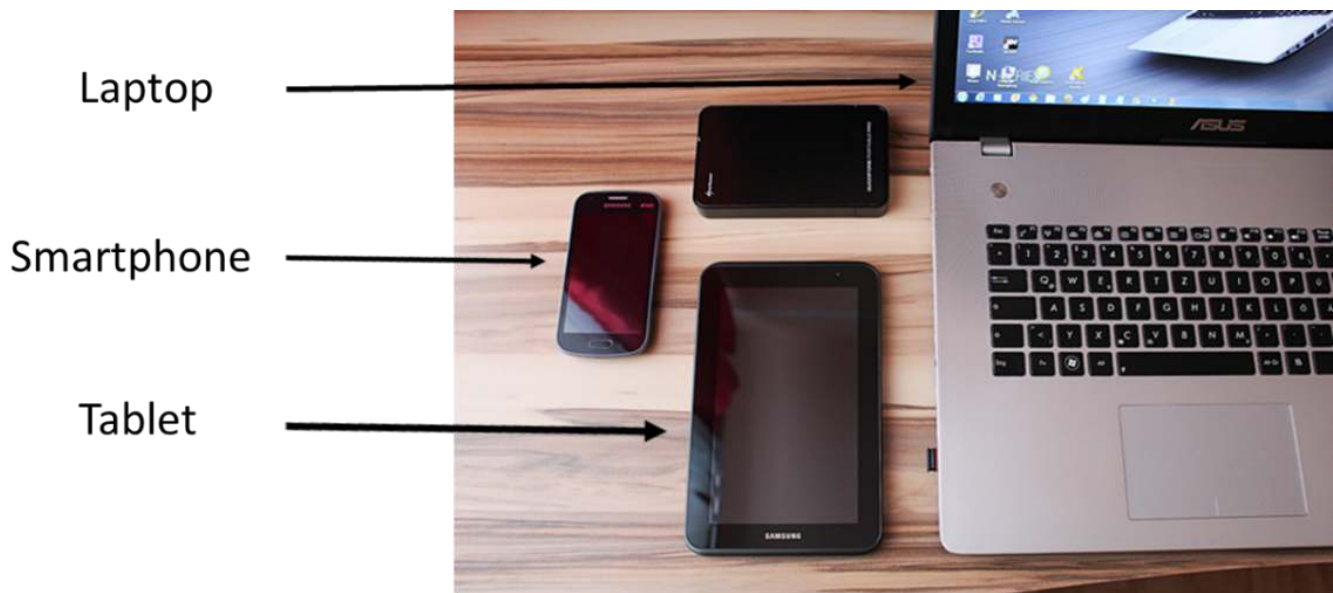
- **Tablets** – thin mobile computers with touchscreen displays. Typically, larger than smartphones, tablets are ideal for reading eBooks, surfing the Web, and watching videos.
- **Smartphones** – pocket-sized mobile phones that combine voice, text, e-mail and personal computing into a single device that can access the Internet and run a variety of third-party software components, known as apps.



Desktop Computer System

Modern desktop and laptop computers are generally either PCs, usually running a Microsoft Windows version operating system, or Apple Macintoshes, which run Apple's proprietary operating system (OS) software. Various versions of the Linux OS also represent a relevant share of desktop and laptop users on a PC platform. However, according to several industry analysts, Microsoft's Windows is the dominant OS in terms of shares of users, with estimates of more than half of all users in 2016.

The most popular mobile (tablets and smartphones) operating systems are Android (developed by Google), iOS (developed by Apple) and Windows 10 Mobile (developed by Microsoft).



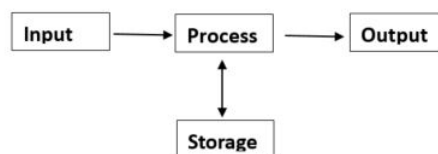
Portable Computers

Identifying Computer System Components

Computer systems consist of hardware and software. **Hardware** is the tangible, physical components of a computer, while software is the intangible programs that function on a computer. Basic hardware components include a hard drive for storing data, a processor for performing operations, memory for holding active data, and a motherboard to tie the parts together. Even gaming consoles are considered computer hardware. **Software** includes computer programs, libraries and data. Software can be categorized as application (most programs), system (operating, utilities and device drivers) and malicious software, or malware (undesirable programs that results in harm or disruption).

Software Examples	
Applications	Operating Systems
Microsoft Office (Word, Excel, Access, PowerPoint, Publisher)	Windows (Microsoft)
Business (QuickBooks, Auto Cad, Photoshop)	Mac O/S (Apple)
Browsers (Chrome, Firefox, Safari, Edge)	Chrome O/S (Google)
Games (Call of Duty, Madden, Solitaire)	Linux (Open-Source)

The four main components of a computer system are input devices, output devices, processing devices and the storage devices used to store data within the computer system. The flow of data through a computer system begins with either an input device that enters data into the central processing unit which then sends the data to an output device as information. Alternatively, data can be retrieved or sent to a storage device from the processor.



Computer system processes

Hardware and software work together to process data. When you open a software program, the computer reads its data from the hard drive or input device, runs the software on the computer's processor and then displays the results on your output device or saves the data to a storage device.

Classifying Various Peripheral Devices

Hardware components that are not an integral part of the central processing unit are often referred to as peripheral devices. Peripheral devices connect with a computer through several I/O interfaces, such as communications (COM), Universal Serial Bus (USB), firewire, and serial ports. Peripherals are usually used for either input, storage or output.

Input Devices

An input device is any device that provides input to a computer. There are many **input devices**, but the two most common ones are a keyboard and mouse. Every key you press on the keyboard and every movement or click you make with the mouse sends a specific input signal to the computer. Examples of commonly used input devices include:



Wireless mouse

- **Mouse:** a small object that you can roll along a hard and flat surface which serves as pointing device to enable the user to control the movement of the cursor on a screen display. Most mice have two or more buttons which allow the user to scroll and click objects on the screen.
- **Keyboard:** desktop and laptop computers have external and built-in keyboards that resemble a traditional typewriter. Most keyboards are designed to have the QWERTY layout of keys which make keyboarding easy and consistent across various devices. Many keyboards have function keys as the top row that perform special shortcut functions.
- **Touchscreen:** the primary input device for tablets and smartphone, this technology combines the functionality of a mouse and a keyboard by allowing a finger or stylus to make gestures or select on-screen menus and keys.
- **Microphone and Camera:** used to record and capture sound and images, and to communicate with others using audio and video conferencing software. Most portable computers have these devices built-in, but external devices are typically a higher quality.

Many input devices operate without cords. **Wireless** mice and keyboards require receivers to collect the electronic signals transmitted by the input devices. **Bluetooth** devices use short-range radio waves to communicate between paired devices and computers. Other input devices include scanners, bar code readers, joy sticks, light pens, trackballs, magnetic ink character recognition (MICR) and optical character recognition (OCR) software. Warning! Excessive use of a computer can lead to repetitive motion injuries such as **carpal tunnel syndrome**, and other computer-related health problems, including **computer addiction**. Take frequent breaks, stretch properly, and utilize ergonomically designed input devices to reduce the threat of these injuries. Limit your time online, and connect face-to-face too!

Output Devices

An **output device** is any hardware peripheral that disseminates processed data. The processed data, stored in the memory of the computer is sent to the output device, which then converts it into an understandable form. Examples of commonly used output devices include:

- **Monitors:** older monitors typically contain a cathode ray tube, which result in a heavy display, which is also an inefficient use of power and your desktop footprint compared to flat screen monitors. A flat panel display uses an LCD (Liquid Crystal

Display), although some use plasma technology. Screen size is measured diagonally across the screen, in inches. The entire screen area may not be usable for image display. The **resolution** of the monitor is the maximum number of pixels it can display horizontally and vertically (such as 800 x 600, or 1024 x 768, or 1600 x 1200). Most monitors can display several resolutions below its maximum setting. **Pixels**(short for picture elements) are the small dots that make the image displayed on the screen. A **video card** is necessary for generating complex computer graphics on a monitor.



Multi-function printer

Printers: want a “hard” copy of a document versus a “soft” copy of a file? A printed output is referred to as a hard copy versus an electronic or soft copy of a file. Printers come in various formats. Popular for home computing is **ink jet** printers. These printers form the image on the page by spraying tiny droplets of ink from the print head. The printer needs several colors of ink (cyan, yellow, magenta, and black) to make color images. Some photo-quality ink jet printers have more colors of ink. Unfortunately, ink cartridges are expensive to replace, so the cheap initial cost of ink jet printers is offset by frequent printing usage. Conversely, **laser** printers utilize toner to burn tiny plastic particles of pigment onto paper. While the initial cost of laser printers can be expensive, they produce a higher quality output and are less expensive and faster than ink jet printers in the long run. Other printers include dot-matrix which use impact and inked ribbon on continuous feed paper. These are (were) popular for multi-layer forms. Lastly, multi-function printers are popular for home office/small office computing because they combine printing, faxing, copying and scanning in a single device.

- **Speakers:** Audio output requires a sound card and internal or external speakers or headphones.



Flash drive

Storage devices: While primary storage is the internal CPU’s RAM, secondary storage consists of external hardware such as CDs, DVDs, flash drives and external hard drives. Obsolete secondary storage examples include floppy disks, magnetic tape, punch cards and zip drives. A popular alternative to physical secondary storage is **cloud storage** which stores data on remote servers accessed from the Internet, or “cloud”, which is maintained by a cloud storage service provider built on virtualization techniques.



- Wearable computer device
- Hybrid peripherals:** Wearable computer devices, such as augmented reality goggles, smartwatches and fitness trackers can all be lumped into this auxiliary device category.

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2.2.4: Creating Screenshots and Useful Keyboard Shortcuts

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Print Screen

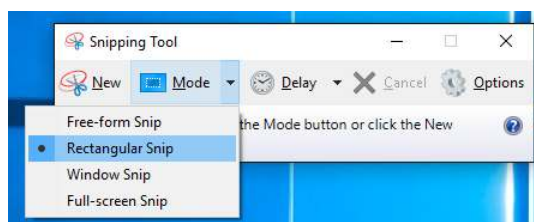
Most keyboards have a key labeled Print Screen, PRT SC, or PRT. Alternatively for a PC, you can select the Windows Key + Shift + S. The shortcut for a Mac is Command + Shift + 3.



Figure 2.2.4.1: PC Keyboard, By [Gresel](#) (Copyright; Adobe Stock, Education License)

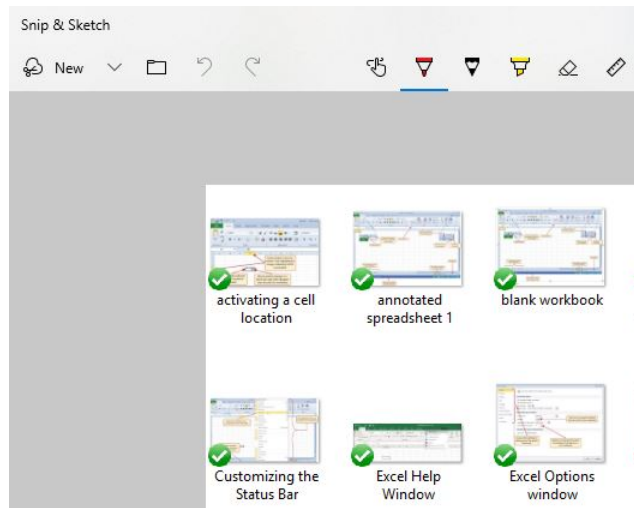
Clipping Tool

One of the first steps to securing assistance with computer-related issues requires sharing the error or screen output with a teacher or technical support staff. Often, these support resources are not available to view the screen in-person. Therefore, capturing the screen output is a vital skill to help resolve computer issues. Screenshots, also known as screen captures, screen grabs, or print screens, are the technical terminology assigned to this piece of data. A **screenshot** is a digital image of what appears on a computer or television screen. Producing a screenshot can be a confusing task, which should be broken down into two parts. The first part is the capturing of the screen image, while the second part is the process of pasting the capture into a storable file. There are numerous methods of capturing a screenshot, and they vary from one computer device to another due to operating system versions and keyboard differences.



Snipping Tool

The most consistent method for Windows users to create screenshots is by utilizing the Windows Snipping Tool. As of late 2018, the new tool is called Snip & Sketch. Most images in this documentation have been generated with the help of these tools. To open the Snip & Sketch tool, select the Start button, type "snip" in the search box on the taskbar, and then select the



Snip & Sketch

Snip & Sketch app from the list of results. In addition to capturing a full-screen snip, the Snip & Sketch Tool provides the convenience of capturing a more specific “snip” of data by using the mouse to draw a rectangular or free-form block of specific data to be captured. This allows for more focused data to be collected versus an entire screen of potentially competing images. Once the drawing is selected, the screenshot should automatically open in a new window. You can modify the screenshot by cropping, highlighting annotating or drawing on the image. This image can then be pasted into a new program (similar to how the above image was added to this document) or saved as a separate file to be stored on a permanent or cloud storage device. The Snip & Sketch tool also be set to a timer to take a screenshot in three or ten seconds. To take a screenshot with Snip & Sketch, just press PrtScn. Screenshots will be quite useful for providing feedback or asking questions to/from students/teachers, particularly in distance education environments.

Useful Keyboard Shortcuts

- **Windows key + E** – open a new instance of File Explorer from anywhere in Windows.
- **Alt + P** – show or hide the Preview pane.
- **Alt + Shift + P** – show or hide the Details pane.
- **Alt + left arrow key** – go back one folder in your history.
- **Alt + up arrow key** – go up one folder in the folder tree.
- **Ctrl + N** – open a new File Explorer window.
- **Ctrl + E** – activate the Search bar.
- **Ctrl + Shift + N** – create a new folder in the current folder.
- **Ctrl + mouse wheel up or down** – increase or decrease the size of icons and thumbnails.

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2.2.5: Hardware Basics

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Chapter Learning Outcomes

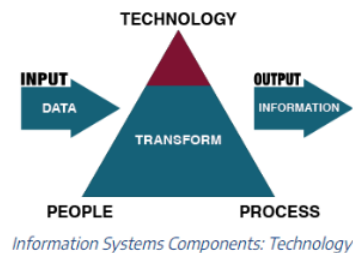
Hardware:

1. Define digital devices and articulate their significance in daily life.
2. Identify and comprehend the primary components of a computer system, elucidating the functions each component performs.
3. Explain the factors that differentiate the computing power of computers, fostering an understanding of their capabilities.
4. Describe various types of input, output, and memory devices, outlining their roles in information processing.
5. Discuss current hardware trends, including the proliferation of mobile computing and the integration of computing into diverse technologies.
6. Assess the impact of the commoditization of computers on the technology landscape and its implications for users and industries.
7. Summarize the environmental challenges associated with electronic waste (e-waste), recognizing the importance of responsible technology disposal and its broader implications for sustainability

Introduction



As you learned in the first chapter, an information system is made up of three components: technology, people, and processes. In this chapter we will focus on the first element of technology—hardware. Computer hardware encompasses devices that you can physically touch including desktop computers, laptop computers, mobile phones, tablets, e-readers, storage devices, and input and output devices. Besides these more traditional computer hardware devices, many items that were once not considered digital devices are now becoming computerized themselves. Digital technologies are being integrated into many everyday objects so the days of a device being labeled categorically as computer hardware may be ending. In this chapter, you will also explore digital



devices, beginning with defining what is meant by the term itself.

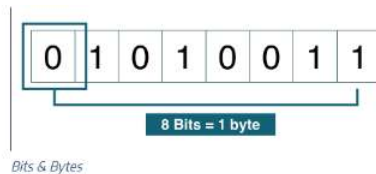
Digital Devices

A digital device processes electronic signals into discrete values, of which there can be two or more. In comparison analog signals are continuous and can be represented by a smooth wave pattern. You might think of digital (discrete) as being the opposite of analog.

Many electronic devices process signals into two discrete values, typically known as binary. These values are represented as either a one (“on”) or a zero (“off”). It is commonly accepted to refer to the on state as representing the presence of an electronic signal. It

then follows that the off state is represented by the absence of an electronic signal. Technically, the voltages in a system are evaluated with high voltages converted into a one or on state and low voltages converted into a zero or off state.

Each one or zero is referred to as a bit (a blending of the two words “binary” and “digit”). A group of eight bits is known as a byte (think of a byte as being a single character you can type from a keyboard). The first personal computers could process 8 bits of data at once. The number of bits that can be processed by a computer’s processor at one time is known as word size. Today’s personal computers can process 64 bits of data at a time which is where the term 64-bit processor comes from. You are most likely using a computer with a 64-bit processor.



As the capacities of digital devices grew, new terms were developed to identify the capacities of processors, memory, and disk storage space. Prefixes were applied to the word byte to represent different orders of magnitude. Since these are digital specifications, the prefixes were originally meant to represent multiples of 1024 (2¹⁰), this usage is referred to as a binary measurement, but have more recently been rounded for the sake of simplicity to mean multiples of 1000, as shown in the table below.

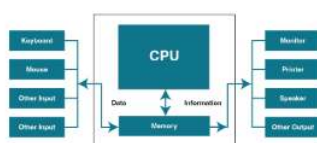
Prefix	Represents	Approximate Examples
Kilo	One thousands bytes	! typewritten page
Mega	One million bytes	1 Digital photo
Giga	One billion bytes	1 Blu- ray movie 25GB
Tera	One trillion bytes	Printed Collection of the library of congress 20TB
Peta	One quadrillion bytes	Date generated on Facebook everyday 4PB
Exa	One quintillion bytes	
Zetta	One sextillion bytes	
Yetta	One septillion bytes	

Personal Computer Tour

Computers are machines that accept data as input, processes that data using stored instructions, and outputs the information.

All personal computers consist of the same basic components:

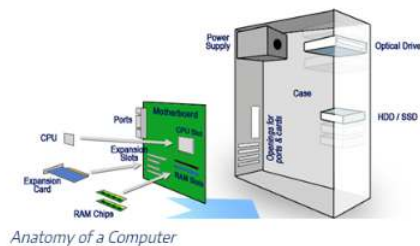
- network connection
- motherboard
- central processing unit (CPU)
- storage/memory
- input/output devices



All personal computers consist of the same basic components:

- network connection
- motherboard
- central processing unit (CPU)
- storage/memory
- input/output devices

Almost every digital device uses the same set of components, so examining the personal computer will give you insight into the structure of a variety of digital devices. The components will be explored in more detail in the following sections.



Network Connection

Personal computers were first developed as stand alone units, which meant that data was brought into the computer or removed from the computer via removable media (i.e. hard drives, USB devices, CD's). However, beginning in the mid-1980s, organizations began to see the value in connecting computers together via a digital network. Because of this, personal computers needed the ability to connect to these networks. Initially, this was done by adding an expansion card to the computer that enabled the network connection. These cards were known as Network Interface Cards (NIC). By the mid-1990s, an Ethernet network port was built into the motherboard on most personal computers. As wireless technologies began to dominate in the early 2000s, many personal computers also began including wireless networking capabilities. Digital communication technologies will be discussed further in a later chapter.

Motherboard

The motherboard is the main circuit board on the computer. The CPU, memory, and storage components, among other things, all connect into the motherboard. Motherboards come in different shapes and sizes, depending upon how compact or expandable the computer is designed to be. Most modern motherboards have many integrated components, such as network interface card, video, and sound processing, which previously required separate components.

The motherboard provides much of the bus of the computer (the term bus refers to the electrical connections between different computer components). The bus is an important factor in determining the computer's speed (the combination of how fast the bus can transfer data and the number of data bits that can be moved at one time). The traces shown in the image are on the underside of the motherboard and provide connections between motherboard components.



Motherboard by Darklanlan CC-BY

Input and Output Devices

In order for a personal computer to be useful, it must have channels for receiving input from the user and channels for delivering output to the user. Input and output devices connect to the computer through connection ports, which are generally part of the motherboard and are accessible outside the computer case. In early personal computers, specific ports were designed for each type of output device. The configuration of these ports has evolved over the years, becoming more and more standardized over time. Today, almost all devices plug into a computer through the use of a USB port. This has increased in its capabilities, both in its data transfer rate and power supplied.



[USB Cable Connection](#) Max Pixel [CC0](#)

Bluetooth

Besides USB, some input and output devices connect to the computer via a wireless-technology standard called Bluetooth, which was invented in 1994. Bluetooth exchanges data over short distances of 10 meters up to 100 meters using radio waves. Two devices communicating with Bluetooth must both have a Bluetooth communication chip installed. Bluetooth devices include pairing your phone to your car, computer keyboards, speakers, headsets, and home security, just to name a few.

Input Devices

All personal computers need components that allow the user to input data. Early computers simply used a keyboard for entering data or selecting an item from a menu to run a program. With the advent of operating systems offering the graphical user interface, the mouse became a standard component of a computer. These two components are still the primary input devices to a personal computer, though variations of each have been introduced with varying levels of success over the years. For example, many new devices now use a touch screen as the primary way of data entry

INPUT DEVICES



[Input Devices](#)

Other input devices include scanners which allow users to input documents into a computer either as images or as text. Microphones can be used to record audio or give voice commands. Webcams and other types of video cameras can be used to record video or participate in a video chat session.

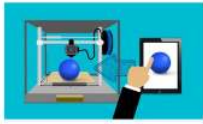
Output Devices

Output devices are essential as well. The most obvious output device is a display or monitor, visually representing the state of the computer. In some cases, a personal computer can support multiple displays or be connected to larger-format displays such as a projector or large-screen television. Other output devices include speakers for audio output and printers for hardcopy output

3D Printing

A 3-D printer allows you to print virtually any 3-D object based on a model of that object designed on a computer. 3-D printers work by creating layer upon layer of the model using malleable materials, such as different types of glass, metals, or even wax. 3-D printing is quite useful for prototyping the designs of products to determine their feasibility and marketability. 3-D printing has also

been used to create working [prosthetic legs](#) and an [ear that can hear beyond the range of normal hearing](#). The US military now uses 3-D printed parts on aircraft such as the F-18. [1]



3D Printer by Mohamed Hassan CCO 1.0

Section Footnote Links

1. The Economist. (2013, September 13). 3-D Printing Scales Up. [↵](#)

PC Commoditization and E-Waste

The Commoditization of the Personal Computer

Over the past forty years, as the personal computer has gone from technical marvel to part of everyday life, it has also become a commodity. There is very little differentiation between computer models and manufacturers, and the primary factor that controls their sale is their price. Hundreds of manufacturers all over the world now create parts for personal computers which are purchased and assembled. As commodities, there are essentially little or no differences between computers made by these different companies. Profit margins for personal computers are minimal, leading hardware developers to find the lowest-cost manufacturing methods.

There is one brand of computer for which this is not the case – Apple. Because Apple does not make computers that run on the same open standards as other manufacturers, they can design and manufacture a unique product that no one can easily copy. By creating what many consider to be a superior product, Apple can charge more for their computers than other manufacturers. Just as with the iPad and iPhone, Apple has chosen a strategy of differentiation, an attempt to avoid commoditization.

E-Waste

Advances in computing technology reduce costs, increase productivity and allow innovation to flourish. But there is a dark side to advancement. A PC has an expected lifetime of three to five years, and a cell phone is expected to last less than two years. Rapid obsolescence means the creation of ever-growing mountains of discarded tech junk, known as electronic waste or e-waste. In 2016 alone approximately 44.7 million metric tonnes of e-waste were created. By 2020, it is predicted that amount will increase by 17% and we will create approximately 52.2 million metric tonnes of e-waste annually throughout the world.[1] Canada is a large contributor to this e-waste problem. A report released by Statistics Canada stated that, in 2012 we contributed 14.3 million tonnes of waste to the global e-waste problem. [2] Consumer electronics and computing equipment can be a toxic cocktail that includes cadmium, mercury, lead, and other hazardous materials. Once called the “effluent of the affluent,” e-waste will only increase with the rise of living standards worldwide.



Ghanians working in Apbopbopbop by Marieme Naoiti CCO 1.0
Universal Public Domain Dedication

The quick answer would be to recycle, as e-waste contains materials like plastics and aluminum, as well as small bits of increasingly valuable metals such as silver, platinum, and copper. However, there's often a disconnect between consumers and managers who want to do good and those efforts that are actually doing good. The complexities of the modern value chain, the vagaries of international law, and the nefarious actions of those willing to put profits above principle show how difficult addressing this problem will be.

The process of separating out the densely packed materials inside tech products so that the value in e-waste can be effectively harvested is extremely labor intensive, more akin to reverse manufacturing than any sort of curbside recycling efforts. Therefore a lot of e-waste is sent abroad which can be much cheaper than processing at home. Much of this waste ends up in China, South Asia, or sub-Saharan Africa.

Thinking deeply about the ethical consequences of a firm's business is an imperative for the modern manager. A slip up (intentional or not) can, in seconds, be captured by someone with a cell phone, uploaded to YouTube, or offered in a blog posting for the world to see. The worst cases expose firms to legal action and can tarnish a brand for years. Big firms are big targets, and environmentalists have been quick to push the best-known tech firms and retailers to take back their products for responsible recycling and to eliminate the worst toxins from their offerings.

Section Footnote Links

1. Leary, K. (n.d.). The World's E-Waste Is Piling Up at an Alarming Rate, Says New Report.
<https://www.sciencealert.com/global-electronic-waste-growth-report-2017-significant-increase> ↵
2. Statistics Canada. (2016, May 24). EnviroStats. Trash Talking : Dealing with Canadian household e-waste.
<http://www.statcan.gc.ca/pub/16-002-x/2016001/article/14570-eng.htm> ↵

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2.2.6: Computer Speed Factors and Data

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Processing Data

The CPU

The core of a computer is the Central Processing Unit, or CPU. It can be thought of as the “brains” of the device. The CPU carries out the commands sent to it by the software and returns results to be acted upon. The earliest CPUs were large circuit boards with limited functionality. Today, a CPU can perform a large variety of functions. There are two primary manufacturers of CPUs for personal computers: Intel and Advanced Micro Devices (AMD)



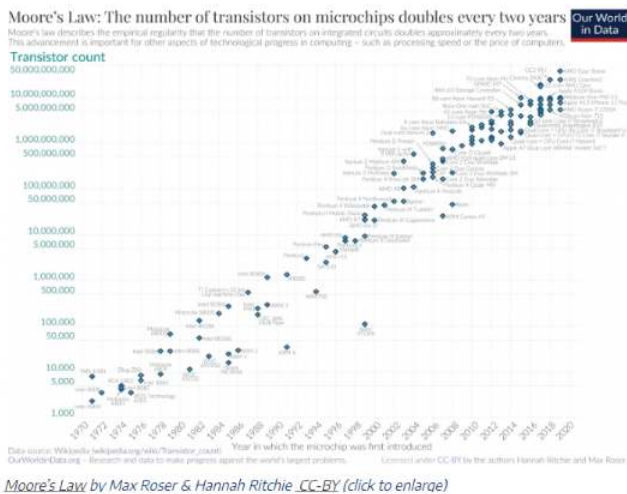
The speed (clock time) of a CPU is measured in hertz. A hertz is defined as one cycle per second. A kilohertz (kHz) is one thousand cycles per second, a megahertz (mHz) is one million cycles per second, and a gigahertz (GHz) is one billion cycles per second. The CPU’s processing power is increasing at an amazing rate.

Besides a faster clock time, today’s CPU chips contain multiple processors. These chips, known as dual-core (two processors) or quad-core (four processors), increase the processing power of a computer by providing the capability of multiple CPUs all sharing the processing load. Intel’s Core i7 processors contain 6 cores and their Core i9 processors contain 16 cores.

Faster & Cheaper

Faster and cheaper are two words that have driven the computer industry for decades. This phenomenon of “faster, cheaper” computing is often referred to as ‘Moore’s Law’, after Intel co-founder, Gordon Moore. Moore recognized that microprocessor transistor counts had been doubling every year, enabling the development of more powerful chips to be manufactured at cheaper prices.[1] Moore’s Law has been generalized into the concept that computing power will double every two years for the same price point. Another way of looking at this is to think that the price for the same computing power will be cut in half every two years. Moore’s Law has held true for over fifty years. (See image below).

The limits of Moore’s Law are now being reached and circuits cannot be reduced further, but a new law, [Huang’s Law](#) has arrived. This law, named for Nvidia’s CEO Jensen Huang, says that Graphics Processing Units (GPUs) which power artificial intelligence, are increasing faster than Moore’s Law. In fact the performance has more than doubled every year. [2]



Section Footnote Links

1. Moore, G. E. (1965). Cramming more components onto integrated circuits. Electronics Magazine, 4 ↵
2. Mims, C. (2020, Sept 19). Huang's Law Is the New Moore's Law, and Explains Why Nvidia Wants ARM. The Wall Street Journal. <https://www.wsj.com/articles/huangs-law-is-the-new-moores-law-and-explains-why-nvidia-wants-arm-11600488001> ↵

Storing Data

Random-Access Memory

When a computer boots up (starts), it begins to load information from storage into its working memory. This working memory, called Random-Access Memory (RAM), can transfer data much faster than the hard disk. Any program that you are running on the computer is loaded into RAM for processing. In order for a computer to work effectively, some minimal amount of RAM must be installed. In most cases, adding more RAM will allow the computer to run faster. Another characteristic of RAM is that it is "volatile." This means that it can store data as long as it is receiving power. When the computer is turned off, any data stored in RAM is lost.

Hard Disk

While the RAM is used as working memory, the computer also needs a place to store data for the longer term. Most of today's personal computers use a hard disk for long-term data storage. A hard disk is considered non-volatile storage because when the computer is turned off the data remains in storage on the disk, ready for when the computer is turned on. Drives with a capacity less than 1 Terabyte usually have just one platter. Notice the single platter in the image. The read/write arm must be positioned over the appropriate track before accessing or writing data.



Hard Disk by Evan-Amos CC-BY-SA

Solid State Drives

Solid State Drives (SSD) are becoming more popular in personal computers. The SSD performs the same function as a hard disk, namely long-term storage. Instead of spinning disks, the SSD uses flash memory that incorporates EEPROM (Electrically Erasable Programmable Read Only Memory) chips, which is much faster.



Solid State Drive by Hans Haase CC-BY-SA

Solid-state drives are currently a bit more expensive than hard disks. However, the use of flash memory instead of disks makes them much lighter and faster than hard disks. SSDs are primarily utilized in portable computers, making them lighter, more durable, and more efficient. Some computers combine the two storage technologies, using the SSD for the most accessed data (such as the operating system) while using the hard disk for data that is accessed less frequently. SSDs are considered more reliable since there are no moving parts.



USB-C by Ajay-suresh CC-BY 2.0

Removable Media: USB Drive

Removable storage has changed greatly over the four decades of PCs. Floppy disks have been replaced by CD-ROM drives, then they were replaced by USB (Universal Serial Bus) drives. USB drives are now standard on all PCs, and USB-C is the latest version. USB-C's shape is oblong instead of rectangular and it is symmetrical, meaning it can be inserted either way which differs from the previous version. New specifications allow for greater data transfer speeds.[1]

Cloud Computing

In addition to the physical devices mentioned above, cloud computing offers another option for data storage. Cloud computing provides access to software applications, services and data storage through the internet. Online data storage provides many benefits including: accessibility, recovery and updates. Data is accessible from anywhere there is an internet connection and has a back-up function to mitigate the risk of data loss. As well, many service providers ensure automatic updating or syncing of data. Personal cloud storage providers include: [Microsoft OneDrive](#), [Google Drive](#), [Dropbox](#). Cloud computing is explored more in a later chapter.

Brant, T. (2021, April 28). What is USB-C? An explainer. PC Magazine. <https://www.pcmag.com/how-to/what-is-usb-c-an-explainer> ↵

Computer Speed Factors

The speed of a computer is determined by many elements, some related to hardware and some related to software. In hardware, speed is improved by giving the electrons shorter distances to travel in completing a circuit. Since the first CPU was created in the early 1970s, engineers have constantly worked to figure out how to shrink these circuits and put more and more circuits onto the same chip – these are known as integrated circuits. And this work has paid off as the speed of computing devices has been continuously improving.

Multi-core processors, or CPUs, have contributed to faster speeds. Intel engineers have also improved CPU speeds by using QuickPath Interconnect, a technique which minimizes the processor's need to communicate directly with RAM or the hard drive. Instead, the CPU contains a cache of frequently used data for a particular program. An algorithm evaluates a program's data usage and determines which data should be temporarily stored in the cache.

The hardware components that contribute to the speed of a personal computer are the CPU, the Motherboard, RAM, and the Hard Disk. In most cases, these items can be replaced with newer, faster components. The table below shows how each of these contributes to the speed of a computer. Besides upgrading hardware, there are many changes that can be made to the software of a computer to make it faster.

Componet	Speed measured by	Units	Description
CPU	Clock speed	GHz (billions of cycles)	Hertz indicates the time to takes to complete a cycle.
Motherboard	Bus speed	MHZ	The speed at which data can move across the bus.
RAM	Data tranfer rate	Mb/s (millions of bytes per second)	The time it takes for data to be transferred from memory to system measured in megabytes
Hard Disk	Access time	ms (millisecond)	The time it takes for the drive to locate the date to be accessed
Hard Disk	Date tranfer rate	MBit/s	The time it takes for date to be transferred from disk to system

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SECTION OVERVIEW

2.3: Software, Security, and AI

Topic hierarchy

2.3.1: Software Basics

2.3.2: Operating and Application Software

2.3.3: Mobile Software

2.3.4: Software- Obtaining and Open Source

2.3.5: Information Systems Security

2.3.6: AI Tools in Modern Business Software

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2.3.1: Software Basics

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Learning Objectives

By the end of this section, you will be able to:

- Explain what software is and what it does
- Describe each of the main software types used in business
- Understand how to install and maintain software

You learned about the history of computers and basic hardware in the Technology in Everyday Life and Business chapter. While hardware is the backbone of a computer, and knowledge of it and what can go wrong with it helps you to keep vital devices working properly, software is the lifeblood that gets work done personally and in the business world.

This chapter examines the basics of software programs. It also covers the terminology and functions common to most programs. Refer to this chapter as you work through the rest of the material in the textbook, especially when you encounter more advanced concepts.

One final note: Before beginning this chapter, be sure you know how to use your mouse to click and hover. Clicking (sometimes called pressing or selecting) the left side of the mouse tells it you want to activate a command directly on the screen. It is the most direct use of the mouse. Clicking the right side (called “right-clicking”) of the mouse will reveal a little screen with a menu of options. Don’t worry about those yet. And, finally, hovering over portions of the screen such as icons will give you a short descriptor of that tool or menu. When you hover, you do not click the mouse at all but rather direct it over the tool icon.

Mac Tip

You will need to hold the Control (Ctrl) key when clicking the mouse to reveal the menu of options, and then hold Command when clicking the mouse to activate a command directly on screen.

What Is Software?

When using a computer, we often hear the terms *programs*, *software*, and *applications*. Sometimes these terms are used interchangeably. However, there are some distinctions. Programs are the instructions that tell the computer how to operate and run specific tasks. Whereas software consists of the step-by-step instructions that tell a computer how to operate with its hardware. Software is essentially a collection of interlinked programs. More specifically, the instructions enable the program to perform specific actions such as printing, saving, or formatting text. These step-by-step instructions are written in computer language or code. Different types of programs include the Microsoft Office suite, educational software, and antivirus software.

There are two major categories of software: system-related software and application software. System software is related to the functioning of the computer. Examples include the computer’s operating system and the software needed to run items such as printers, the keyboard, and antivirus software. Applications are programs that are task-oriented, including those we will cover in this text such as word processing programs and presentation software. Internet browsers are also considered application programs. They are used to search for content on the internet.

There are several facets of programs that are consistent regardless of the type of program. The programs use computer programming to add the functionality for the software or application. For example, there is a specific computer programming language (or code) that is used to simply print a document. This language is the foundation for making the program work. The basic elements of programs are shown in Figure 2.2. They are:

- The graphical user interface (GUI) is the portion of a program that allows the user to interact with it. Commands in Office are organized in groupings called tabs, while in Google Workspace, these groupings are called menus.

- A menu bar, or ribbon, typically at the top of the screen, contains an array of general commands that the user can choose, such as changing the font, printing the file, or adding elements such as pictures or shapes. In Office, this is referred to as the ribbon.
- A toolbar, typically located below the menu bar, contains icons or graphical representations for commonly used commands such as Copy or Save that are more specific than those contained in the menu bar.
- A dialog box provides information or requests inputs. These boxes typically appear after a user action, such as clicking a button or selecting a menu option. For example, see Figure 2.2, which shows more options for changing the font color or size.
- The status bar is located at the bottom of the program window. Its main function is to show the status of the program, such as the number of pages.

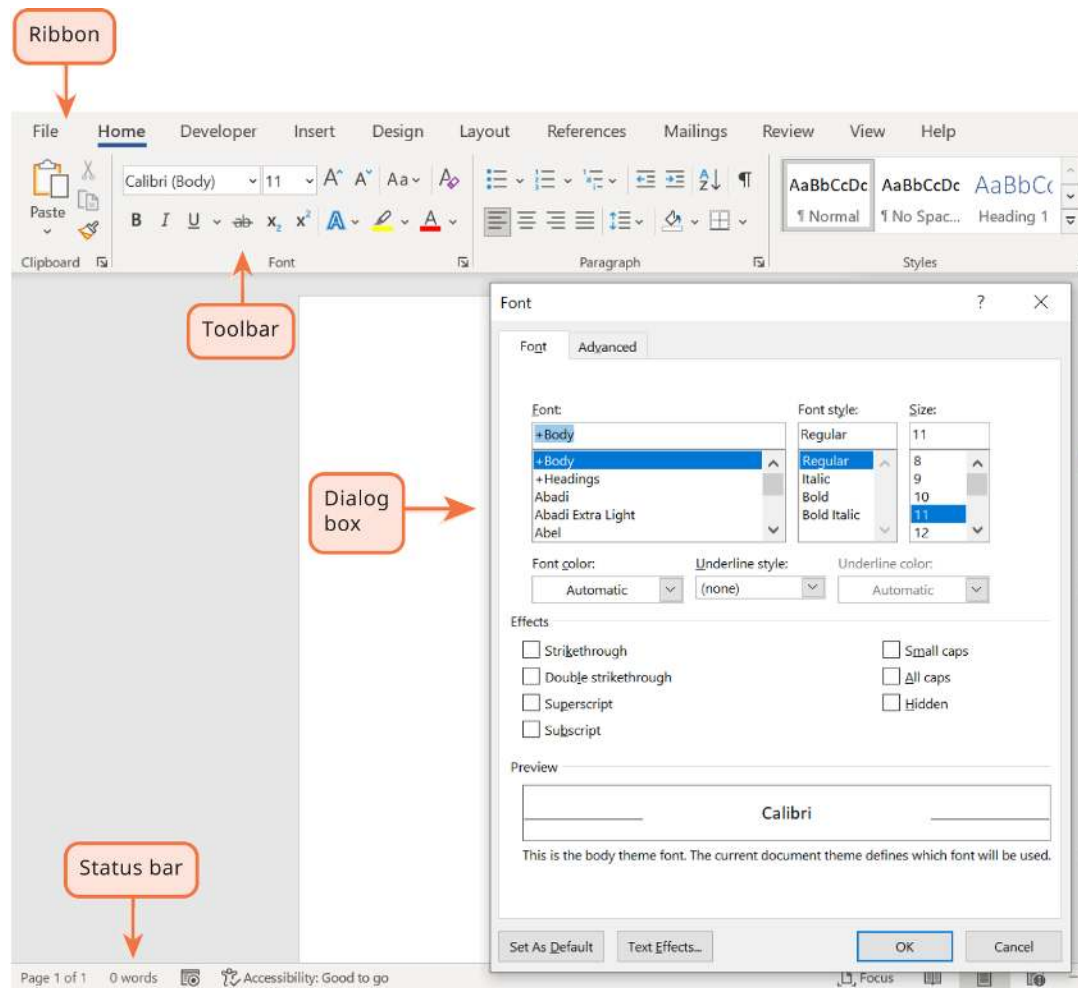


Figure 2.2: The common format for software includes a series of menus or toolbars at the top of the screen that are specific to the functionality of the program. (Used with permission from Microsoft)

Common Applications in Business

Task-oriented applications include word processing, spreadsheet, presentation, and database management programs. Figure 2.3 shows the icons for the popular applications in Google Workspace.

Specialized applications include programs used only for certain disciplines or occupations, such as QuickBooks, which is used for accounting. Mobile applications such as E-reader applications are programs designed primarily for smartphones and tablets.

A word processing application creates text-based documents such as memos, letters, and reports. Just about every organization uses word processing software, especially businesses, colleges, and universities. Microsoft Word is the most widely used word processing application, along with Google Docs and Open Office Writer.

A spreadsheet application organizes, analyzes, and uses numeric data. These applications are common in just about every profession today for compiling data in a table and creating visual displays (graphs and charts) of the information. Sales data from

WorldCorp can be analyzed using the tools in a spreadsheet application. The most widely used spreadsheet applications are Microsoft Excel and Google Sheets.

A presentation application combines graphics and text to create attractive slideshows. These applications are used by students in colleges and universities as well as in the business world. The most common presentation applications are Microsoft PowerPoint and Google Slides. Employees at WorldCorp can use presentation applications to prepare sales summaries to present to key executives at the company.

A database application is designed to organize and store large amounts of data. The information in a database program often includes both text and numeric information. Microsoft Access is a database application that can be used to compile and filter a large dataset. WorldCorp can use Access to store customer data in one file that includes information such as the customer address, historical purchase information, key contacts, and other related information.



Figure 2.3: Google Workspace includes applications for emailing, managing files, and creating spreadsheets. These are the common icons you will see most as you start to learn this suite. (Google Workspace is a trademark of Google LLC.)

Specialized applications include programs that are used only in certain disciplines or occupations, such as a design application used in the engineering profession. Another example would be tax software programs that accounting professionals use to prepare taxes for their clients. Desktop publishing enables users to mix text and graphics to create page designs and layouts for brochures, newsletters, and textbooks. Popular types of desktop publishing software include Adobe InDesign and Microsoft Publisher.

Finally, businesses might also use social media applications. Social media applications are used to create virtual networks or communities through which users connect and share information, messages, and/or content such as images and videos. These applications are accessed either through the internet or by downloading the application to your device. These applications are geared to connecting with others in a variety of different scenarios. For example, LinkedIn is a professional networking application that can help you connect with others in your career field. Social media applications will be covered in detail in Content Management Systems and Social Media in Business.

One of the first social media platforms was Myspace, which was used to connect individuals with family and friends, as well as for networking. Then came Facebook (which became more popular than Myspace), Instagram, LinkedIn, TikTok, and Twitter (now X). At WorldCorp, you would most likely use LinkedIn, which is a site tailored to the business world. Companies and workers share news, their résumés, and network through it. Social media also allows virtual collaboration, which plays a role in work life, as individuals can use Zoom or Microsoft Teams for business meetings, a feature that became crucial during the COVID pandemic. Many organizations also use social media for marketing purposes.

In addition to interacting with others, social media users can watch movies and play games on many different types of devices, including tablets, computers, and even cell phones through social media sites. The chapter Content Management Systems and Social Media in Business covers this topic in more depth.

Installing and Maintaining Software

Installing software is an automated process for the most part. Although there are some differences based on both the software and the operating systems (Windows or macOS), software installation follows a basic process. Acquisition of the software often begins with visiting the software website and purchasing the software download. Not all software requires a purchase. Some programs are freely available. Also, not all programs are directly downloaded onto your computer. With today's cloud-based technologies, some software exists in the cloud and instead you are downloading an app on your device to get access to the software.

Once you have identified the software you would like to install, generally you will find a link (or button) on the website that says Download. By clicking on the download, you agree to allow the software components to be added to your computer's hard drive. Also, although not as common today, software programs can be installed via a CD-ROM. If you have a CD-ROM to install the

software, often the installation process will begin once the CD is inserted in the CD drive. You will be prompted with similar dialog windows whether installing from a download or a CD-ROM.

Keep in mind that you need to do your research and use caution when choosing software from the internet to download. There are fake sites that exist for downloading software that could harm your computer. Additionally, sometimes there are options to download other software or additional features to install. These are generally not necessary and could again be potentially harmful to your computer. Take the time to make sure you are downloading software from trusted sites.

The installation begins with downloading a folder that contains the necessary files to install the software program on your computer. Two key files in the folder are the README file and the actual install file, which will have a .exe extension (the execute file). It is a good idea to read the README file. This file is a text file that contains the steps needed to install the program. It will also contain the system requirements information to determine if your computer is suitable for the program. The programs differ based on the computer space needed to store the software files and the version of the operating system needed for the software to function. The download prompter screens will often indicate the amount of space required for the installation.

Installation starts when you click on the .exe file. You will be prompted with a series of approvals at the beginning of the installation. These approvals could include the consent to make changes (add files) to your computer, closing all other open programs, and usage of the software. Some software programs will have options to customize the installation based on the elements you want installed or where you want to place the installation files. You may be prompted with a dialog box asking you the type of installation, which could include options such as basic installation or customized. Often, the software developers will recommend the basic installation for most applications. Unless you have a reason not to complete the installation as recommended, there is usually no reason to choose a customized installation.

Mac Tip

.exe files are only for Windows computers and cannot be installed on macOS operating systems. The Mac operating system uses .dmg files.

Maintenance of software is simple. Developers of the programs will regularly check the programs for issues. At times, there may be a need to update the software. You might already be familiar with the concept with your cell phone. These updates improve security and functionality of the programs when issues arise. Installation of the updates can be set to be automatic, or you can manually and regularly check for updates of the software programs. Many programs will notify users when the program is opened if an update is available. Updating the software is a necessary part of keeping the program functional.

Troubleshooting issues in a program is another key component of being a software user. Most software has a Help function or menu available to assist the user with questions about the program. The items in the Help function are generally centered on issues of using the program itself. Items could include how to perform a certain task such as printing or other related items. If your issue is not solved with this type of assistance, most programs have a way to connect with the software company for more assistance through registering the software. This could be in the form of sending an email, contacting customer service by phone, or through a chat function in the program. Most problems with the functionality of a program can be resolved through one of these methods.

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2.3.2: Operating and Application Software

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Software

You will remember that computer hardware is the components of information technology that you can physically touch. Computing hardware is getting faster and cheaper, creating all sorts of exciting and disruptive opportunities for organizations. However, it is the software that makes the magic of computing happen. Software refers to a computer program or collection of programs—sets of instructions that tell the hardware what to do, and without software, the hardware would not be functional. Software gets your computer to behave like a Web browser or word processor, makes your phone play music and video, and enables your bank's ATM to spit out cash. In this chapter we will explore the different types of software, how to obtain it, and understand the importance of software from a managerial context.



Photo by Maxwell Nielsen / Unsplash License

Managers who understand software can better understand the possibilities and impact of technology. They can make better decisions regarding the strategic value of IT and the potential for technology-driven savings. They can appreciate the challenges, costs, security vulnerabilities, legal and compliance issues, and limitations involved in developing and deploying technology solutions.

Operating Systems

Software can be broadly divided into two categories: Operating Systems and Application Software.

Operating systems manage the hardware and create the interface between the hardware and the user. Operating systems are designed to create a platform so that programmers can write additional applications, allowing the computer to do even more useful things. Application software (sometimes referred to as software applications, applications or even just apps) performs specific tasks for the user.



Operating System
Placement (Software)

Operating Systems

An operating system is first loaded into the computer by the boot program, then it manages all of the programs in the computer, including both programs native to the operating system such as file and memory management and application software. Operating systems provide you with these key functions:

1. Managing the hardware resources of the computer;
2. Providing the user-interface components;
3. Providing a platform for software developers to write applications.

All computing devices require an operating system. The most popular operating systems for personal computers are: Microsoft Windows, Apple's Mac OS, and various versions of Linux. Smartphones and tablets run operating systems as well, such as iOS (Apple), and Android (Google).

Microsoft provided the first operating system for the IBM-PC, released in 1981. Their initial venture into a Graphical User Interface (GUI) operating system, known as Windows, occurred in 1985. A GUI provides the way a user interacts with a program on a computer. It is what gives a program its look and feel. Today's Windows 10 supports the 64-bit Intel CPU. Recall that "64-bit" indicates the size of data that can be moved within the computer.

Apple introduced the Macintosh computer 1984 with the first commercially successful GUI. Apple's operating system for the Macintosh is known as "Mac OS " and also uses an Intel CPU supporting 64-bit processing. Mac OS versions used to be named after mountains (such as El Capitan) and are now named after locations in California. The most recent version is called Monterey. Multitasking, virtual memory, and voice input have become standard features of both operating systems.

The Linux operating system is open source, meaning individual developers are allowed to make modifications to the programming code. Linux is a version of the Unix operating system. Unix runs on large and expensive minicomputers (computers that are smaller and less powerful than a mainframe or supercomputer but more expensive and more powerful than a personal computer). Linux developer Linus Torvalds, a professor in Finland and the creator of Linux, wanted to find a way to make Unix run on less expensive personal computers. Linux has many variations and now powers a large percentage of web servers in the world.

Why Is Microsoft Software So Dominant in the Business World?

If you've worked in business, you may have noticed that almost all computers in business run a version of Microsoft Windows. Many businesses used IBM mainframe computers back in the 1960s and 1970s. When businesses migrated to the microcomputer (personal computer) market, they elected to stay with IBM and chose the PC. Companies took the safe route, invested in the Microsoft operating system and in Microsoft software/applications.

Microsoft soon found itself with the dominant personal computer operating system for businesses. As the networked PC began to replace the mainframe computer, Microsoft developed a network operating system along with a complete suite of programs focused on business users. Today Microsoft's desktop operating system Windows controls 71% of the market, and their productivity software Office 365 has 48% of the market share. [1]

Liu, S. (2021, August 31). Topic: Microsoft. Statista. <https://www.statista.com/topics/823/microsoft/#dossierKeyfigures>. / ↵

Application Software

The second major category of software is Application Software. Application Software is used to accomplish a specific goal such as word processing, calculations on a spreadsheet, or surfing the internet using a web browser. There are many different types of application software, and they can work on mobile devices or desktop and laptop computers. Typically, software falls into the categories of productivity, multimedia, home, and communication and collaboration. This section will focus on a few of these categories below.



Productivity Software includes word processors, email clients, presentation and spreadsheet editors.

Productivity Software

Productivity software is a type of application software that has become a standard tool for the workplace. These programs allow office employees to complete their daily work efficiently. Many times these applications come packaged together as integrated software suites, such as in Microsoft's Office suite. Here is a list of some of these applications and their basic functions:

Word processing

- Users can create and edit documents using this class of software. Functions include the ability to type and edit text, format fonts and paragraphs, as well as add, move, and delete text throughout the document. Tables and images can be inserted. Documents can be saved in a variety of electronic file formats with Microsoft Word's DOCX being the most popular. Documents can also be converted to other formats such as Adobe's PDF (Portable Document Format) or to a TXT file.

Spreadsheet

- This class of software provides a way to do numeric calculations and analysis, displaying the result in charts and graphs. The working area is divided into rows and columns, where users can enter numbers, text, or formulas. It is the formulas that make a spreadsheet powerful, allowing the user to develop complex calculations that can change based on the numbers entered. The most popular spreadsheet package is Microsoft Excel, which saves its files in the XLSX format.

Presentation

- Users can create slideshow presentations using this class of software. The slides can be projected, printed, or distributed to interested parties. Text, images, audio, and visual can all be added to the slides. Microsoft's PowerPoint is the most popular software right now, saving its files in PPTX format.

Database management system

- This software serves as an electronic filing cabinet for records such as customer lists, employee data, and inventory information. Data can be sorted, manipulated and queried to create reports. (Databases are covered more in a later chapter)

Desktop publishing

- This software combines word processing, graphics, and page layout software to create documents. Allows companies to design and produce sales brochures, catalogs, advertisements, and newsletters in-house.

Financial software

- This software is used to compile accounting and financial data and create financial statements and reports.

Some office suites include other types of software. For example, Microsoft Office includes Outlook, its e-mail package, and OneNote, an information-gathering collaboration tool. The professional version of Office also includes Microsoft Access, a database package. Microsoft popularized the idea of the office-software productivity bundle with their release of the Microsoft Office Suite. This package continues to dominate the market and most businesses expect employees to know how to use this software. However, many competitors to Microsoft Office do exist and are compatible with the file formats used by Microsoft. Microsoft also offers a cloud-based version of their office suite named [Microsoft Office 365](#). Similar to [Google Drive](#), this suite allows users to edit and share documents online utilizing cloud-computing technology.

The "Killer" App: Spreadsheets

When a new type of digital device is invented, there are generally a small group of technology enthusiasts who will purchase it just for the joy of figuring out how it works. A "killer" application is one that becomes so essential that large numbers of people will buy a device just to run that application. For the personal computer, the killer application was the spreadsheet.

The first spreadsheet was created by an MBA student at Harvard University who tired of making repeated calculations to determine the optimal result on a problem and decided to create a tool that allowed the user to easily change values and recalculate formulas. The result was the spreadsheet. Today's dominant spreadsheet is Microsoft Excel which still retains the basic functionality of the first spreadsheet.

Collaborative Systems

As organizations began to implement networking technologies, information systems emerged that allowed employees to begin collaborating in different ways. These systems allowed users to brainstorm ideas together without the necessity of physical, face-to-face meetings. Tools such as video conferencing with [Zoom](#) or [WebEx](#), collaboration and document sharing with Microsoft SharePoint or Teams, and project management with SAP's Project System make collaboration possible in a variety of endeavors.

Broadly speaking, any software that allows multiple users to interact on a document or topic could be considered collaborative. Electronic mail, a shared Word document, and social networks fall into this broad definition. However, many software tools have

been created that are designed specifically for collaborative purposes. These tools offer a broad spectrum of collaborative functions. Here is just a short list of some collaborative tools available for businesses today:

- **Google Drive.** Google Drive offers a suite of office applications (such as a word processor, spreadsheet, drawing, presentation) that can be shared between individuals. Multiple users can edit the documents at the same time and the threaded comments option is available.
- **Microsoft SharePoint.** SharePoint integrates with Microsoft Office and allows for collaboration using tools most office workers are familiar with. SharePoint will be covered in greater detail in chapter 5.
- **Cisco WebEx.** WebEx combines video and audio communications and allows participants to interact with each other's computer desktops. WebEx also provides a shared whiteboard and the capability for text-based chat to be going on during the sessions, along with many other features. Mobile editions of WebEx allow for full participation using smartphones and tablets.
- **GitHub.** Programmers/developers use GitHub for web-based team development of computer software.

Utility Software and Programming Software

Utility software includes programs that allow you to fix or modify your computer in some way. Examples include anti-malware software and programs that totally remove software you no longer want installed. These types of software packages were created to fill shortcomings in operating systems. Many times a subsequent release of an operating system will include these utility functions as part of the operating system itself.

Programming software's purpose is to produce software. Most of these programs provide developers with an environment in which they can write the code, test it, and convert/compile it into the format that can then be run on a computer. This software is typically identified as the Integrated Development Environment (IDE) and is provided free from the corporation that developed the programming language that will be used to write the code.

Software Providers

There are hundreds of types of businesses that require systems to facilitate operations. A look at the software providers by category as compiled by [Capterra](https://www.capterra.com/categories) (<https://www.capterra.com/categories>) gives you some insight into how expansive the information systems industry actually is.

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2.3.3: Mobile Software

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Just as with the personal computer, mobile devices such as smartphones and tablets also have operating systems and application software. These mobile devices are in many ways just smaller versions of personal computers. A mobile app is a software application designed to run specifically on a mobile device.

As discussed in a previous chapter smartphones are becoming the dominant form of computing, with more smartphones being sold than personal computers. Businesses have adjusted to this trend by increasing their investment in the development of apps for mobile devices. The number of mobile apps in the Apple App Store has increased from zero in 2008 to over 2 million in 2017.[1]

Cloud Computing

Historically, an individual copy of the software had to be installed on the computer to use it. The concept of cloud computing changed this, as applications, services, and data storage are made accessible through the internet. Cloud service providers rely on giant server farms and massive storage devices that are connected via a network.

You probably already use cloud computing in some form. For example, if you access your email on your web browser, or use Google Drive's applications you are using a form of cloud computing. While these are free versions of cloud computing, there is big business in providing applications and data storage over the web. Software as a service (SaaS) is software that is rented rather than purchased. It is subscription-based. Software as a service gives companies access to a large assortment of software packages without having to invest in hardware or install and maintain software on their own computers. The available software, which includes e-mail and collaboration systems and customer relationship management programs, can be customized and used by an individual client or shared among several clients.

Advantages of Cloud Computing

- No software to install or upgrades to maintain.
- Available from any computer that has access to the Internet.
- Can scale to a large number of users easily.
- New applications can be up and running very quickly.
- Services can be leased for a limited time on an as-needed basis.
- Your information is not lost if your hard disk crashes or your laptop is lost or stolen.
- You are not limited by the available memory or disk space on your computer.

Disadvantages of Cloud Computing

- Your information is stored on someone else's computer.
- You must have Internet access to use it.
- You are relying on a third-party to provide these services.
- Cloud computing has the ability to really impact how organizations manage technology. For example, why is an IT department needed to purchase, configure, and manage personal computers and software when all that is really needed is an Internet connection?
- Automatic upgrades can be done without notice causing confusion for the user

The benefit is that all of the software requirements are outsourced to a company with expertise. However, the concern is that this can leave a company vulnerable. If a traditional software company goes out of business, in most cases its customers can still go on using its products. But if your SaaS vendor goes under, they have all the data, and even if firms could get their data out, most organizations don't have the hardware, software, staff, or expertise to quickly absorb an abandoned function. Firms that buy and install packaged software usually have the option of sticking with the old stuff as long as it works, but organizations adopting SaaS may find they are forced into adopting new versions. Keep in mind that SaaS systems are also reliant on a network connection. If a firm's link to the Internet goes down, the link to its SaaS vendor is also severed. Relying on an Internet connection also means that data is transferred to and from a SaaS firm at Internet speeds, rather the potentially higher speeds of a firm's internal network.

Amazon Web Services (AWS)

Cloud computing is not limited to web applications. It can also be used for services such as audio or video streaming. Amazon Web Services (AWS) is the largest on-demand cloud computing platform. AWS offers more than 90 services ranging from computing, storage, networking, database, analytics application services, deployment, mobile, developer tools, and the Internet of Things.[2]

Using a Private Cloud

Many organizations are understandably nervous about giving up control of their data and some of their applications by using cloud computing. But they also see the value in reducing the need for installing software and adding disk storage to local computers. A solution to this problem lies in the concept of a private cloud. While there are various models of a private cloud, the basic idea is for the cloud service provider to section off web server space for a specific organization. The organization has full control over that server space while still gaining some of the benefits of cloud computing.

Virtualization

Virtualization is the process of using software to simulate a computer or some other device. For example, using virtualization a single physical computer can perform the functions of several virtual computers, usually referred to as Virtual Machines (VMs). Organizations implement virtual machines in an effort to reduce the number of physical servers needed to provide the necessary services to users. This reduction in the number of physical servers also reduces the demand for electricity to run and cool the physical servers. For more detail on how virtualization works, [see this informational page from VMWare](#).

Section Footnote Links

1. Statista. (2018). Number of apps in Apple App Store July 2008 to January 2017. <https://www.statista.com/statistics/263795/number-of-available-apps-in-the-apple-app-store/>. ↵
2. Wikiversity. (n.d.). Amazon Web Services. https://en.wikiversity.org/wiki/Amazon_Web_Services ↵

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2.3.4: Software- Obtaining and Open Source

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Obtaining Software

Software can be obtained in a number of different ways. It can be developed internally which is referred to as proprietary software, or it can be purchased off-the-shelf, also referred to as packaged software. Proprietary software is developed for a specific problem and is owned by the company. If the company does not have the resources within, they may contract another company to build the software for them. Off-the-shelf software is software that is readily available and already developed, such as Microsoft Windows or the Office Suite.

Proprietary Software	Off- the-shelf Software
Advantages Get exactly what you need and want. Control over the process.	Advantages Initial cost is lower. Usually will meet the basic need of the organization, and may have the ability to customize. Support and training available
Disadvantages Significant investment (time and money) Need to provide ongoing support and maintenance	Disadvantages Might pay for features that are not needed or wanted. Software may lack requires features and customization can be costly.

Software Creation

Software is created via programming, which is the process of creating a set of logical instructions for a digital device to follow. The process of programming is sometimes called “coding” because the developer takes the design and encodes it into a programming language which then runs on the computer. Modern software applications are written using a programming language such as Java, Visual C, C++, Python, etc. A programming language consists of a set of commands and syntax that can be organized logically to execute specific functions. Using this language a programmer writes a program (known as source code) that can then be compiled into machine-readable form, the ones and zeroes necessary to be executed by the CPU. Languages such as HTML and Javascript are used to develop web pages.

Software programming was originally an individual process, with each programmer working on an entire program, or several programmers each working on a portion of a larger program. However, newer methods of software development include a more collaborative approach, with teams of programmers working on code together. When the personal computer was first released, it did not serve any practical need. Early computers were difficult to program and required great attention to detail. However, many personal-computer enthusiasts immediately banded together to build applications and solve problems. These computer enthusiasts were happy to share any programs they built and solutions to problems they found; this collaboration enabled them to innovate and fix problems quickly.

As software began to become a business, however, this idea of sharing everything fell out of favor, at least with some. When a software program takes hundreds of man-hours to develop, it is understandable that the programmers do not want to just give it away. This led to a new business model of restrictive software licensing, which required payment for software, a model that is still dominant today. This model is sometimes referred to as closed source, as the source code is not made available to others.

Software Ownership

When you purchase software and install it on your computer, are you the owner of that software? Technically, you are not. When you install software, you are actually just being given a license to use it. When you first install a package, you are asked to agree to the terms of service or the license agreement. In that agreement, you will find that your rights to use the software are limited. For

example, in the terms of the Microsoft Office software license, you will find the following statement: “This software is licensed, not sold. This agreement only gives you some rights to use the features included in the software edition you licensed.” [1]

For the most part, these restrictions are what you would expect. You cannot make illegal copies of the software and you may not use it to do anything illegal. However, there are other, more unexpected terms in these software agreements. For example, many software agreements ask you to agree to a limit on liability. This means if a problem with the software causes harm to your business, you cannot hold Microsoft or the supplier responsible for damages.

Section Footnote Links

1. Microsoft. (n.d.) Microsoft software license terms. <https://support.microsoft.com/en-us/windows/microsoft-software-license-terms-e26eedad-97a2-5250-2670-aad156b654bd> ↵

Open Source Software

The last section discussed closed source software where the source code is not available to others to use or copy. However, there are many who feel that software should not be restricted in this way. Just as with those early hobbyists in the 1970s, they feel that innovation and progress can be made much more rapidly if they share what has been learned. In the 1990s, with Internet access connecting more people together, the open-source movement gained steam.

Open-source software makes the source code available for anyone to copy and use. For most people having access to the source code of a program does little good since it is challenging to modify existing programming code. However, open-source software is also available in a compiled format that can be downloaded and installed. The open-source movement has led to the development of some of the most used software in the world such as the Firefox browser, the Linux operating system, and the Apache web server.

Many businesses are wary of open-source software precisely because the code is available for anyone to see. They feel that this increases the risk of an attack. Others counter that this openness actually decreases the risk because the code is exposed to thousands of programmers who can incorporate code changes to quickly patch vulnerabilities. There are many arguments on both sides of the open-source model debate and can be found below.

Advantages of Open Source

- The software is available for free
- The software source-code is available; it can be examined and reviewed before it is installed.
- The large community of programmers who work on open-source projects leads to quick bug-fixing and feature additions.

Disadvantages of Open Source

- Technical support is not available like with traditional software products.
- Software companies provide updates and features as required by the users.
- The user interface may be more challenging to use.

Open Source Applications

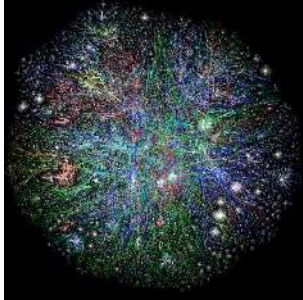
There are thousands of open-source applications available for download. For example, you can get the productivity suite from Open Office. One good place to search for open-source software is sourceforge.net, where thousands of programs are available for free download.

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2.3.5: Information Systems Security

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Introduction



Internet security is a tree branch of computer security specifically related to the Internet, often involving browser security but also network security on a more general level as it applies to other applications or operating systems on a whole. Its objective is to establish rules and measures to use against attacks over the Internet. The Internet represents an insecure channel for exchanging information leading to a high risk of intrusion or fraud, such as phishing. Different methods have been used to protect the transfer of data, including encryption.

Types of security

Network layer security

TCP/IP which stands for Transmission Control Protocol (TCP) and Internet Protocol (IP) aka Internet protocol suite can be made secure with the help of cryptographic methods and protocols. These protocols include Secure Sockets Layer (SSL), succeeded by Transport Layer Security (TLS) for web traffic, Pretty Good Privacy (PGP) for email, and IPsec for the network layer security.

Internet Protocol Security (IPsec)

This protocol is designed to protect communication in a secure manner using TCP/IP aka Internet protocol suite. It is a set of security extensions developed by the Internet Task force IETF, and it provides security and authentication at the IP layer by transforming data using encryption. Two main types of transformation that form the basis of IPsec: the Authentication Header (AH) and ESP. These two protocols provide data integrity, data origin authentication, and anti-replay service. These protocols can be used alone or in combination to provide the desired set of security services for the Internet Protocol (IP) layer.

The basic components of the IPsec security architecture are described in terms of the following functionalities:

- Security protocols for AH and ESP
- Security association for policy management and traffic processing
- Manual and automatic key management for the Internet key exchange (IKE)
- Algorithms for authentication and encryption

The set of security services provided at the IP layer includes access control, data origin integrity, protection against replays, and confidentiality. The algorithm allows these sets to work independently without affecting other parts of the implementation. The IPsec implementation is operated in a host or security gateway environment giving protection to IP traffic.

Security token

Some online sites offer customers the ability to use a six-digit code which randomly changes every 30–60 seconds on a security token. The keys on the security token have built in mathematical computations and manipulate numbers based on the current time built into the device. This means that every thirty seconds there is only a certain array of numbers possible which would be correct to validate access to the online account. The website that the user is logging into would be made aware of that devices' serial

number and would know the computation and correct time built into the device to verify that the number given is indeed one of the handful of six-digit numbers that works in that given 30-60 second cycle. After 30-60 seconds the device will present a new random six-digit number which can log into the website.

Electronic mail security (E-mail)

Background

Email messages are composed, delivered, and stored in a multiple step process, which starts with the message's composition. When the user finishes composing the message and sends it, the message is transformed into a standard format: an RFC 2822 formatted message. Afterwards, the message can be transmitted. Using a network connection, the mail client, referred to as a mail user agent (MUA), connects to a mail transfer agent (MTA) operating on the mail server. The mail client then provides the sender's identity to the server. Next, using the mail server commands, the client sends the recipient list to the mail server. The client then supplies the message. Once the mail server receives and processes the message, several events occur: recipient server identification, connection establishment, and message transmission. Using Domain Name System (DNS) services, the sender's mail server determines the mail server(s) for the recipient(s). Then, the server opens up a connection(s) to the recipient mail server(s) and sends the message employing a process similar to that used by the originating client, delivering the message to the recipient(s).

Pretty Good Privacy (PGP)

Pretty Good Privacy provides confidentiality by encrypting messages to be transmitted or data files to be stored using an encryption algorithm such Triple DES or CAST-128. Email messages can be protected by using cryptography in various ways, such as the following:

- Signing an email message to ensure its integrity and confirm the identity of its sender.
- Encrypting the body of an email message to ensure its confidentiality.
- Encrypting the communications between mail servers to protect the confidentiality of both message body and message header.

The first two methods, message signing and message body encryption, are often used together; however, encrypting the transmissions between mail servers is typically used only when two organizations want to protect emails regularly sent between each other. For example, the organizations could establish a virtual private network (VPN) to encrypt the communications between their mail servers over the Internet. Unlike methods that can only encrypt a message body, a VPN can encrypt entire messages, including email header information such as senders, recipients, and subjects. In some cases, organizations may need to protect header information. However, a VPN solution alone cannot provide a message signing mechanism, nor can it provide protection for email messages along the entire route from sender to recipient.

Multipurpose Internet Mail Extensions (MIME)

MIME transforms non-ASCII data at the sender's site to Network Virtual Terminal (NVT) ASCII data and delivers it to client's Simple Mail Transfer Protocol (SMTP) to be sent through the Internet. The server SMTP at the receiver's side receives the NVT ASCII data and delivers it to MIME to be transformed back to the original non-ASCII data.

Message Authentication Code

A Message authentication code (MAC) is a cryptography method that uses a secret key to encrypt a message. This method outputs a MAC value that can be decrypted by the receiver, using the same secret key used by the sender. The Message Authentication Code protects both a message's data integrity as well as its authenticity.

Firewalls



A computer firewall controls access between networks. It generally consists of gateways and filters which vary from one firewall to another. Firewalls also screen network traffic and are able to block traffic that is dangerous. Firewalls act as the intermediate server between SMTP and Hypertext Transfer Protocol (HTTP) connections.

Role of firewalls in web security

Firewalls impose restrictions on incoming and outgoing Network packets to and from private networks. Incoming or outgoing traffic must pass through the firewall; only authorized traffic is allowed to pass through it. Firewalls create checkpoints between an internal private network and the public Internet, also known as *choke points* (borrowed from the identical military term of a combat limiting geographical feature). Firewalls can create choke points based on IP source and TCP port number. They can also serve as the platform for IPsec. Using tunnel mode capability, firewall can be used to implement VPNs. Firewalls can also limit network exposure by hiding the internal network system and information from the public Internet.

Types of firewall

Packet filter

A packet filter is a first generation firewall that processes network traffic on a packet-by-packet basis. Its main job is to filter traffic from a remote IP host, so a router is needed to connect the internal network to the Internet. The router is known as a screening router, which screens packets leaving and entering the network.

Stateful packet inspection

In a stateful firewall the circuit-level gateway is a proxy server that operates at the network level of an Open Systems Interconnection (OSI) model and statically defines what traffic will be allowed. Circuit proxies will forward Network packets (formatted unit of data) containing a given port number, if the port is permitted by the algorithm. The main advantage of a proxy server is its ability to provide Network Address Translation (NAT), which can hide the user's IP address from the Internet, effectively protecting all internal information from the Internet.

Application-level gateway

An application-level firewall is a third generation firewall where a proxy server operates at the very top of the OSI model, the IP suite application level. A network packet is forwarded only if a connection is established using a known protocol. Application-level gateways are notable for analyzing entire messages rather than individual packets of data when the data are being sent or received.

Malicious software

A computer user can be tricked or forced into downloading software onto a computer that is of malicious intent. Such software comes in many forms, such as viruses, Trojan horses, spyware, and worms.

- Malware, short for malicious software, is any software used to disrupt computer operation, gather sensitive information, or gain access to private computer systems. Malware is defined by its malicious intent, acting against the requirements of the computer user, and does not include software that causes unintentional harm due to some deficiency. The term badware is sometimes used, and applied to both true (malicious) malware and unintentionally harmful software.
- A botnet is a network of zombie computers that have been taken over by a robot or bot that performs large-scale malicious acts for the creator of the botnet.
- Computer Viruses are programs that can replicate their structures or effects by infecting other files or structures on a computer. The common use of a virus is to take over a computer to steal data.
- Computer worms are programs that can replicate themselves throughout a computer network, performing malicious tasks throughout.
- Ransomware is a type of malware which restricts access to the computer system that it infects, and demands a ransom paid to the creator(s) of the malware in order for the restriction to be removed.
- Scareware is scam software with malicious payloads, usually of limited or no benefit, that are sold to consumers via certain unethical marketing practices. The selling approach uses social engineering to cause shock, anxiety, or the perception of a threat, generally directed at an unsuspecting user.
- Spyware refers to programs that surreptitiously monitor activity on a computer system and report that information to others without the user's consent.

- A Trojan horse, commonly known as a *Trojan*, is a general term for malicious software that pretends to be harmless, so that a user willingly allows it to be downloaded onto the computer.

Denial-of-service attack

A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer resource unavailable to its intended users. Although the means to carry out, motives for, and targets of a DoS attack may vary, it generally consists of the concerted efforts to prevent an Internet site or service from functioning efficiently or at all, temporarily or indefinitely. According to businesses who participated in an international business security survey, 25% of respondents experienced a DoS attack in 2007 and 16.8% experienced one in 2010.

Phishing



Phishing is another common threat to the Internet. “SA, the Security Division of EMC, today announced the findings of its January 2013 Fraud Report, estimating the global losses from Phishing at \$1.5 Billion in 2012.”. Filter evasion, website forgery, phone phishing, Covert Redirect are some well known phishing techniques.

Hackers use a variety of tools to conduct phishing attacks. They create forged websites that pretend to be other websites in order for users to leave their personal information. These hackers usually host these sites on legitimate hosting services using stolen credit cards while the last trend is to use a mailing system and finding a mailing list of people which they can try and fraud.

Browser choice

Web browser statistics tend to affect the amount a Web browser is exploited. For example, Internet Explorer 6, which used to own a majority of the Web browser market share, is considered extremely insecure because vulnerabilities were exploited due to its former popularity. Since browser choice is more evenly distributed (Internet Explorer at 28.5%, Firefox at 18.4%, Google Chrome at 40.8%, and so on) and vulnerabilities are exploited in many different browsers.

Application vulnerabilities

Applications used to access Internet resources may contain security vulnerabilities such as memory safety bugs or flawed authentication checks. The most severe of these bugs can give network attackers full control over the computer. Most security applications and suites are incapable of adequate defense against these kinds of attacks.

Internet security products

Antivirus

Antivirus and Internet security programs can protect a programmable device from malware by detecting and eliminating viruses; Antivirus software was mainly shareware in the early years of the Internet, but there are now several free security applications on the Internet to choose from for all platforms.

Security suites

So called “security suites” were first offered for sale in 2003 (McAfee) and contain a suite of firewalls, anti-virus, anti-spyware and more.^[15] They may now offer theft protection, portable storage device safety check, private Internet browsing, cloud anti-spam, a file shredder or make security-related decisions (answering popup windows) and several were free of charge as of at least 2012.

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Internet and Computer Safety Tips

The following article was retrieved from usa.kapersky.com (Kapersky.com, n.d.)

A 19-year-old running for public office in New Hampshire found out about the importance of following Internet safety rules the hard way. As [Seacoast Online](#) reports, his opponents found images in his social media posts that were sexually suggestive and referenced past drug use. Just like that, his political career crashed and burned upon takeoff. But, unfortunately, he isn't the only one, as careless Internet habits have left others exposed to scams, identity theft and physical harm at the hands of people they met online. With more users accessing the Internet through mobile devices, these risks are changing and growing quickly. Even though apps loom larger in most people's daily online interactions than traditional websites do, that does not mean that the basic Internet safety rules have changed. Hackers are still on the lookout for personal information they can use to access your credit card and bank information. Unsafe surfing can also lead to other threats—from embarrassing personal comments or images that, once online, are nearly impossible to erase, to getting mixed up with people you'd rather have had nothing to do with.

Here are the Top 10 Internet safety rules to help you avoid getting into trouble online (and offline).

1. **Keep Personal Information Professional and Limited:** Potential employers or customers don't need to know your personal relationship status or your home address. They do need to know about your expertise and professional background, and how to get in touch with you. You wouldn't hand purely personal information out to strangers individually—don't hand it out to millions of people online.
2. **Keep Your Privacy Settings On:** Marketers love to know all about you, and so do hackers. Both can learn a lot from your browsing and social media usage. But you can take charge of your information. As noted by Lifehacker, both web browsers and mobile operating systems have settings available to protect your privacy online. Major websites like Facebook also have privacyenhancing settings available. These settings are sometimes (deliberately) hard to find because companies want your personal information for its marketing value. Make sure you have enabled these privacy safeguards and keep them enabled.
3. **Practice Safe Browsing:** You wouldn't choose to walk through a dangerous neighborhood—don't visit dangerous neighborhoods online. Cybercriminals use lurid content as bait. They know people are sometimes tempted by dubious content and may let their guard down when searching for it. The Internet's demimonde is filled with hard-to-see pitfalls, where one careless click could expose personal data or infect your device with malware. By resisting the urge, you don't even give the hackers a chance.
4. **Make Sure Your Internet Connection is Secure.** Make sure your device is secure, and when in doubt, wait for a better time (i.e., until you're able to connect to a secure Wi-Fi network) before providing information such as your bank account number.
5. **Be Careful What You Download:** A top goal of cybercriminals is to trick you into downloading malware—programs or apps that carry malware or try to steal information. This malware can be disguised as an app: anything from a popular game to something that checks traffic or the weather. Don't download apps that look suspicious or come from a site you don't trust.
6. **Choose Strong Passwords:** Passwords are one of the biggest weak spots in the whole Internet security structure, but there's currently no way around them. And the problem with passwords is that people tend to choose easy ones to remember (such as "password" and "123456"), which are also easy for cyber thieves to guess. Select strong passwords that are harder for cybercriminals to demystify. Password manager software can help you to manage multiple passwords so that you don't forget

them. A strong password is one that is unique and complex—at least 15 characters long, mixing letters, numbers and special characters.

7. **Make Online Purchases from Secure Sites:** Any time you make a purchase online, you need to provide credit card or bank account information—just what cybercriminals are most eager to get their hands on. Only supply this information to sites that provide secure, encrypted connections. As Boston University notes, you can identify secure sites by looking for an address that starts with https: (the S stands for secure) rather than simply Http: They may also be marked by a padlock icon next to the address bar.
8. **Be Careful What You Post:** The Internet does not have a delete key, as that young candidate in New Hampshire found out. Any comment or image you post online may stay online forever because removing the original (say, from Twitter) does not remove any copies that other people made. There is no way for you to "take back" a remark you wish you hadn't made or get rid of that embarrassing selfie you took at a party. Don't put anything online that you wouldn't want your mom or a prospective employer to see.
9. **Be Careful Who You Meet Online:** People you meet online are not always who they claim to be. Indeed, they may not even be real. Be as cautious and sensible in your online social life as you are in your in-person social life.
10. **Keep Your Antivirus Program Up to Date:** Internet security software cannot protect against every threat, but it will detect and remove most malware—though you should make sure it's to date. Be sure to stay current with your operating system's updates and updates to the applications you use. They provide a vital layer of security.

Keep these 10 basic Internet safety rules in mind and you'll avoid many of the nasty surprises that lurk online for the careless

Authentication and Identification

What is Authentication?

Authentication is the process of verifying whether someone (or something) is, in fact, who (or what) it is declared to be. According to the National Institute of Standards and Technology authentication is defined as "Authentication: Verifying the identity of a user, process, or device, often as a prerequisite to allowing access to resources in an information system". Notice that this definition does not restrict authentication to human users. It includes processes or devices.

Authentication factors

The ways in which someone may be authenticated fall into four categories, based on what is known as the factors of authentication: something the user *knows*, something the user *has*, something the user *does*, and something the user *is*. Each **authentication factor** covers a range of elements used to authenticate or verify a person's identity prior to being granted access, approving a transaction request, signing a document or other work product, granting authority to others, and establishing a chain of authority.

Security research has determined that for a positive authentication, elements from at least two, and preferably all three, factors should be verified. The four factors (classes) and some of the elements of each factor are:

- the knowledge factors: Something the user knows (e.g., a password, partial password, passphrase, personal identification number (PIN), challenge-response (the user must answer a question or pattern), security question).
- the ownership factors: Something the user possesses (e.g., wrist band, ID card, security token, implanted device, cell phone with a built-in hardware token, software token, or cell phone holding a software token).
- the inherence factors: Something the user is or does (e.g., fingerprint, retinal pattern, DNA sequence (there are assorted definitions of what is sufficient), signature, face, voice, unique bio-electric signals, or other biometric identifiers).
- the location factors: Somewhere the user is (e.g. connection to a specific computing network or using a GPS signal to identify the location).

Multi-factor authentication

Multi-factor authentication is an electronic authentication method in which a computer user is granted access to a website or application only after successfully presenting two or more pieces of evidence (or factors) to an authentication mechanism: knowledge (something only the user knows), possession (something only the user has), and inherence (something only the user is). It protects the user from an unknown person trying to access their data such as personal ID details or financial assets.

Authentication takes place when someone tries to log into a computer resource (such as a network, device, or application). The resource requires the user to supply the identity by which the user is known to the resource, along with evidence of the authenticity of the user's claim to that identity. Simple authentication requires only one such piece of evidence (factor), typically a password. For additional security, the resource may require more than one factor—multi-factor authentication, or two-factor authentication in cases where exactly two pieces of evidence are to be supplied.

The use of multiple authentication factors to prove one's identity is based on the premise that an unauthorized actor is unlikely to be able to supply the factors required for access. If in an authentication attempt, at least one of the components is missing or supplied incorrectly, the user's identity is not established with sufficient certainty and access to the asset (e.g., a building, or data) being protected by multi-factor authentication then remains blocked.

Knowledge

Knowledge factors are the most commonly used form of authentication. In this form, the user is required to prove knowledge of a secret in order to authenticate.

A password is a secret word or string of characters that is used for user authentication. This is the most commonly used mechanism of authentication. Many multi-factor authentication techniques rely on passwords as one factor of authentication. Variations include both longer ones formed from multiple words (a passphrase) and the shorter, purely numeric, personal identification number (PIN) commonly used for ATM access. Traditionally, passwords are expected to be memorized.

Many secret questions such as "Where were you born?" are poor examples of a knowledge factor because they may be known to a wide group of people, or be able to be researched.

Possession

Possession factors ("something only the user has") have been used for authentication for centuries, in the form of a key to a lock. The basic principle is that the key embodies a secret that is shared between the lock and the key, and the same principle underlies possession factor authentication in computer systems. A security token is an example of a possession factor.

Disconnected tokens have no connections to the client's computer. They typically use a built-in screen to display the generated authentication data, which is manually typed in by the user. This type of token mostly uses a "one-time password" that can only be used for that specific session.

Connected tokens are devices that are physically connected to the computer to be used. Those devices transmit data automatically. There are a number of different types, including card readers, wireless tags, and USB tokens.

A software token (a.k.a. soft token) is a type of two-factor authentication security device that may be used to authorize the use of computer services. Software tokens are stored on a general-purpose electronic device such as a desktop computer, laptop, PDA, or mobile phone and can be duplicated. (Contrast hardware tokens, where the credentials are stored on a dedicated hardware device and therefore cannot be duplicated, absent physical invasion of the device.) A soft token may not be a device the user interacts with. Typically an X.509v3 certificate is loaded onto the device and stored securely to serve this purpose.

Inherent

These are factors associated with the user and are usually biometric methods, including fingerprint, face, voice, or iris recognition. Behavioral biometrics such as keystroke dynamics can also be used.

Location

Increasingly, a fourth factor is coming into play involving the physical location of the user. While hard wired to the corporate network, a user could be allowed to log in using only a pin code while off the network entering a code from a soft token as well could be required. This could be seen as an acceptable standard where access to the office is controlled.

Systems for network admission control work in similar ways where your level of network access can be contingent on the specific network your device is connected to, such as wifi vs wired connectivity. This also allows a user to move between offices and dynamically receive the same level of network access in each.

Mutual authentication

Mutual authentication or two-way authentication (not to be confused with two-factor authentication) refers to two parties authenticating each other at the same time in an authentication protocol. It was previously referred to as “mutual entity authentication,” as two or more entities verify the others' legality before any data or information is transmitted.

Mutual authentication is a desired characteristic in verification schemes that transmit sensitive data, in order to ensure data security. Mutual authentication is found in two types of schemes: username-password-based schemes and certificate-based schemes, and these schemes are often employed in the Internet of Things (IoT). Writing effective security schemes in IoT systems can become challenging, especially when needing schemes to be lightweight and have low computational costs. Mutual authentication is a crucial security step that can defend against many adversarial attacks, which otherwise can have large consequences if IoT systems (such as e-Healthcare servers) are hacked. In scheme analyses done of past works, a lack of mutual authentication had been considered a weakness in data transmission schemes.

Password

A password, sometimes called a passcode, is a memorized secret, typically a string of characters, usually used to confirm a user's identity. Using the terminology of the NIST Digital Identity Guidelines, "the secret is memorized by a party called the claimant while the party verifying the identity of the claimant is called the verifier. When the claimant successfully demonstrates knowledge of the password to the verifier through an established authentication protocol, the verifier is able to infer the claimant's identity".

In general, a password is an arbitrary string of characters including letters, digits, or other symbols. If the permissible characters are constrained to be numeric, the corresponding secret is sometimes called a personal identification number (PIN).

Despite its name, a password does not need to be an actual word; indeed, a non-word (in the dictionary sense) may be harder to guess, which is a desirable property of passwords. A memorized secret consisting of a sequence of words or other text separated by spaces is sometimes called a passphrase. A passphrase is similar to a password in usage, but the former is generally longer for added security.

Choosing a secure and memorable password

The easier a password is for the owner to remember generally means it will be easier for an attacker to guess. However, passwords that are difficult to remember may also reduce the security of a system because (a) users might need to write down or electronically store the password, (b) users will need frequent password resets and (c) users are more likely to re-use the same password across different accounts. Similarly, the more stringent the password requirements, such as "have a mix of uppercase and lowercase letters and digits" or "change it monthly", the greater the degree to which users will subvert the system. Others argue longer passwords provide more security (e.g., entropy) than shorter passwords with a wide variety of characters.

In *The Memorability and Security of Passwords*, Jeff Yan et al. examine the effect of advice given to users about a good choice of password. They found that passwords based on thinking of a phrase and taking the first letter of each word are just as memorable as naively selected passwords, and just as hard to crack as randomly generated passwords.

Combining two or more unrelated words and altering some of the letters to special characters or numbers is another good method, but a single dictionary word is not. Having a personally designed algorithm for generating obscure passwords is another good method.

However, asking users to remember a password consisting of a "mix of uppercase and lowercase characters" is similar to asking them to remember a sequence of bits: hard to remember, and only a little bit harder to crack (e.g. only 128 times harder to crack for 7-letter passwords, less if the user simply capitalizes one of the letters). Asking users to use "both letters and digits" will often lead to easy-to-guess substitutions such as 'E' → '3' and 'I' → '1', substitutions that are well known to attackers. Similarly typing the password one keyboard row higher is a common trick known to attackers.

In 2013, Google released a list of the most common password types, all of which are considered insecure because they are too easy to guess (especially after researching an individual on social media):

- The name of a pet, child, family member, or significant other
- Anniversary dates and birthdays
- Birthplace

- Name of a favorite holiday
- Something related to a favorite sports team
- The word "password"

Strong Password

A strong password is hard to detect both by humans and by the computer. Two things make a password stronger: (1) a larger number of characters (and the more characters, the stronger the password), and (2) mixing numeric digits, upper and lower case letters, and special characters (\$, #, etc.). Passwords are typically case-sensitive, so a strong password contains **letters in both uppercase and lowercase**. A strong password is not a word that can be found in a dictionary or the name of a person, character, product, or organization, significantly different from your previous passwords, and easy for you to remember but difficult for others to guess. Consider using a memorable phrase like "6MonkeysRLooking^".

Factors in the security of a password system

The security of a password-protected system depends on several factors. The overall system must be designed for sound security, with protection against computer viruses, man-in-the-middle attacks, and the like. Physical security issues are also a concern, from deterring shoulder surfing to more sophisticated physical threats such as video cameras and keyboard sniffers. Passwords should be chosen so that they are hard for an attacker to guess and hard for an attacker to discover using any of the available automatic attack schemes. See password strength and computer security for more information.

Nowadays, it is a common practice for computer systems to hide passwords as they are typed. The purpose of this measure is to prevent bystanders from reading the password; however, some argue that this practice may lead to mistakes and stress, encouraging users to choose weak passwords. As an alternative, users should have the option to show or hide passwords as they type them.

Effective access control provisions may force extreme measures on criminals seeking to acquire a password or biometric token. Less extreme measures include extortion, rubber hose cryptanalysis, and side-channel attack.

The rate at which an attacker can try guessed passwords

The rate at which an attacker can submit guessed passwords to the system is a key factor in determining system security. Some systems impose a time-out of several seconds after a small number (e.g., three) of failed password entry attempts. In the absence of other vulnerabilities, such systems can be effectively secure with relatively simple passwords if they have been well chosen and are not easily guessed.

Many systems store a cryptographic hash of the password. If an attacker gets access to the file of hashed passwords guessing can be done offline, rapidly testing candidate passwords against the true password's hash value. In the example of a web-server, an online attacker can guess only at the rate at which the server will respond, while an off-line attacker (who gains access to the file) can guess at a rate limited only by the hardware on which the attack is running.

Passwords that are used to generate cryptographic keys (e.g., for disk encryption or Wi-Fi security) can also be subjected to high rate guessing. Lists of common passwords are widely available and can make password attacks very efficient. (See Password cracking.) Security in such situations depends on using passwords or passphrases of adequate complexity, making such an attack computationally infeasible for the attacker. Some systems, such as PGP and Wi-Fi WPA, apply a computation-intensive hash to the password to slow such attacks. See key stretching.

Limits on the number of password guesses

An alternative to limiting the rate at which an attacker can make guesses on a password is to limit the total number of guesses that can be made. The password can be disabled, requiring a reset, after a small number of consecutive bad guesses (say 5); and the user may be required to change the password after a larger cumulative number of bad guesses (say 30), to prevent an attacker from making an arbitrarily large number of bad guesses by interspersing them between good guesses made by the legitimate password owner. Attackers may conversely use knowledge of this mitigation to implement a denial of service attack against the user by intentionally locking the user out of their own device; this denial of service may open other avenues for the attacker to manipulate the situation to their advantage via social engineering.

Identification - what is it?

Identification is basically the process of someone claiming to be a specific person. They can identify themselves as “Pat”, show an id card of some type of card with a name on it, or have an email address showing their name.

In the current context of online transactions, users “identify” themselves by providing a name, an email address, or phone number to a web request. For example, using a process of identification alone, as long as a buyer has the card’s proper information that is associated with the card being used, the user is pretty much accepted as is.

A business that allows identification by itself is essentially saying, "We have no reason to doubt that you are indeed the person you claim to be", despite having not independently verified if the information is truthful. It’s like asking, “Who are you?” and simply accepting whatever answer is given. For transactions where there is not a lot at stake, like registering for a class or checking out a book, simply having someone declare their identity without providing any verification may be good enough.

It is becoming more and more frequent that identification alone is adequate. It’s like having a username without a password.

So how can we determine the person is who they say they are? That’s where verification comes in.

What is Verification?

Verification goes beyond the basic question, “Who are you?” Identity verification goes the extra mile and asks, “Are you really who you say you are?” the response needs to provide, a high degree of confidence that, the answer is accurate.

The most accurate way to verify someone’s identity is to request and validate more than one form of identification against the person standing in front of you, with at least one of them being a photo ID. A driver’s license, a Social Security card, a valid passport, or military photo identification are some forms of identification. Verifying someone’s identity to a high degree of certainty takes effort. At a time when service providers want to provide a “frictionless” onboarding process, some may cut corners and require a low barrier to entry. Typical social media accounts, for example, only ask new users to provide a name, email address, username, and password. A phone number may be thrown in there for good measure.

Depending on the organization and the level of assurance needed, a university ID or other non-government issued identification card may suffice for one form of ID. Identity verification in the electronic sense also called identity "proofing" or "vetting", is used to confirm an identity where the individual is not standing before you to show some sort of picture ID. In these cases, most organizations require a real-time process that validates the personal information provided by the individual.

Apply for an online bank account, though, and you may be expected to provide a social security number, photo ID or passport, and proof of your current address. The stakes associated with a bank account are much greater than those with a TikTok account, therefore the verification requirements are more stringent. In fact, in the financial sector alone, there are numerous regulatory acts to prevent fraudsters from setting up false bank accounts, laundering money, and other unseemly criminal activities. The compliance mandates associated with these regulations are not satisfied by traditional verification methods, which is why businesses are beginning to make a shift to pairing a customer’s identity information with one of their biometric markers at the point of onboarding.

The Information Security Triad: Confidentiality, Integrity, Availability (CIA)

The Information Security Triad, also known as the CIA triad, is a guide for organizations. This guide helps them make policies to protect information security.

In this context, the CIA means the following:

- Confidentiality – set of rules that limit access to information
- Integrity – the assurance that the information is reliable and correct
- Availability – a guarantee of reliable access to the information

Confidentiality

When protecting information, we want to be able to restrict access to those who are allowed to see it; everyone else should be disallowed from learning anything about its contents. This is the essence of confidentiality. For example, federal law requires that universities restrict access to private student information. The university must be sure that only those who are authorized have access to view the grade records.

Integrity

Integrity is the assurance that the information being accessed has not been altered and truly represents what is intended. Just as a person with integrity means what he or she says and can be trusted to consistently represent the truth, information integrity means information truly represents its intended meaning. Information can lose its integrity through malicious intent, such as when someone who is not authorized makes a change to intentionally misrepresent something. An example of this would be when a hacker is hired to go into the university's system and change a grade.

Integrity can also be lost unintentionally, such as when a computer power surge corrupts a file or someone authorized to make a change accidentally deletes a file or enters incorrect information.

Availability

Information availability is the third part of the CIA triad. *Availability* means that information can be accessed and modified by anyone authorized to do so in an appropriate timeframe. Depending on the type of information, an *appropriate timeframe* can mean different things. For example, a stock trader needs information to be available immediately, while a salesperson may be happy to get sales numbers for the day in a report the next morning. Companies such as Amazon.com will require their servers to be available twenty-four hours a day, seven days a week. Other companies may not suffer if their web servers are down for a few minutes once in a while.

Tools for Information Security

In order to ensure the confidentiality, integrity, and availability of information, organizations can choose from a variety of tools. Each of these tools can be utilized as a part of an overall information-security policy.

Access Control

Once a user has been authenticated, the next step is to ensure that they can only access the information resources that are appropriate. This is done through the use of access control. Access control determines which users are authorized to read, modify, add, and/or delete information. Several different access control models exist. Here we will discuss two: the access control list (ACL) and role-based access control (RBAC).

For each information resource that an organization wishes to manage, a list of users who have the ability to take specific actions can be created. This is an access control list or ACL. For each user, specific capabilities are assigned, such as *read*, *write*, *delete*, or *add*. Only users with those capabilities are allowed to perform those functions. If a user is not on the list, they have no ability to even know that the information resource exists.

ACLs are simple to understand and maintain. However, they have several drawbacks. The primary drawback is that each information resource is managed separately, so if a security administrator wanted to add or remove a user to a large set of information resources, it would be quite difficult. And as the number of users and resources increases, ACLs become harder to maintain. This has led to an improved method of access control, called role-based access control, or RBAC. With RBAC, instead of giving specific users access rights to an information resource, users are assigned to roles and then those roles are assigned access. This allows the administrators to manage users and roles separately, simplifying administration and, by extension, improving security.

Encryption

Many times, an organization needs to transmit information over the Internet or transfer it on external media such as a CD or flash drive. In these cases, even with proper authentication and access control, it is possible for an unauthorized person to get access to the data. Encryption is a process of encoding data upon its transmission or storage so that only authorized individuals can read it. This encoding is accomplished by a computer program, which encodes the plain text that needs to be transmitted; then the recipient receives the ciphertext and decodes it (decryption). In order for this to work, the sender and receiver need to agree on the method of encoding so that both parties can communicate properly. Both parties share the encryption key, enabling them to encode and decode each other's messages. This is called symmetric key encryption. This type of encryption is problematic because the key is available in two different places.

An alternative to symmetric key encryption is public-key encryption. In public-key encryption, two keys are used: a public key and a private key. To send an encrypted message, you obtain the public key, encode the message, and send it. The recipient then uses

the private key to decode it. The public key can be given to anyone who wishes to send the recipient a message. Each user simply needs one private key and one public key in order to secure messages. The private key is necessary in order to decrypt something sent with the public key.

Backups

Another essential tool for information security is a comprehensive backup plan for the entire organization. Not only should the data on the corporate servers be backed up, but individual computers used throughout the organization should also be backed up. A good backup plan should consist of several components.

- A full understanding of the organizational information resources. What information does the organization actually have? Where is it stored? Some data may be stored on the organization's servers, other data on users' hard drives, some in the cloud, and some on third-party sites. An organization should make a full inventory of all of the information that needs to be backed up and determine the best way to back it up.
- Regular backups of all data. The frequency of backups should be based on how important the data is to the company, combined with the ability of the company to replace any data that is lost. Critical data should be backed up daily, while less critical data could be backed up weekly.
- Offsite storage of backup data sets. If all of the backup data is being stored in the same facility as the original copies of the data, then a single event, such as an earthquake, fire, or tornado, would take out both the original data and the backup! It is essential that part of the backup plan is to store the data in an offsite location.
- Test of data restoration. On a regular basis, the backups should be put to the test by having some of the data restored. This will ensure that the process is working and will give the organization confidence in the backup plan.

Besides these considerations, organizations should also examine their operations to determine what effect downtime would have on their business. If their information technology were to be unavailable for any sustained period of time, how would it impact the business?

Additional concepts related to backup include the following:

- Universal Power Supply (UPS). A UPS is a device that provides battery backup to critical components of the system, allowing them to stay online longer and/or allowing the IT staff to shut them down using proper procedures in order to prevent the data loss that might occur from a power failure.
- Alternate, or "hot" sites. Some organizations choose to have an alternate site where an exact replica of their critical data is always kept up to date. When the primary site goes down, the alternate site is immediately brought online so that little or no downtime is experienced.

As information has become a strategic asset, a whole industry has sprung up around the technologies necessary for implementing a proper backup strategy. A company can contract with a service provider to back up all of their data or they can purchase large amounts of online storage space and do it themselves. Technologies such as storage area networks and archival systems are now used by most large businesses.

Firewalls

Network configuration with firewalls, IDS, and a DMZ. [Click to enlarge.](#)

Another method that an organization should use to increase security on its network is a firewall. A firewall can exist as hardware or software (or both). A hardware firewall is a device that is connected to the network and filters the packets based on a set of rules. A software firewall runs on the operating system and intercepts packets as they arrive at a computer. A firewall protects all company servers and computers by stopping packets from outside the organization's network that does not meet a strict set of criteria. A firewall may also be configured to restrict the flow of packets leaving the organization. This may be done to eliminate the possibility of employees watching YouTube videos or using Facebook from a company computer.

Some organizations may choose to implement multiple firewalls as part of their network security configuration, creating one or more sections of their network that are partially secured. This segment of the network is referred to as a DMZ, borrowing the term *demilitarized zone* from the military, and it is where an organization may place resources that need broader access but still need to be secured.

Intrusion Detection Systems

Another device that can be placed on the network for security purposes is an intrusion detection system or IDS. An IDS does not add any additional security; instead, it provides the functionality to identify if the network is being attacked. An IDS can be configured to watch for specific types of activities and then alert security personnel if that activity occurs. An IDS also can log various types of traffic on the network for analysis later. An IDS is an essential part of any good security setup.

Physical Security

An organization can implement the best authentication scheme in the world, develop the best access control, and install firewalls and intrusion prevention, but its security cannot be complete without the implementation of physical security. Physical security is the protection of the actual hardware and networking components that store and transmit information resources. To implement physical security, an organization must identify all of the vulnerable resources and take measures to ensure that these resources cannot be physically tampered with or stolen. These measures include the following.

- Locked doors: It may seem obvious, but all the security in the world is useless if an intruder can simply walk in and physically remove a computing device. High-value information assets should be secured in a location with limited access.
- Physical intrusion detection: High-value information assets should be monitored through the use of security cameras and other means to detect unauthorized access to the physical locations where they exist.
- Secured equipment: Devices should be locked down to prevent them from being stolen. One employee's hard drive could contain all of your customer information, so it is essential that it be secured.
- Environmental monitoring: An organization's servers and other high-value equipment should always be kept in a room that is monitored for temperature, humidity, and airflow. The risk of a server failure rises when these factors go out of a specified range.
- Employee training: One of the most common ways thieves steal corporate information is to steal employee laptops while employees are traveling. Employees should be trained to secure their equipment whenever they are away from the office.

Security Policies

Besides the technical controls listed above, organizations also need to implement security policies as a form of administrative control. In fact, these policies should really be a starting point in developing an overall security plan. A good information-security policy lays out the guidelines for employee use of the information resources of the company and provides the company recourse in the case that an employee violates a policy.

According to the SANS Institute, a good policy is “a formal, brief, and high-level statement or plan that embraces an organization's general beliefs, goals, objectives, and acceptable procedures for a specified subject area.” Policies require compliance; failure to comply with a policy will result in disciplinary action. A policy does not lay out the specific technical details, instead it focuses on the desired results. A security policy should be based on the guiding principles of confidentiality, integrity, and availability.^[2]

A good example of a security policy that many will be familiar with is a web use policy. A web use policy lays out the responsibilities of company employees as they use company resources to access the Internet.

A security policy should also address any governmental or industry regulations that apply to the organization. For example, if the organization is a university, it must be aware of the Family Educational Rights and Privacy Act (FERPA), which restricts who has access to student information. Health care organizations are obligated to follow several regulations, such as the Health Insurance Portability and Accountability Act (HIPAA).

A good resource for learning more about security policies is the [SANS Institute's Information Security Policy Page](https://www.sans.org/information-security-policy/).

Usability

When looking to secure information resources, organizations must balance the need for security with users' need to effectively access and use these resources. If a system's security measures make it difficult to use, then users will find ways around the security, which may make the system more vulnerable than it would have been without the security measures! Take, for example, password policies. If the organization requires an extremely long password with several special characters, an employee may resort to writing it down and putting it in a drawer since it will be impossible to memorize.

Personal Information Security

Poster from Stop. Think. Connect. Click to enlarge. (Copyright: Stop. Think. Connect. <http://stopthinkconnect.org/resources>)

We will end this chapter with a discussion of what measures each of us, as individual users, can take to secure our computing technologies. There is no way to have 100% security, but there are several simple steps we, as individuals, can take to make ourselves more secure.

- Keep your software up to date. Whenever a software vendor determines that a security flaw has been found in their software, they will release an update to the software that you can download to fix the problem. Turn on automatic updating on your computer to automate this process.
- Install antivirus software and keep it up to date. There are many good antivirus software packages on the market today, [including free ones](#).
- Be smart about your connections. You should be aware of your surroundings. When connecting to a Wi-Fi network in a public place, be aware that you could be at risk of being spied on by others sharing that network. It is advisable not to access your financial or personal data while attached to a Wi-Fi hotspot. You should also be aware that connecting USB flash drives to your device could also put you at risk. Do not attach an unfamiliar flash drive to your device unless you can scan it first with your security software.
- Back up your data. Just as organizations need to back up their data, individuals need to as well. And the same rules apply: do it regularly and keep a copy of it in another location. One simple solution for this is to set up an account with an online backup service, such as Mozy or Carbonite, to automate your backups.
- Secure your accounts with two-factor authentication. Most e-mail and social media providers now have a two-factor authentication option. The way this works is simple: when you log in to your account from an unfamiliar computer for the first time, it sends you a text message with a code that you must enter to confirm that you are really you. This means that no one else can log in to your accounts without knowing your password *and* having your mobile phone with them.
- Make your passwords long, strong, and unique. For your personal passwords, you should follow the same rules that are recommended for organizations. Your passwords should be long (eight or more characters) and contain at least two of the following: upper-case letters, numbers, and special characters. You also should use different passwords for different accounts, so that if someone steals your password for one account, they still are locked out of your other accounts.
- Be suspicious of strange links and attachments. When you receive an e-mail, tweet, or Facebook post, be suspicious of any links or attachments included there. Do not click on the link directly if you are at all suspicious. Instead, if you want to access the website, find it yourself and navigate to it directly.

You can find more about these steps and many other ways to be secure with your computing by going to [Stop. Think. Connect](#). This website is part of a campaign that was launched in October of 2010 by STOP. THINK. CONNECT. Messaging Convention in partnership with the U.S. government, including the White House.

Sidebar: Mobile Security

As the use of mobile devices such as smartphones and tablets proliferates, organizations must be ready to address the unique security concerns that the use of these devices brings. One of the first questions an organization must consider is whether to allow mobile devices in the workplace at all. Many employees already have these devices, so the question becomes: Should we allow employees to bring their own devices and use them as part of their employment activities? Or should we provide the devices to our employees? Creating a BYOD (“Bring Your Own Device”) policy allows employees to integrate themselves more fully into their job and can bring higher employee satisfaction and productivity. In many cases, it may be virtually impossible to prevent employees from having their own smartphones or iPads in the workplace. If the organization provides the devices to its employees, it gains more control over use of the devices, but it also exposes itself to the possibility of an administrative (and costly) mess.

Mobile devices can pose many unique security challenges to an organization. Probably one of the biggest concerns is the theft of intellectual property. For an employee with malicious intent, it would be a very simple process to connect a mobile device either to a computer via the USB port, or wirelessly to the corporate network, and download confidential data. It would also be easy to secretly take a high-quality picture using a built-in camera.

When an employee does have permission to access and save company data on his or her device, a different security threat emerges: that device now becomes a target for thieves. Theft of mobile devices (in this case, including laptops) is one of the primary

methods that data thieves use.

So what can be done to secure mobile devices? It will start with a good policy regarding their use. According to a 2013 SANS study, organizations should consider developing a mobile device policy that addresses the following issues: use of the camera, use of voice recording, application purchases, encryption at rest, Wi-Fi auto-connect settings, Bluetooth settings, VPN use, password settings, lost or stolen device reporting, and backup. ^[3]

Besides policies, there are several different tools that an organization can use to mitigate some of these risks. For example, if a device is stolen or lost, geolocation software can help the organization find it. In some cases, it may even make sense to install remote data-removal software, which will remove data from a device if it becomes a security risk.

Study Questions

1. Briefly define each of the three members of the information security triad.
2. What does the term *authentication* mean?
3. What is multi-factor authentication?
4. What is role-based access control?
5. What is the purpose of encryption?
6. What are two good examples of a complex password?
7. What is pretexting?
8. What are the components of a good backup plan?
9. What is a firewall?
10. What does the term *physical security* mean?

Exercises

1. Describe one method of multi-factor authentication that you have experienced and discuss the pros and cons of using multi-factor authentication.
2. What are some of the latest advances in encryption technologies? Conduct some independent research on encryption using scholarly or practitioner resources, then write a two- to three-page paper that describes at least two new advances in encryption technology.
3. What is the password policy at your place of employment or study? Do you have to change passwords every so often? What are the minimum requirements for a password?
4. When was the last time you backed up your data? What method did you use? In one to two pages, describe a method for backing up your data. Ask your instructor if you can get extra credit for backing up your data.
5. Find the information security policy at your place of employment or study. Is it a good policy? Does it meet the standards outlined in the chapter?
6. How are you doing on keeping your own information secure? Review the steps listed in the chapter and comment on how well you are doing.

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2.3.6: AI Tools in Modern Business Software

This page is a draft and is under active development.

 [Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Introduction: The AI-Enhanced Workplace

The modern workplace is undergoing a significant transformation. Artificial intelligence is no longer a futuristic concept—it's embedded in the software tools you likely use every day. From drafting emails to analyzing spreadsheets, AI assistants are becoming as common as spell-checkers once were.

Understanding how to work effectively with AI tools is quickly becoming an essential workplace skill, much like proficiency in Microsoft Office has become a baseline requirement over the past few decades. Whether you're pursuing a career in marketing, finance, healthcare, or any other field, you'll likely encounter AI-enhanced tools that can amplify your productivity and capabilities.

This section introduces you to the AI tools currently reshaping how business professionals work with familiar applications, such as Word and Excel. It explains the new skills you'll need to thrive in this AI-augmented environment.

Popular AI Tools in the Business Environment

Today's business professionals have access to a growing ecosystem of AI tools, each designed to enhance different aspects of work. Let's explore the major categories you're most likely to encounter.

Microsoft Copilot represents Microsoft's integration of AI across its entire suite of business applications. Available in Word, Excel, PowerPoint, Outlook, and Teams, Copilot acts as an intelligent assistant that understands natural language commands. For example, you might ask Copilot to "summarize this 20-page report" or "create a chart showing quarterly sales trends." The system interprets your request and performs the task, often in seconds.

Google Workspace AI (formerly known as Duet AI, now integrated as Gemini) offers similar functionality to users of Google Docs, Sheets, Gmail, and other Google applications. If your organization uses Google's ecosystem, you'll interact with AI features that can draft emails, analyze data, and generate content directly within these familiar applications.

ChatGPT and Claude are standalone AI assistants that have gained widespread adoption in the workplace. Unlike Copilot or Google's integrated tools, these are separate applications or websites that professionals use for tasks like brainstorming, drafting content, solving problems, or learning new concepts. Many workers keep these tools open in a browser tab alongside their other applications, consulting them throughout the day for various tasks.

Specialized AI tools are designed to address specific business needs. Grammarly utilizes AI to enhance writing quality beyond basic spell-checking, providing tone suggestions and clarity improvements. Notion AI enhances knowledge management and note-taking. Jasper and Copy.ai focus on marketing content creation. As you enter the workforce, you'll discover that different industries and companies have adopted various combinations of these tools based on their specific needs.

AI in Microsoft Word

Microsoft Word with Copilot transforms the traditional word processing experience into an interactive collaboration between you and an AI assistant. Understanding these capabilities will help you work more efficiently with documents in professional settings.

Drafting and editing assistance is perhaps the most immediately useful feature. Instead of staring at a blank page, you can provide Copilot with a basic prompt, such as "Draft a professional email requesting a meeting with a client to discuss project delays." The AI generates a complete draft that you can then refine and personalize. This doesn't mean the AI writes for you—instead, it provides a strong starting point that you shape into the final product.

Copilot can also assist you in editing existing content. You might highlight a paragraph and ask it to "make this more concise" or "adjust the tone to be more formal." The AI understands context and can rewrite sections while maintaining your document's

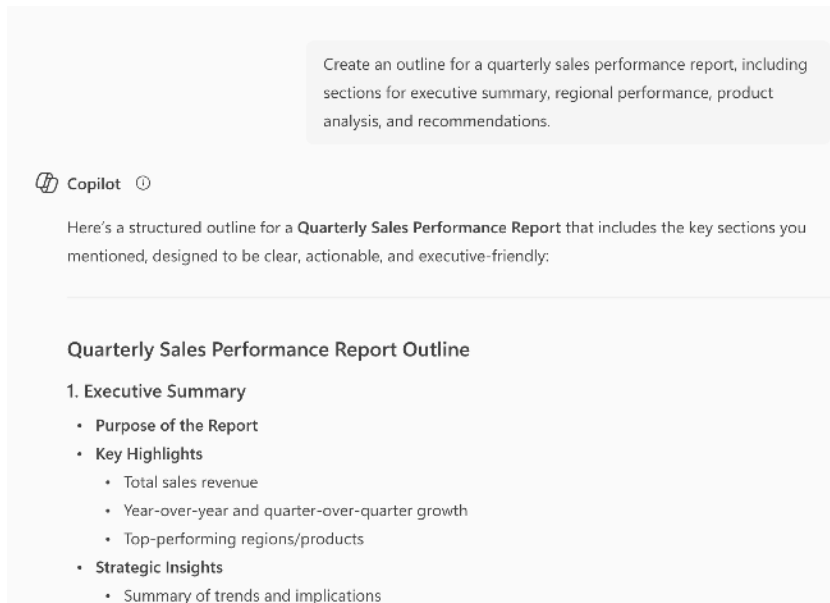
overall flow and purpose.

Document formatting and summarization features save a considerable amount of time. Copilot can automatically format lengthy documents with appropriate headings, create tables of contents, or adjust styling to match corporate templates. When you need to digest information quickly, you can ask Copilot to summarize lengthy documents, extracting key points and action items.

Real-world example: Creating a business report. Imagine you're an intern tasked with creating a quarterly performance report. You have data from various sources, meeting notes, and previous report templates. Here's how AI might assist:

1. You start by asking Copilot to "Create an outline for a quarterly sales performance report including sections for executive summary, regional performance, product analysis, and recommendations."
2. Copilot generates a structured outline. You then paste your raw data and notes into different sections.
3. For each section, you might ask Copilot to "draft a summary of this data, highlighting the most significant trends." The AI analyzes your numbers and writes initial descriptions.
4. You review what the AI wrote, verify the accuracy against your source data, adjust the interpretation where needed, and add your own insights and observations.
5. Finally, you ask Copilot to ensure consistent formatting throughout and generate an executive summary of the complete report.

Throughout this process, you remain the author and decision-maker. The AI accelerates the mechanical aspects of report creation, allowing you to focus more time on analysis, interpretation, and strategic thinking.



Create an outline for a quarterly sales performance report, including sections for executive summary, regional performance, product analysis, and recommendations.

 Copilot ⓘ

Here's a structured outline for a **Quarterly Sales Performance Report** that includes the key sections you mentioned, designed to be clear, actionable, and executive-friendly:

Quarterly Sales Performance Report Outline

1. Executive Summary
 - Purpose of the Report
 - Key Highlights
 - Total sales revenue
 - Year-over-year and quarter-over-quarter growth
 - Top-performing regions/products
 - Strategic Insights
 - Summary of trends and implications

AI in Microsoft Excel

Excel has evolved from a spreadsheet program into an intelligent data analysis platform. AI capabilities in Excel are compelling because they make advanced data analysis accessible to users who may not have extensive technical training in statistics or programming.

Natural language data analysis is transforming how professionals interact with spreadsheets—previously, analyzing data required knowing specific functions and formulas. Now, you can ask questions in plain English. For example, with a sales dataset open, you might type "What were the top 5 selling products last quarter?" or "Show me a breakdown of revenue by region." Copilot interprets these questions, performs the necessary calculations, and presents results—often with visualizations.

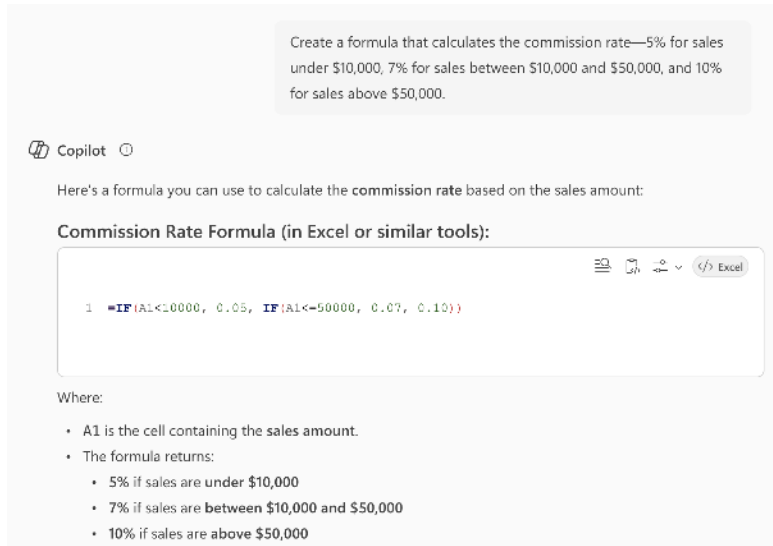
This capability democratizes data analysis. You no longer need to memorize dozens of Excel functions to extract insights from your data. Instead, you can focus on asking the right questions and interpreting the answers.

Automated formula generation addresses one of Excel's steepest learning curves. Complex formulas, particularly those using functions like VLOOKUP, INDEX-MATCH, or nested IF statements, can be intimidating. With AI assistance, you can describe

what you want to calculate in everyday language: "Create a formula that calculates the commission rate—5% for sales under \$10,000, 7% for sales between \$10,000 and \$50,000, and 10% for sales above \$50,000."

Copilot generates the appropriate formula, often explaining how it works. This serves a dual purpose: you get immediate results, and over time, you learn more about Excel's capabilities by seeing how the AI solves problems.

When formulas contain errors, AI can help identify and correct them. Instead of searching through documentation or online forums, you can simply describe the error you're encountering, and the AI can identify the issue and suggest corrections.



Create a formula that calculates the commission rate—5% for sales under \$10,000, 7% for sales between \$10,000 and \$50,000, and 10% for sales above \$50,000.

Copilot ⓘ

Here's a formula you can use to calculate the **commission rate** based on the sales amount:

Commission Rate Formula (in Excel or similar tools):

```
1 =IF(A1<10000, 0.05, IF(A1<=50000, 0.07, 0.10))
```

Where:

- A1 is the cell containing the sales amount.
- The formula returns:
 - 5% if sales are under \$10,000
 - 7% if sales are between \$10,000 and \$50,000
 - 10% if sales are above \$50,000

Real-world example: Financial analysis and forecasting. Consider a scenario where you're working in a company's finance department, analyzing monthly expenses to create a budget forecast.

1. You import six months of expense data into Excel—thousands of rows covering various departments and expense categories.
2. You ask Copilot to "identify the top three expense categories and show month-over-month growth rates." Within seconds, you have a summary table and chart.
3. You notice an unusual spike in marketing expenses. You ask, "Which specific marketing expenses increased most dramatically in April?" The AI breaks down the category and identifies the outliers.
4. For forecasting, you request: "Create a three-month projection for each department's expenses based on current trends, accounting for the 5% budget reduction mandate." Copilot generates formulas using appropriate statistical functions and creates forecast tables.
5. You review the projections, apply your business knowledge (perhaps you are aware of an upcoming project that will impact specific departments), and adjust the AI's baseline forecasts accordingly.

Again, the pattern is clear: AI handles data manipulation and calculation, while you provide business context, verify accuracy, and make informed decisions based on the results.

Essential Skills for the AI-Augmented Workforce

As AI tools become ubiquitous in business environments, a new set of skills is emerging as essential for workplace success. These aren't technical programming skills—they're practical competencies that anyone can develop.

Prompt engineering basics refers to the skill of communicating effectively with AI systems. Unlike traditional software, where you click buttons and select menu options, AI tools respond to written instructions, known as "prompts." The quality of your results depends heavily on how well you craft these prompts.

Effective prompts are typically:

- **Specific:** Instead of "help me with this data," try "calculate the average sales per quarter and identify any quarters that were more than 20% below the overall average."

- **Contextual:** Provide relevant background. "I'm drafting a formal proposal for a client in the healthcare industry" yields better results than simply "write a proposal."
- **Iterative:** Start with a basic prompt, review the results, then refine. "Make this more concise" or "add more specific examples" helps you shape the output.

As you practice, you'll develop an intuition for how to phrase requests to get optimal results. This skill—knowing how to "talk to" AI systems effectively—is becoming as valuable as learning how to use advanced software features.

Critical evaluation of AI outputs is perhaps the most crucial skill in the era of AI. AI systems are powerful but not infallible. They can generate plausible-sounding content that contains errors, biases, or hallucinations (completely fabricated information presented confidently as fact).

You must always:

- Verify facts and figures against reliable sources
- Check that AI-generated formulas actually perform the calculations you intended
- Ensure that AI-written content aligns with your organization's voice and values
- Review for potential biases in AI-generated analysis or recommendations

Think of AI as a competent intern: useful and productive, but requiring supervision and verification. You remain responsible for the final product, regardless of how much AI assistance you used in creating it.

Understanding when to use (and not use) AI tools demonstrates professional maturity. AI excels at specific tasks while being inappropriate for others.

Good uses of AI include:

- Generating first drafts and outlines
- Summarizing lengthy documents
- Performing routine data analysis
- Formatting and organizing information
- Brainstorming ideas and alternatives

Poor uses of AI include:

- Making sensitive decisions without human judgment (hiring, firing, medical decisions)
- Handling confidential or proprietary information (depending on your organization's policies)
- Creating content where authenticity and personal voice are crucial
- Situations requiring current, real-time information (unless the AI has internet access)
- Complex strategic decisions requiring deep industry expertise

Part of becoming AI-literate is developing judgment about which tools to use for which tasks, and when human intelligence remains irreplaceable.

Ethical considerations and data privacy must not be overlooked. When you input information into AI tools, consider where that data will be stored and how it may be used. Many AI systems utilize interactions to train and improve their models, meaning that your company's sensitive information could potentially become part of the AI's knowledge base.

Before using AI tools with work-related information, always:

- Understand your organization's AI usage policies
- Never input confidential client information, trade secrets, or personal data into public AI tools
- Be aware of whether your company uses enterprise versions of AI tools with stronger privacy protections
- Consider the ethical implications of AI-generated content, particularly regarding transparency and authenticity

Additionally, remain aware that AI systems can perpetuate biases present in their training data. An AI might generate job descriptions that inadvertently discourage specific demographics from applying, or produce analysis that reflects historical inequities. Your role includes catching and correcting these issues.

Conclusion: Building AI Literacy

As this section has demonstrated, AI tools are not replacing human workers—they're changing what it means to be an effective professional. The most successful workers in the years to come will be those who can seamlessly integrate human judgment, creativity, and expertise with AI's computational power and efficiency.

AI as a collaborative tool, not a replacement. It's essential to maintain a balanced perspective on what AI can and cannot do. These tools handle routine tasks, process large amounts of information quickly, and provide starting points for creative work. However, they lack proper understanding, contextual awareness, and the ability to make nuanced judgments that consider organizational culture, relationship dynamics, and strategic implications.

Your value as a professional lies not in performing tasks that AI can automate, but in providing the human elements: strategic thinking, emotional intelligence, ethical reasoning, relationship building, and contextual decision-making. AI amplifies these human capabilities rather than replacing them.

The importance of continuous learning. AI technology is evolving rapidly. The tools available today will be more capable next year, and entirely new categories of AI assistance will likely emerge throughout your career. Developing a mindset of continuous learning is essential.

This means:

- Staying curious about new AI capabilities as they're released
- Experimenting with AI tools in low-stakes situations to build familiarity
- Learning from colleagues who use AI effectively
- Reading about AI trends and best practices in your industry
- Remaining open to changing your workflows as better tools become available

Next steps for developing AI competency. You don't need to become an AI expert overnight. Start small and build your skills progressively:

1. **Experiment regularly:** Use AI tools for small tasks—summarizing articles you need to read, drafting routine emails, or analyzing simple datasets. Regular practice builds intuition.
2. **Compare and learn:** When you use AI to generate content or analysis, compare it to what you would have created manually. This helps you understand the tool's strengths and limitations.
3. **Seek feedback:** Ask supervisors or mentors to review work you've created with AI assistance. Learn what meets professional standards and what needs improvement.
4. **Stay informed:** Follow reputable sources covering AI in business. Understanding where the technology is heading helps you prepare for future developments.
5. **Share knowledge:** As you discover effective techniques, share them with classmates or colleagues. Teaching others reinforces your own learning and contributes to a more AI-literate professional community.

The integration of AI into business tools represents one of the most significant transformations in the workplace in decades. By developing AI literacy now, while you're still in school, you'll enter the workforce with a competitive advantage and the adaptability needed to thrive in an increasingly AI-augmented professional environment.

Remember: the goal isn't to let AI do your work for you. The goal is to leverage AI, allowing you to focus on higher-level thinking, creativity, and the distinctly human contributions that create real value in any organization.

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2.4: Computer Concepts Terminology

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Computer Concepts Summary

- The worldwide presence of information systems in daily life by emphasizing their impact on various activities and their strategic importance for businesses.
- It defines information systems as interrelated components facilitating data collection, processing, storage, and distribution in organizations.
- Components include technology (hardware, software, data), networking communication, people, and processes.
- The five major components—technology (hardware, software, data), networking communication, people, and process—are explored, with technology detailed in subsequent chapters.
- The evolution of information systems, from the mainframe era to the post-PC world, highlights key milestones such as the PC revolution, client-server architecture, and the rise of the internet, the World Wide Web, and e-commerce.
- The chapter addresses the question of whether information systems bring competitive advantage, referencing Nicholas Carr's argument in "Does IT Matter?" and illustrating success with Walmart's innovative use of information systems.
- The concluding emphasis is on understanding information system components for organizational competitiveness, setting the stage for further exploration in the book.

Key Terms I

Advanced Research Projects Administration (ARPA): an experimental network that eventually became known as the Internet.

Application Software: allows the user to perform tasks such as creating documents, recording data in spreadsheets, or messaging a friend.

Cloud Computing: the practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than a local server or a personal computer.

Data (computers): data is any sequence of one or more symbols.

Enterprise Resource Planning (ERP): an application with a centralized database that can be used to run a company's entire business.

Hardware: includes the physical parts of the computer, such as the case, central processing unit, random access memory, monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers, and motherboard.

Information Security: the state of being protected against the unauthorized use of information, especially electronic data.

Information Systems (IS): is a formal, sociotechnical, organizational system designed to collect, process, store, and distribute information. (*Examples are laptops, databases, networks, and smartphones.*)

Information Technology (IT): Any computer-based tool that people use to work with information and support the information and support the information and information-processing needs of an organization.

Intangible: unable to touch or grasp; not having a physical presence.

Internet of Things (IoT): refers to a network of physical devices, vehicles, appliances, and other physical objects embedded with sensors, software, and network connectivity that allows them to collect and share data. (*Examples are connected appliances, smart home security systems, wearable health monitors, and autonomous farming equipment.*)

Local Area Network (LAN): a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building.

Manufacturing Resources Planning (MRP): refers to an information system that is used by businesses involved in manufacturing goods. MRP systems focus on materials management.

Network: A connecting system (wireline or wireless) that enables multiple computers to share resources.

Operating Systems: is software that provides the interface between the hardware and the application software. (Examples are personal computer include Microsoft Windows and Ubuntu Linux.)

People: refers to anything that has to do with the role of people in the development or use of computer software and hardware system. (Examples are individual people, teams of people, business innovators and end users.

Process: A series of steps undertaken to achieve a desired outcome or goal.

Software: is a collection of instructions, data, and programs that enable to user to interact with a computer, its hardware, pr perform tasks. Software can be classified into three main categories: system software, application software, and programming software. (Examples are internet browser software, word processing software, spreadsheet software, and programming software.)

Tangible: Physical objects

World Wide Web: a collection of webpages and other web resources that are linked by hyperlinks and can be accessed over the internet.

Key Terms II

“Killer” App: An application viewed as so desirable by consumers that it can influence them to purchase devices or applications that include it.

Analog signals: are continuous and can be represented by smooth wave patterns.

Android: A mobile operating system (OS) based on the Linux kernel and currently developed by Google.

Binary: A number expressed in the binary numeral system, or base-2 numeral system, which represents numeric values using two different symbols: typically 0 (zero) and 1 (one).

Bit: The smallest unit of data in a computer represented by one or zero.

Bluetooth: A wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz[4]) from fixed and mobile devices, and building personal area networks.

Bus: The electrical connection between different computer components that is an important determiner of the computer’s speed.

Byte: A unit of data that computers use to represent a character such as a letter, number, or typographic symbol with a group of eight bits.

Central Processing Unit (CPU): The “brains” of the device, carries out the commands sent to it by the software and returns results to be acted upon. (3.4)

Collaborative Systems: These systems allow users to brainstorm ideas together without the necessity of physical, face-to-face meetings. (Example: zoom, teams)

Customer Relationship Management (CRM): An approach to managing a company’s interactions with current and future customers. It often involves using technology to organize, automate, and synchronize sales, marketing, customer service, and technical support.

Database Management System (DBMS): Stores and retrieves the data that an application creates and uses. Although the DBMS is itself considered an application,

it’s often useful to think of a firm’s database systems as sitting above the operating system, but under the enterprise applications.

Desktop Software: Refers to applications installed on a personal computer—your browser, your Office suite, photo editors, and computer games are all desktop software.

Digital Devices: Is an electronic device that uses discrete, numerable data and processes for all its operations.

Electronic Waste: Used electronics that are destined for reuse, resale, salvage, recycling, or disposal.

Enterprise Software: Refers to applications that address the needs of multiple, simultaneous users in an organization or work group. Most companies run various forms of enterprise software programs to keep track of their inventory, record sales, manage payments

to suppliers, cut employee paychecks, and handle other functions.

Hard Disk: Where data is stored when the computer is turned off and where it is retrieved from when the computer is turned on.

Hertz: A measure of computer processing speed.

Input Devices: Peripheral hardware used to provide data and control signals to a computer. Examples of input devices include keyboards, mice, scanners, digital cameras, and joysticks.

Integrated Computing: Integration of computing technology into everyday products to enhance its capabilities.

iOS(iPhone OS): An operating system used for mobile devices manufactured by Apple Inc.

LINUX/UNIX: Linux is a version of the Unix operating system that runs on the personal computer. Unix is an operating system used primarily by scientists and engineers on larger minicomputers.

Memory: *Specifically, Computer Memory*. Any physical device capable of storing information temporarily or permanently.

Mobile Applications: Programs that run on tablet computers and smartphones.

Moore's Law: The observation that over the history of computing hardware, the number of transistors in a dense integrated circuit has doubled approximately every two years.

Motherboard: The main circuit board on the computer that connects to the CPU, memory, and storage components, among other things.

Network Connection: Provides connectivity between your computer and the Internet, a network, or another computer.

Open Source: Software that can be freely used, changed, and shared (in modified or unmodified form) by anyone.

Output Devices: An output device sends data from a computer to another device or user. This includes audio and video output. Other examples are monitors, projectors, speakers, headphones, and printers.

Private Cloud: A particular model of cloud computing that involves a distinct and secure cloud-based environment in which only the specified client can operate.

Productivity Software: Software applications have become standard tools for the workplace. (*Example: Excel or spreadsheet software*)

Read Access Memory (RAM): The working memory that begins to load information from the hard disk as the computer starts up.

Removable Media: Fixed storage components. Removable storage media that is portable.

Software as a service (SaaS): Is software that is rented rather than purchased. It is subscription-based. Software as a service gives companies access to a large assortment of software packages without having to invest in hardware or install and maintain software on their own computers.

Solid State Drive (SSD): Performs the same function as a hard disk: long-term storage that uses spinning disks, and flash memory, which is much faster.

Storage Devices: any device used to store digital data or information through input or output operations.

Storage: The retention of retrievable data on a computer or other electronic system.

Systems, Application & Products in Data Processing (SAP): A German multinational software corporation that makes enterprise software to manage business operations and customer relations.

Virtualization: Refers to the act of creating a virtual (rather than actual) version of something, including (but not limited to) a virtual computer hardware platform, operating system (OS), storage device, or computer network resources.

Windows: Microsoft's operating system.

Key Terms III

AutoSave

a function that saves continuously as you make changes to a file

Backstage view

welcome screen and the File tab, where you can open or save a document, create a new document, or configure settings for the application

blind carbon copy (Bcc)

recipient in email; the recipient will receive the same email as recipients in the Cc and To fields but will not be known to those recipients

carbon copy (Cc)

recipient in email; the recipient who is Cc'd on the email will receive the same email as the recipient in the To field, but the Cc recipient will be known to all other recipients

command

process the user selects; located on the toolbar, on the ribbon, or in a menu

command group

group of related commands that are placed together in one area of the ribbon

communication applications

software that facilitates communication between individuals or groups

database applications

software that organizes and manages large amounts of data, which could be textual or numeric

dialog box

window that appears within a software program prompting the user to choose or enter information for a task

Download

command in Google Docs that lets the user Save As their .gdocx file by exporting the file in another file extension

email

mail sent and received electronically

file

electronic system used to store data and programs

file compression

process of reducing the size of one or more files by removing unnecessary data

file format

way data is encoded based on the application that the computer will use to read the file

folder

defined area of a computer that stores files and subfolders

graphical user interface (GUI)

portion of an application that allows the user to interact with the program

instant chat/messaging

chat application that allows messages to be sent and received in real time

menu bar

screen display of software commands that can be arranged in tabs and often at the top of the screen; also called a *ribbon*

Portable Document Format (PDF)

file format designed for publishing documents; maintains the same text and object alignment when read in different software versions of .pdf readers

presentation application

software used to create slides that combines text and visuals to be shared in a presentation

ribbon

area at the top of the application window where all commands are housed; organized into tabs

Rich Text Format (RTF)

older text file format that is plainer and less sophisticated than .docx

Save

way of saving a document that resaves the file with its existing name

Save a Copy

command that creates a duplicate version of an existing file

Save As

way of saving a document that enables you to rename the file or save it in another format

Share

command that enables a document's owner to invite others to work on it

spreadsheet application

software that is used to work with data, especially numerical data

status bar

feature that shows the computer's progress in loading a website and is often found at the bottom of the software screen

tabs

sections of the ribbon that refer to related processes, organized by labels

template

preformatted file, designed to save the user time in document formatting

toolbar

bar of icons that are used in the program to perform functions; often found below the menus in the program

Version history

Google Drive feature that allows users to access past versions of the same document, created using AutoSave

videoconferencing

allows you to communicate with individuals over the internet using sound and video

word processing application

software that is used to create text-based documents such as memos, letters, and reports

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CHAPTER OVERVIEW

3: File Management

File Management offers an overview of file management, emphasizing concepts like file paths and tools such as Windows File Explorer and Macintosh Finder for effective navigation and organization of files. It also covers screenshot methods on various operating systems, empowering users to capture and share screen visuals. The overall aim is to enhance user efficiency in file handling through a better understanding of file management systems and practices.

3.1: File Management Sections

3.1.1: File Management Overview

3.1.2: File Path and Save As

3.1.3: Windows File Explorer

3.1.4: Macintosh Finder

3.1.5: Creating Screenshots

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SECTION OVERVIEW

3.1: File Management Sections

Topic hierarchy

[3.1.1: File Management Overview](#)

[3.1.2: File Path and Save As](#)

[3.1.3: Windows File Explorer](#)

[3.1.4: Macintosh Finder](#)

[3.1.5: Creating Screenshots](#)

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3.1.1: File Management Overview

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Learning Objectives

By the end of this section, you will be able to:

- Describe the purpose and use of files and folders
- Identify different file formats and their common uses
- Apply best practices in file and folder organization, including saving
- Understand the differences between Google Drive, SharePoint, and OneDrive

Being organized is a key skill in the business world. Disorganized workspaces, whether real or virtual, can lead to a host of negative outcomes: lost productivity, wasted money and resources, and a poor worker reputation. A study by professional staffing company Express Employment Professionals revealed that approximately six hours per week can be lost to poor organizational skills, and that employees earning \$50,000 a year can cost their employers upward of \$10,000 annually in lost time. You don't want to be one of those employees. So, here, we will learn how to organize your computer software files. This is a basic, key skill.

Right now, as a student, you need a way to organize the items from your classes such as the syllabus, homework papers, and class notes. Some students choose to use a physical binder to organize all the material needed for a class. You may have one binder to hold the information for all your courses, or multiple binders, one for each course. Just as you would organize class material in a binder, a computer needs a way to organize the information stored in the hard drive. Through computer coding and programming, the computer uses a system of files and folders to organize the information and run its programs correctly.

Most people will never use many of the files and folders stored on the hard drive. For example, you probably will not access the information in the Windows folder or the Program Files folder. Those files that are needed for operating the computer are generally not necessary for the average computer user to access. You will use files and folders for specific software programs for information you have created. Understanding how to navigate the files and folders on the computer is crucial.

Using and Organizing Folders and Files

A file is a collection of data, such as a document or a program. Files are stored within a folder, which can contain subfolders as well as individual files. Files contain information, unlike folders, which are used to organize the files. For example, you might organize the photos on your phone into folders labeled by year or by type of photo (family, friends, events). In addition to those folders of photos, your phone contains other folders, each named based on its contents.

In this course, you will work frequently with four types of files:

- Document files are used in word processing applications to save documents such as school assignments, communications, and lists. Microsoft Word and Google Docs are two of the programs businesses use most. WorldCorp would use document files for company memos to employees or to write up contracts with new vendors.
- Spreadsheet files are produced by spreadsheet applications, such as Microsoft Excel and Google Sheets. This type of file is often used to analyze data and for numerical recordkeeping and calculations. Spreadsheet files could be particularly useful for WorldCorp when summarizing sales data for the last quarter or to create charts to show sales trends in different regions.
- Database files are created by database management applications. Many companies have high-level, specialized databases that store information about customers or specific products they sell. In this course, you will learn about Microsoft Access.
- Presentation files consist of pages that may be used as slides or handouts. Google Slides and Microsoft PowerPoint are popular presentation applications.

What Is a Folder?

A folder is a defined area of a computer or drive that stores subfolders and files (Figure 2.4). Organizing files into folders and subfolders makes it easier to locate a specific file and to keep files organized for the long term. Folders and subfolders are a

hierarchical way of organizing your files.



Figure 2.4: A computer stores files in the same way you might store files in a filing cabinet (although maybe a little neater). (credit: “document file, folders, carton, paper” by PPD/Pixnio, CC0)

Using and Organizing Files

As you create and use files, you will develop a system of organization that works for your needs. In some cases, the entity that you work for will have a system that is used for all employees. The goal is to gather files in such a way that facilitates finding and using those files. You could organize files by type (all Word documents in one folder), by date, or even by project. Your system will depend on how you interact with your computer and how you plan to use the files you create or download. There is no one standard way to organize files, but here are a few tips to get you started:

- Decide on an organizational system that works for you.
- Use descriptive folder names and be consistent with naming.
- Make use of subfolders within the main folder.
- When files are created, place them in the appropriate folder.
- Regularly delete or archive files or folders that you no longer need.

Opening a File

To open an existing file, locate the file wherever it is saved. It may be saved on your computer hard drive, in the cloud, or on an external drive such as a flash drive. The easiest method for locating an existing file is by using the File Explorer folder (see Figure 2.5).

Mac Tip

Folders can be found in the Finder or the Documents tab.

To access File Explorer, either double-click the manila folder icon on the desktop or access File Explorer through the Windows menu. You can also search for a specific file name using the search bar at the bottom of the screen or the search bar at the upper-right side of File Explorer. As you can see, there are several ways to find the file you are looking for.

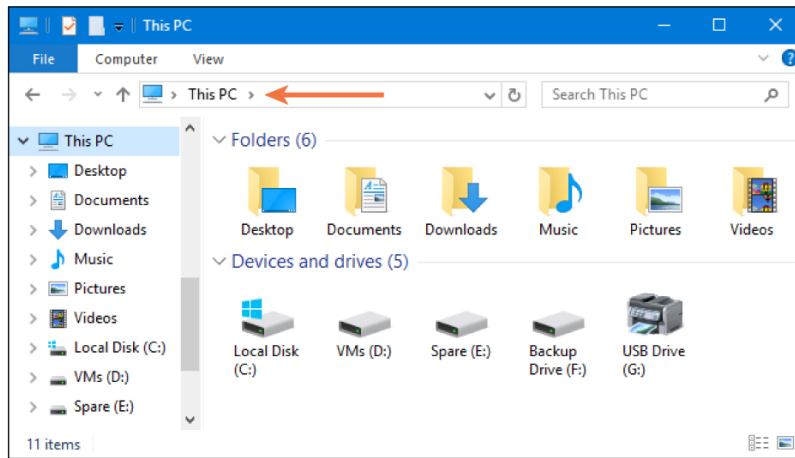


Figure 2.5: File Explorer shows the folders on your hard drive and the devices that are connected to your computer. The Search This PC search bar finds specific files on your local hard drive. (Used with permission from Microsoft)

Once you have located your file, you can either right-click or double-click on the file to open it.

Creating a File

To create a file, you will likely begin in the application program itself. For example, to create a new presentation file, open PowerPoint or Slides. Or you can create a new file directly from the desktop: Simply right-click on the desktop screen itself, select New, and choose the file type you want, as Figure 2.6 shows.

Mac Tip

For Mac users, the procedure to create a file is the same, except you would use Finder.

The new file will be created when the application program opens. Once a new file opens, you can add text, images, and other items to your file as needed.

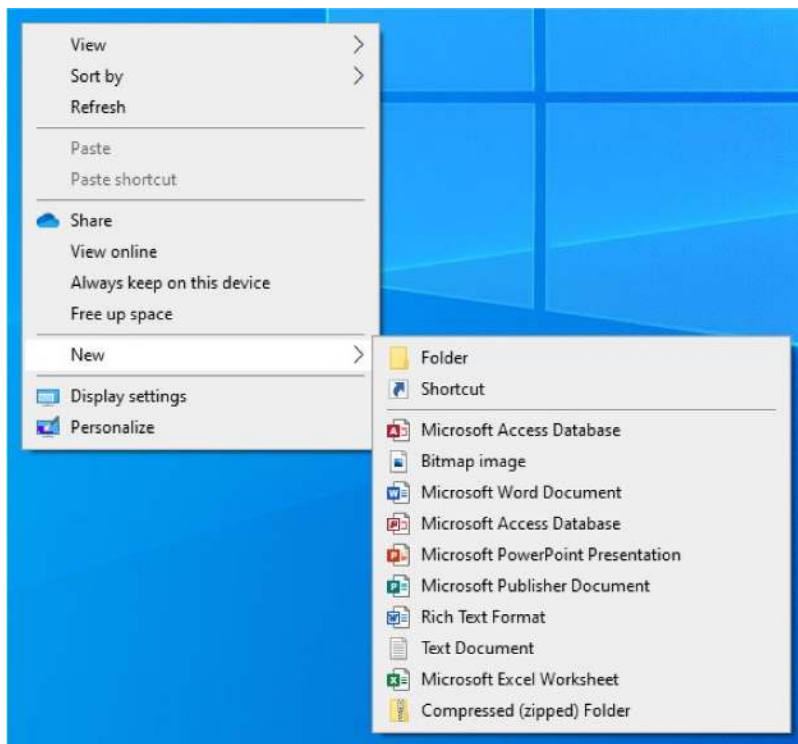


Figure 2.6: The various application programs are listed for you to select when creating a new file. (Used with permission from Microsoft)

Saving a File

Saving files might seem like a mundane task, but it is one of the most basic skills to master in computer work. In general, there are three broad categories of saving files: Save, Save As, and AutoSave. Save and Save As both give you the option to choose the file type and the name of the file. You would use Save if you are saving a file for the first time and also, as you go along if you are saving the file to your computer, rather than to the cloud. You can use Save As to save an existing file under a different name. This can be useful if you are keeping track of different versions or revisions of the same file. You would also use Save As to save the file in a different location on your computer. Finally, AutoSave does just what it implies—saves continuously as you make changes to the file. This is a nice feature in both Microsoft and Google applications, making it easier to retain changes in a file without having to constantly remember to save the file you are working with.

Moving and Deleting a File

From time to time, you will need to move and delete files as part of good computer housekeeping practices. To delete a file, right-click on the file you want to delete and choose Delete. Once deletion is confirmed, select OK. You can select multiple files by using either the Shift or Ctrl keys. Use Shift to select files that are listed together. You would click the first file and then hold Shift and click the last file in the list you want to move or delete. To select files that are not listed together, use the Ctrl key. Click on the first file, and then, to select additional files, hold the Ctrl key and then click on each file name.

Mac Tip

You can delete the file, which will move it to the trash bin, or you can simply drag the file to the trash bin. To completely delete the file, you must empty the trash bin.

To move a file, you can use one of two methods. You can click and drag the file to the new location. This is particularly useful if you have saved a file on the desktop and now want to move that file to a designated folder. Alternatively, you can Cut the file from its current location (see the Home tab) and then Paste the file to the new folder or location. This can be tricky if you do not immediately paste the file in another spot. Use caution when totally deleting files.

Recovering a File

After you have deleted a file, you may still be able to recover it. This is not always possible, but in some cases, you can recover files that have been deleted or, at least, locate a previous version that may be saved on your computer. First, check the Recycle Bin. Generally, you will find it on the desktop. Open the Recycle Bin by double-clicking on the Recycle Bin icon on the computer desktop. When you see the file that you deleted and now want to retrieve, select it by double-clicking on the file name. Then, choose Restore from the dialog box. You can also right-click on the file name and choose Restore from there. Another strategy is to simply search for the file on your computer in File Explorer. In the search bar, type in the name of the file (even a partial name will work). You may be able to locate the file or a version of the file through the search tool.

Mac Tip

A file that is in the Trash can be restored. If the file has been removed from the Trash, and you use Time Machine, Apple's backup program, you can recover an earlier version of the file even after it has been removed from the Trash.

Windows systems have another option for retrieving deleted files, which involves restoring files from the file history. This is in the Systems and Security area of your computer's Control Panel. The easiest way to access this tool is to type File History in the search bar by the Start menu (see Figure 2.7). If you have File History enabled on your computer, you can choose Restore your files with File History to search for the file you have deleted.

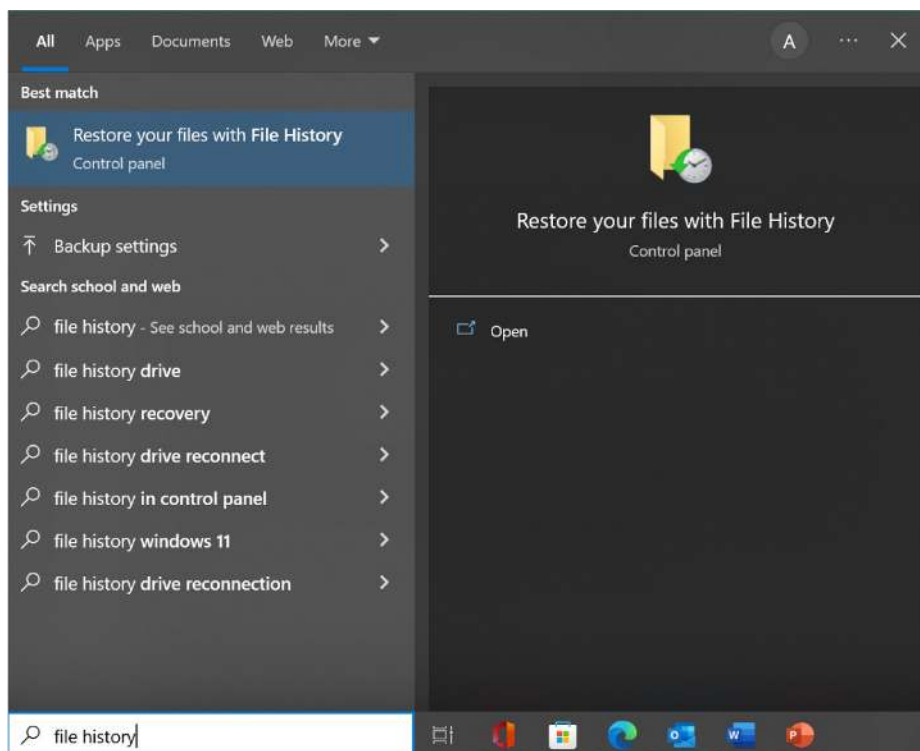


Figure 2.7: File History can also be accessed through your computer's Control Panel. (Used with permission from Microsoft)

As a final option, there are apps that you can download to help you search and recover deleted files. Several apps that serve this purpose are free and can be helpful when searching for a deleted file.

Compressing and Extracting Files

Sometimes you'll be working with a file that is too big to send as an email attachment. In that case, you can shrink the file down. It's analogous to letting the air out of a raft so you can store it in a tight spot and then reinflating it later for use. The process of reducing the size of one or more files by removing unnecessary data is called file compression. Compression also allows larger files to be sent faster and more efficiently. Large files usually contain lots of dense graphics or video clips or photos. With compression, no content in the file is lost; the file is simply compressed in size by the computer to make it more manageable. These compressed files are often referred to as *zipped* files. But be aware that in some instances, email recipients may not be set up to receive zipped files. This is a setting that is managed by their information technology (IT) administrator. In this case, you may have to send the uncompressed file or share the file with the recipient in another way.

How to Compress and Extract Files

Locate the file or files that need to be zipped. Press and hold or right-click the file to select it, click Send To, and then select the compressed folder. Locate the zipped file that needs to have files extracted from it. You can extract a single file, open it, and then drag it from the extracted folder to a new location. Or, to extract all contents of the zipped folder, you can press and hold or right-click the folder and select Extract All.

Mac Tip

To compress a file on a Mac, select the file you want to compress and then hold Control and click on the mouse and choose Compress.

File Types

Information in computers is stored in a system of files. Each file will have a unique file name followed by an extension, using the file name.extension format. The file format depends on the usage of the file, the program in which the file was created, and/or the size of the file. The computer will store the data in a particular file format, which is the way the data is encoded, depending on the

type of data and the application the computer will use to read it. There are many different file formats. You may be familiar with some of them, such as .doc or .txt. The .txt file format is a general format for a text file that can be recognized by almost any word processing application. The text contained in a .txt file does not contain any formatting such as underlines, special spacing, and other related items.

There are many other file types within the computer filing system that you will probably never see. These file types are necessary instructions created to make the computer function. Those operating file types are beyond the scope of this text and are not essential for you to understand how to use a computer and the software programs on your computer effectively.

Table 2.1 lists some common software program file extensions that you may already be familiar with. You can choose the file type in the Save dialog box so that you do not have to type the file extension as part of the file name. Generally, the application you are using will have the file extension already chosen in the Save dialog box as a default. In general, an “x” is added to the end of a file extension for newer versions of the application. For example, when documents are created in Word in versions 2007 or newer, the file will have the .docx extension rather than .doc only.

Table 2.1: Types Computer application files are saved with the file name and an extension that identifies the type of file it is.

Application	File Extensions
Microsoft Word	.doc, .docx
Google Docs	.gdoc, .gdocx
Microsoft Excel	.xls, .xlsm, .xlsx
Google Sheets	.gsheet
Microsoft PowerPoint	.ppt, .pptx
Google Slides	.gslides

Rich Text Format (RTF)

Microsoft developed Rich Text Format (RTF), or .rtf, files in 1987 to enable other Microsoft applications to read Word output more easily. Today, the .rtf format can be used to make your .docx file more compatible so that other software can use the information in the file more readily. For example, information from a Word document that is saved as an .rtf file type can be fed into a database program. Text in .rtf appears fairly “plain”—that is, with minimal formatting. .rtf files have stayed more or less the same as when they were first released, but Word .docx files are frequently updated. To put it another way, an .rtf is less sophisticated than a .docx file and may not support all the features of a newer .docx. To save a file as an .rtf, go to the File tab, click on Export, hover over Rich Text Format, and then click Save As.

Mac Tip

To open .rtf files on a Mac:

1. In the TextEdit app on your Mac, choose TextEdit > Settings, and then click Open and Save.
2. Select Display RTF files as RTF code instead of formatted text.
3. Open the .rtf file.

Portable Document Format (PDF)

In the business setting, you will see many documents in Portable Document Format (PDF), or .pdf. Unlike .docx format, the .pdf format is designed as a publishing platform, so .pdf documents are not easily editable. This is an advantage because it means that everyone who opens the .pdf document will see the same format, alignment of objects, font style and size, images, tables, graphs, and so on. The appearance of the document will not change across any computer, phone, tablet, or other device. The Word file format, by contrast, is designed to be fully editable, so if you use Word 2019 or Word 365 (part of Microsoft 365), for example, to open a .docx created in Word 2013 or Word 2016, you may see unintended and unwelcome changes, such as a shifted object.

Countless companies and other institutions typically release their annual reports and other public documents in .pdf format. WorldCorp publishes its annual report using the .pdf format. Local townships, public schools, and community agencies also are likely to distribute their newsletters and other information as .pdf documents. Further, many job seekers produce a .pdf version of their résumé, as Figure 2.8 shows, to prevent style or alignment changes when the prospective employer opens the file.

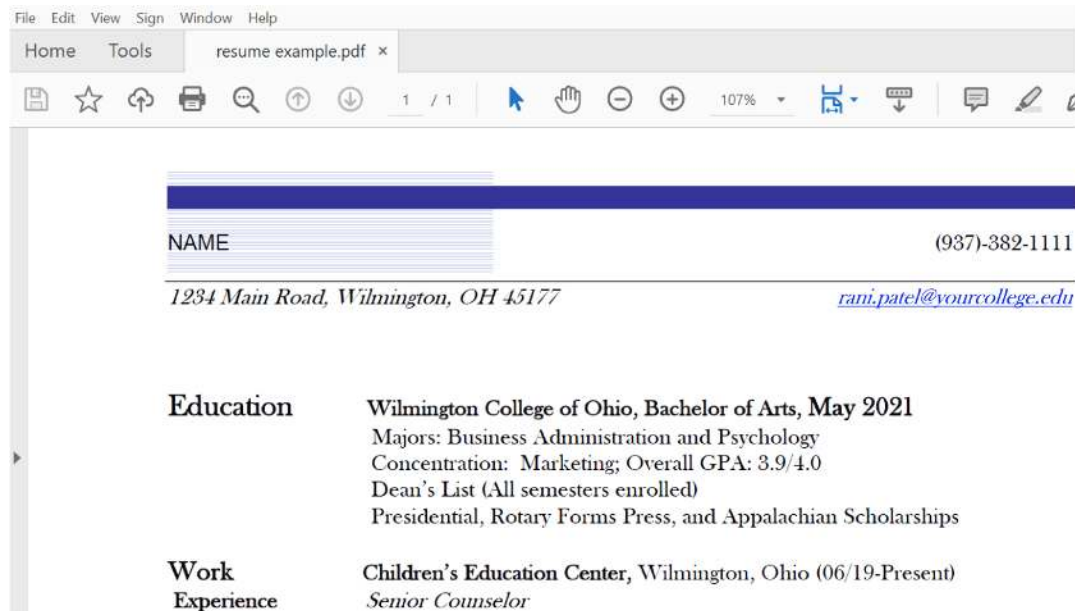


Figure 2.8: Saving as a .pdf file can preserve formatting and spacing in documents such as résumés and newsletters when they are shared with others and opened in other programs. (Used with permission from Microsoft)

Web Page/Hypertext Markup Language (HTML)

Many professionals have their own web page, featuring their professional experience, skills, contact information, and samples of work or testimonials. The content of such a website can be created in Word. For more than a decade, Word has doubled as a What You See Is What You Get (WYSIWYG) HTML editor—a web page design application that lets users make their own web pages without needing to know hypertext markup language (HTML). HTML is one of the major programming languages that web designers use to make websites. Essentially, Word lets you write the content of your web page as if you were writing any document in Word; you can add images, objects, and graphs, then Save As an .html file. However, there are better ways to create content for websites rather than using Word. We will discuss more about this later in the book.

Today, many people use packaged services such as WordPress or Squarespace to create their own websites. You may still find some people who prefer to use Word to create their website or at least to design the initial content and layout of the site. Also, note that just creating a website doesn't make it available on the web. The website will need to be published, a domain name purchased (e.g., www.yourwebsite.com), and it hosted through a paid service such as GoDaddy.

Graphics

Graphics file formats are for pictures and moving images. In general, graphics can mean any program that allows a computer to display these types of images. But for our purposes here, it means a file format. Without going into detail that is beyond the scope of this text, these graphics file formats organize their information in different ways. You just need to be able to recognize what they are in the workplace.

- JPEG, which stands for Joint Photographic Experts Group, is the most common of the formats. Its benefit is that the files can be quickly uploaded to any platform, even if the images are large. However, if the files are compressed and decompressed multiple times when sending, the images can lose quality.
- PNG files (.png) are higher quality than JPEGs. PNG stands for portable network graphics. This file type is best for images with sophisticated backgrounds, making them denser and therefore needing more storage space on the hard drive, and more time to load on your computer.
- GIF (.gif) stands for graphics interchange format. It is a file format that works well for graphics with few colors.

- PDF stands for portable document format. It is a common file format that works best for online documents that you don't want altered. They print well, too. A PDF (.pdf) file format is not only used for text, but for images such as photos, as well as audio and video. Adobe Photoshop, InDesign, Word, and Docs are some of the applications that allow you to create PDFs.
- SVG (Scalable Vector Graphics) file formats support digital illustrations made up of geometric shapes. SVG (.svg) file formats retain the highest quality even when resized, but they are not applicable to social media platforms.
- MP4 (Moving Picture Experts Group) is a multimedia format that stores internet videos. MP4 (.mp4) files can contain audio and subtitles. They take up a manageable amount of computer storage space and you can easily upload them on a social media channel or a website.

Best Practices in Using and Organizing Folders and Files

Remember that Word allows users to save documents in different file formats and in multiple versions within a single format, designated by changing the file name—for example, from “version1” to “version2.” Word also lets you choose between different file formats depending on how you want to use the file. You may also want to publish your document on the web, using a file format that allows it to be read correctly by web browsers.

Real-World Application: Tips for Organizing and Maintaining Files

Imagine you have been asked by your professor to resubmit a homework assignment that you originally turned in at the beginning of the semester. The professor cannot find your submitted assignment, so you currently have received zero credit in the gradebook. Having a well-organized system for keeping track of your school notes and assignments will help you quickly find this assignment.

This scenario can also be applied to the workplace. Suppose you need to quickly locate a document for a customer or a coworker. A good organizational system makes this task much easier. Here are some tips for effective file management:

- After creating and naming a file, place it in the appropriate folder based on your organization system. If you want quick access to a file, you can store it on the desktop. But if you store too many files on the desktop, it can be hard to locate a specific file. It is generally preferable to store files within folders and to reserve the desktop for icons to access particular apps. Ultimately, this is a matter of personal preference.
- Group files by category. For example, your categories might be Business Plans, Résumé Services, Memos, Letters, and Meeting Notes.
- Create subfolders for all files and give them descriptive names. For example, you might want to label a subfolder Business Plan – Client 2 – June 2023.
- Use effective file name conventions for folders. Specific, informative file names like Resumes – 2022 and Employee Files – A–M will save you the time of having to search within a folder with a more generic name.

It is important to keep your files current. In many cases, you may have files that you no longer use or that have been updated. In that case, delete the previous versions of the file. Unless you need to refer to a previous version of a document or think you might need the information in the future, generally there is no need to keep older files that you no longer use. You can save multiple versions of a file and rename them in such a way that they identify the version of the original file referencing the version or even the date of the version of the file.

To make this process effective, be consistent in naming versions of files. Always use the same approach. For example, you could have the file name with the version number and the date (nameV2Mar212023). What is more important is having a consistent approach that is used by everyone who uses the files.

If you are hesitant to delete the files entirely, consider backing them up to an external drive such as a flash drive or a cloud-based storage option. This will free up space on your computer's hard drive, while still reassuring you that your files are secure. As a best practice, regularly back up all your files/folders on your computer, not just the items you are no longer using.

Create a *folder* organization system that works for your needs. For example, you might want to create folders by software program, by date, or by client. Establishing an organization system for your folders will save you time when searching for specific files. Consider writing out the system on paper first to get an idea of what it will look like. Just the process of writing out how your folders will be organized may give you additional ideas on how to structure your system. For example, if you have a few larger

folders organized by client, you may want to have several subfolders within each of them that house specific files for that client by software program or usage.

Suppose WorldCorp asks you to keep track of correspondence with four of its clients. You can create four main folders (Clients 1–4) and then, within each of those folders, subfolders labeled Invoices, Email Correspondence, and Work Tasks. It is often easier to have the folders and the files within those folders sorted alphabetically so that you can easily find information.

It is better to use full names and words rather than abbreviations in your folder names. This makes using the search function more effective in locating the folders you need. This is especially important if files are shared and may need to be accessed in your absence. Most computers have the capability to mark or flag certain folders or files for quick access so that you can readily find them. Generally, this capability is found in the File Explorer feature in your computer, which looks like a manila folder and is located on your desktop. You could also place those files or folders that you use daily on the desktop for quick access to them when you need them. Finally, organize your files as you create them rather than saving that task for later. When you create a new file in a software program, determine the folder where the file will be placed, and save the information there.

Google Drive, SharePoint, and OneDrive

Both Microsoft and Google have applications to help you manage, organize, and share your computer files. Drive is the online, cloud-based file storage system in Google. Drive is free and allows you to store, organize, manage, and create files online through the Google platform. Drive also has the capabilities to sync with multiple devices and has convenient sharing tools to share files and images with others. You will get your Drive when you create a Google account. There are limits to the storage capacity on Drive, but you can pay for more storage if needed.

Microsoft's versions of Drive are OneDrive and SharePoint. Like Drive, both are cloud-based systems. However, each serves a different purpose. OneDrive is most similar to Drive in its intended use. It is a storage system for files in the cloud, which enables you to access files on a variety of platforms and to share documents with others. You can also store and manage documents through SharePoint, but it has many more capabilities, designed for business and team communication. SharePoint helps build a shared library of resources to be used company-wide, such as links to employee documents or forms common to the organization. You can also use it to distribute comments or announcements company-wide and to create content and web pages to share. Within a company, you may have both OneDrive and SharePoint. For personal use, when you create a Microsoft account, you will be given a OneDrive account. SharePoint is more of an enterprise system for company teams.

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3.1.2: File Path and Save As

[Click here to view Getting Started with Computers and Microsoft Office Chapters](#)

Learning Objectives

- Organize files and folders.

Finding a Specific Folder or File: File Paths

When looking for a specific folder or file, it is helpful to follow the **file path**. The file path tells you what folders to click on to get to the file. Read it left to right to show what folders to click on to get to the file; read it right to left to show which folders are nested in each folder.

For example:

C:\Users\Sierra Rowan\Documents\Projects\suppliers

This file path means that the file is in the suppliers folder, which is in the Projects folder, which is in the Documents folder, which is in the Sierra Rowan username folder, which is in the Users folder, which is on the C drive of the computer.

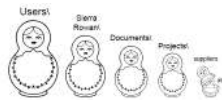


Figure 3.1.2.1: Visual File Path (Copyright; Lumen Learning, CC BY)

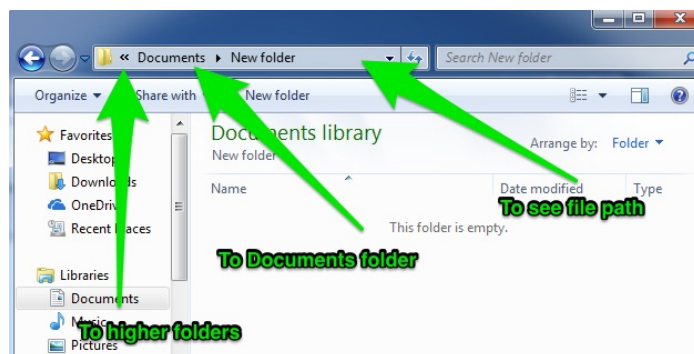
Note that the backslash is another shorthand format you might see in instructions to indicate which folder is being discussed. (For example, “Go to the Documents\Office Templates folder”)

Traveling the File Path

Rather than remembering the file path for a specific file, you can use the toolbar at the top of File Explorer or the Properties window.

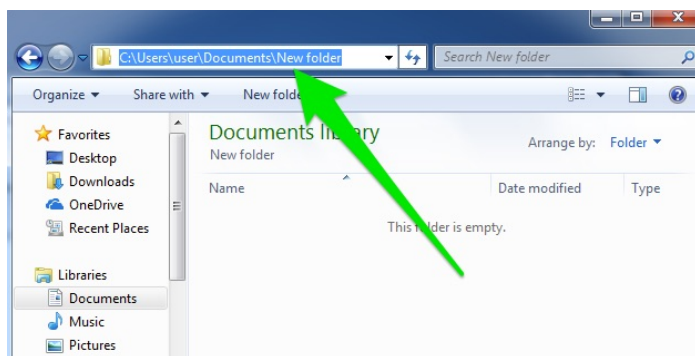
Toolbar Method

For example, the screenshot below shows a folder in Windows 7 called New folder. The file path for this folder is C:\Users\user\Documents\New folder. In the screenshot below, the user could click Documents to go up one folder to the Documents folder, and the small double-arrow on the left to go up to higher folders such as user.



The screenshot shows a folder in Windows 7 called New folder. The file path for this folder is C:\Users\user\Documents\New folder. The user could click Documents to go up one folder to the Documents folder, and the small double-arrow on the left to go up to higher folders such as user.

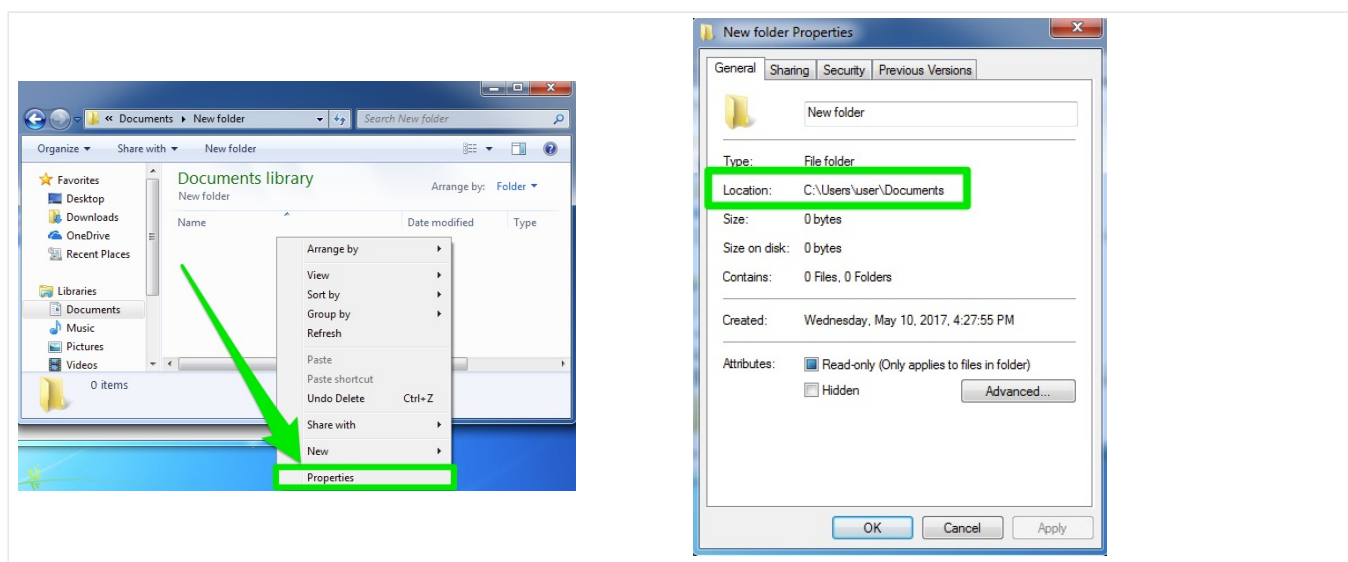
Clicking the blank space to the right of the folder name will reveal the entire file path, which can be copied and pasted elsewhere.



Properties Method

Right-click the file or anywhere in the folder and select Properties. A window will pop up displaying the file path of the file or folder. (Note that it does not include New folder itself.)

Folder Screen



Selecting and Moving Files

There are several ways to move files:

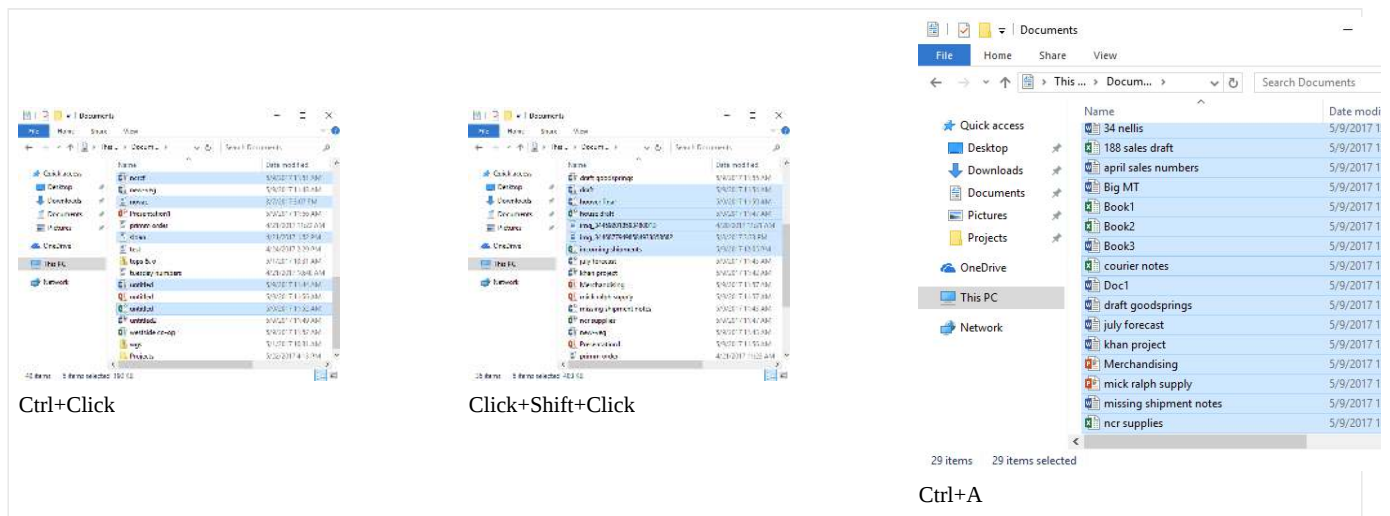
- Click and drag the file into a folder.
- Click a file, cut using Ctrl+X, then paste into the new folder using Ctrl+V
- Click a file, copy using Ctrl+C, then paste into the new folder using Ctrl+V (leaves the original file where it is)
 - Note that the copies are not connected; edits made to one copy will not be reflected in the other copy.
- Right-click a file, select either Copy or Cut in the dialog menu, then right-click in the folder and select Paste.

Moving Multiple Files

There are a few different ways to select multiple files (which we'll discuss below). Once you've selected multiple files, anything you do to a single file will be done to all selected files. (For example, clicking and dragging will move all selected files, hitting Ctrl+C will copy all selected files, etc.)

You can select multiple files at once using the following shortcuts: Hold down Ctrl while clicking to select multiple files. Hold down Shift while clicking to select two files and all the files between them. Press Ctrl+A to select all files. (Note that when using Ctrl+A, you can use Ctrl+Click to deselect files. You'll want to deselect the destination folder, since a folder cannot be in itself.)

File paths



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Save As

Once a document has been created, it should be saved as a file for future retrieval. The process of saving a Word document requires two essential elements: giving the document a filename, and defining the location where the file will be stored. The save process can be initiated by clicking the Save icon on the Quick Access toolbar, choosing **Save** or **Save As** from the File menu or using the keyboard equivalents, [Ctrl + S] for Save or [F12] for Save As. The filename should be a unique, yet identifiable description of the file's contents. The filename extension (.docx) is automatically added to filenames in Word. Once saved, the title bar will update with the new file name. The location of the file should also be given careful consideration. The user will likely choose between saving the file to the hard drive of the computer they are using, or using cloud-storage to make the file more easily accessible from multiple devices. The Save command < will overwrite the existing file, while the Save As command will allow the user to change the filename or file location.

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3.1.3: Windows File Explorer

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File Explorer is an application built into Windows 10 to help the user find, browse, and select folders and files. The main way to access the File Explorer is by clicking the folder icon in the Taskbar. After clicking the icon, the File Explorer window will open.

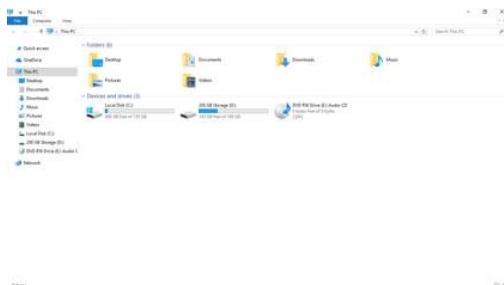


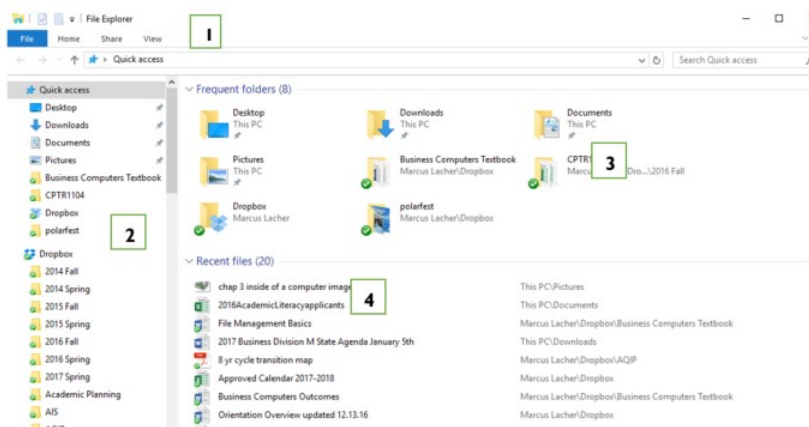
Figure 3.1.3.1: [This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

The initial File Explorer window is comprised of the File Explorer Ribbon, the Navigation Pane, Frequent Folders, and Recent Files.

One of the many attributes of being a successful college student is evidence of time management, communication, and organization skills. Managing the files on a computer is essential to excel at all of these skills. Almost all courses require a computer to access and communicate information. The inability to locate a file on a computer or course management system (like Brightspace D2L or Blackboard) could result in a late or missing assignment, missed conversations with an instructor or classmate, and/or tremendous stress. The primary solution to enhanced computer organization skills is through increased knowledge of Windows' File Explorer tool (formerly known as Windows Explorer).

File Explorer displays the hierarchical structure of files, folders, and drives on your computer. All data, including applications, program files, etc. is stored on the computer's disk (also known as disk drive). The primary internal hard drive is known as the C: drive. The contents of a disk are organized into individual files within individual folders. The Document folder is a general storage location for files created in programs like Microsoft Office, whereas photos downloaded from the Internet or a camera are typically stored in the Pictures folder. The Quick Access section displays frequently used folders and files, whereas the This PC view displays information regarding the computer's storage capacity, and attached storage devices, including optical media.

To access the computer's files, click *Start > File Explorer* or select the File Explorer icon located in the taskbar. Upon launching File Explorer in Windows 10, the *Quick access* window will open. Previously known as "Favorites" in previous versions of Windows; this is where users will see their most frequently accessed folders and files that have been created.



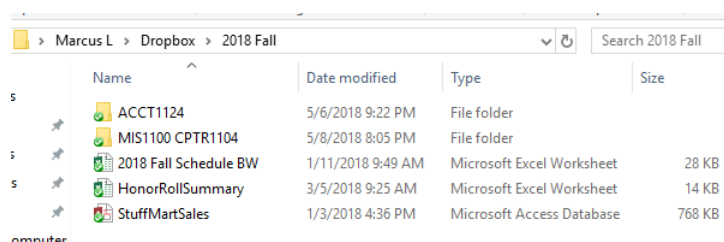
File Explorer

The File Explorer window can be broken into the following sections:

1. **File Explorer ribbon.** This is similar to the ribbon you will find in most Microsoft Office applications. The ribbon contains buttons for common tasks to perform on your files and folders, such as copying, pasting, moving and renaming files and folders. A recommended feature is the View menu which allows you to view your files via icons, tiles, a list or the underappreciated Details view.
2. **Navigation Pane.** Vertically scroll through this pane to access commonly used drives and folders. You can also access your Downloaded files, Documents, and external storage devices, as well as other libraries, such as pictures and music.
3. **Frequent folders.** This displays the folders you've worked with recently to allow for quick access.
4. **Recent files section.** Similar to the Frequent folders section, this area displays the files and documents that you've recently opened.

The Search box is an underappreciated tool to help find files that can't be found in their presumed location. Use the asterisk (*) wildcard character to expand the search results. i.e. Plane* will find files with the words plane or planet, and more. The File Explorer contains an array of tools which can help manage files and stay organized!

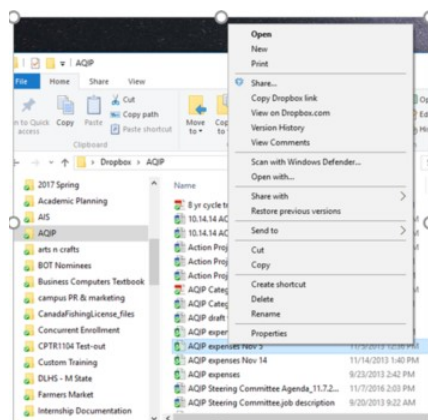
Creating a custom hierarchical structure of folders for each semester and each course is considered a best practice for organizing college data. For example, create a folder with the name of the current semester, i.e. 2018 Fall. Within this folder, create subfolders for each course, i.e. MIS1100. Descriptive folders and file names also diminish confusion when trying to find files on a computer disk.



Name	Date modified	Type	Size
ACCT1124	5/6/2018 9:22 PM	File folder	
MIS1100 CPTR1104	5/8/2018 8:05 PM	File folder	
2018 Fall Schedule BW	1/11/2018 9:49 AM	Microsoft Excel Worksheet	28 KB
HonorRollSummary	3/5/2018 9:25 AM	Microsoft Excel Worksheet	14 KB
StuffMartSales	1/3/2018 4:36 PM	Microsoft Access Database	768 KB

Folder Hierarchy

File Explorer is the primary tool for copying, moving, renaming and searching for files and folders. The View tab provides display and sorting options for files and folders. Viewing files using the Details layout allows for quick sorting by simply clicking a column header to toggle between ascending and descending order. The sort order in the above illustration is sorted by Name in ascending order. Clicking the File name extensions checkbox helps identify the source program for each file, particularly if the Type column is not displayed. Perhaps the most useful column is Size, which can be helpful to determine if a file is too large for distribution via e-mail or portable storage methods.



Shortcut menu

One of the most common operations for users is copying files, which creates a replica of an original file. To copy a file, select the file you want to copy and click Copy under the Home tab. Moving a file necessitates substituting the Copy button with the Cut button. Moving a file saves hard drive space by not creating a duplicate file. To add a new folder, right click and choose New > Folder from the Shortcut menu. Conversely, to delete a file or folder, right-click the object and choose Delete from the shortcut menu.

Organizing Files and Folders

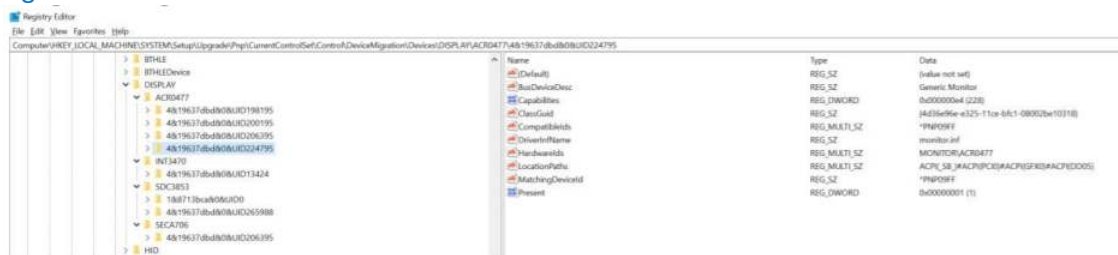
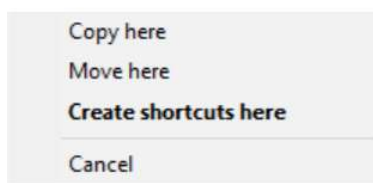


Figure 3.1.3.1: This Photo by Unknown Author is licensed under CC BY-SA

A common method to organize your files is to place them in folders, which can contain files and other folders. Folders can be stored on multiple locations on your PC. The specific location or address allows your computer to keep track of where each file is located. You may also create a Windows File Explorer window for each folder you are working in. Files and Folders may be moved between folders by clicking on the file/folder and dragging the file/folder to the new location.

Cut / Copy / Paste



One of the most common operations for users is cut, copy, or pasting files & folders. Pasting a file inserts the new file into the new location. Selecting “Cut” to a file will remove it from its current location and paste the file to its new location. The “Copy” command creates a replica of an original file and pastes the file in the selected location. To copy a file, select the file you want to copy and click Copy under the Home tab. In addition, you can copy or move a file without leaving your current location. Under the Home tab within the Organize group, click ‘Copy to’ or ‘Move to’ button, and choose the location if it’s listed, or click the Choose Location button and select the location.

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3.1.4: Macintosh Finder

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Understanding my Mac computer - Directories

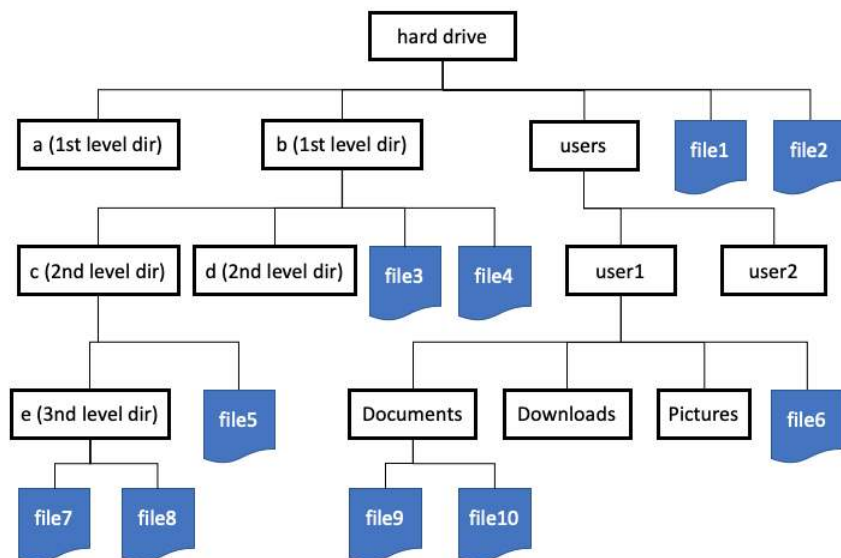
Directories

Reminder: “directory” means the same thing as “folder”

The directory tree

The operating system works with the hard drive of your computer to manage a complex system for tracking the location of all of the bytes of data stored there. Fortunately, we generally don’t have to worry about that. The operating system has a built-in file management system that helps you keep track of where files are located.

In the first lesson, a directory was described as an index telling the computer where the data included in files were located on the hard drive of your computer. That index also keeps track of the file names, sizes, modified dates, etc. – all of the information we saw in the Get Info box in the first lesson. Although as a practical matter there isn’t a limit to the number of files you can put in a directory, it is difficult to manage a large number of files in a single directory. For that reason, a hard drive can have many directories.



To help humans keep track of directories and files, the file management system lets users nest directories inside of other directories in a hierarchical manner. There are a number of ways you can visualize this hierarchical structure, but the diagram above is typical. Because of the branching nature of the directories, this organizational system is called the *directory tree*. When organized in this way, the “tree” is upside-down, since its branches point down (unless you want to envision the branches as roots!). But this arrangement is probably better since we refer to directories lower down on the diagram as *subdirectories* and talk about moving “up” the tree when we move towards the top of the diagram.

The very top of the tree is called the *root directory*. You can think of it as sitting directly on the hard drive. It can contain first-level directories, and there can be second-level directories nested inside the first-level ones. There is theoretically no limit to the number of levels of nesting of directories within directories. Files can be located inside any directory, including the root directory.

We can describe the position of a file within the directory tree using an expression called the *path* to the file. The path describes the position of the file by listing all of the directories from the root to the file, in order and separated by forward slashes (/). This system is also used by the Linux operating system (based on Unix), which is actually the underlying system on Macs.

The root directory is simply a slash by itself, so the path to a file in the root directory (like file2 in the diagram) would be:

```
/file2
```

The path to files 3, 5, and 8 would be:

```
/b/file4  
/b/c/file5  
/b/c/e/file8
```

Note: for simplicity the names used for the directories in this example are a single letter. Normally, they would have longer names. In general, directories have the same naming rules as files. The guidelines given for “safe” file names in the first lesson also apply to directory names.

Tech tip: Annoyingly, the Windows operating system separates parts of the path with backslashes (\) instead of forward slashes. Otherwise, the way of specifying a path in Windows is the same as in the Unix system that Macs use.

Special directories on Macs

In the first lesson, we saw that several special folders in a Mac (Documents, Downloads, Pictures, etc.) were duplicated for each user of the computer. These special folders (a.k.a. directories) are kept sorted by placing them in what is known as the *home directory* for the user. When a user logs onto the computer, the operating system takes note of which user home directory is appropriate, and uses that home directory as the basis of reference for the other special folders (Documents, Downloads, etc.).

Because of the special status of the home folder, it has a special abbreviation in Linux: a tilde (~). In the diagram above, the full path of **file6** would be:

```
/users/user1/file6
```

but it can be abbreviated as:

```
~/file6
```

This tilde shorthand can be thought of as “the home directory of whatever user is logged on”. If we want to refer to “file9 in the Documents directory of whatever user is logged on”, we could say:

```
~/Documents/file9
```

This is convenient if we want to indicate, for example, that a file is in the Downloads folder of the current user, but don’t actually want to have to specify who that user is. If we used the full path starting with the root directory, we would have to include the user’s home directory name in the path, and that would change if a different user logged in.

Making Finder work the way you want

When you open a Finder window, its exact appearance is going to depend on how you’ve used Finder in the past, since it usually remembers how you had it set up the last time you used it. There are certain modifications that you can do to make Finder easier to use based on how you like to organize things.

 finder with sidebar and toolbar

Sidebar and toolbar

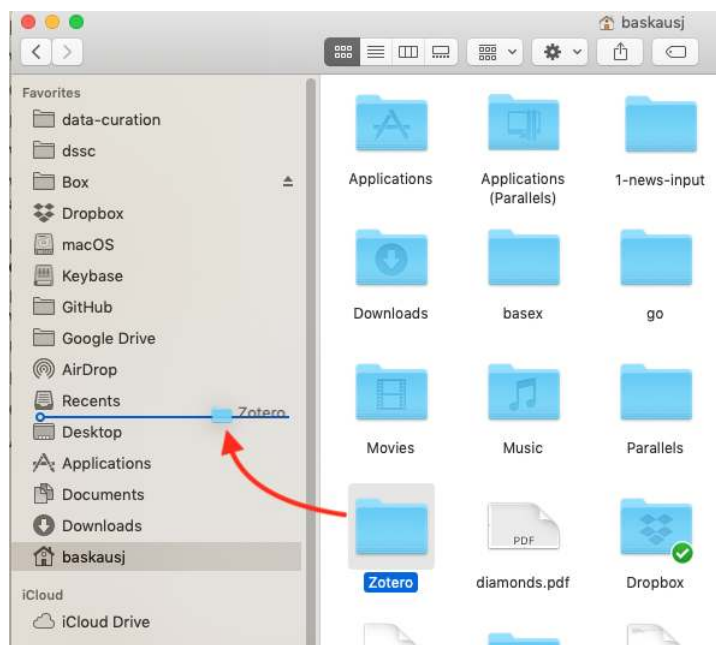
There are two parts of the Finder window that you can choose to display or not. The *toolbar* is at the top of the window. Its most useful features are the back button, which allows you to go back to previous directory that you viewed, and the set of four buttons that control how the files are displayed (as icons, list, columns, or gallery). The *sidebar* allows you to quickly jump to folders that you frequently use.

You can control whether the toolbar and sidebar are visible or not by going to the Finder View menu and toggling **show toolbar / hide toolbar** option. Unless you are really hard up for screen space, I recommend leaving them visible. (You can also show or hide just the sidebar, but toggling the toolbar shows or hides both).

Once the sidebar is visible, there are two ways you can control what “favorite” folders are visible. To control which of the “special” folders are visible, click on a Finder window (or the Finder icon in the dock), then from the Finder menu, select “Preferences”. Click on the Sidebar tab.

Finder Preferences

Uncheck the boxes of any items you don’t want to see, and check any that you think you might use frequently. For these exercises, make sure that your home folder is checked (the icon that looks like a little house) as well as the Location that has your computer name (in this case, **erebus's MacBook Pro**). When you are done, close the window by clicking on the red dot. **Note: you can always go to any of the special folders by dropping down the Finder Go menu, then selecting the folder you want.**



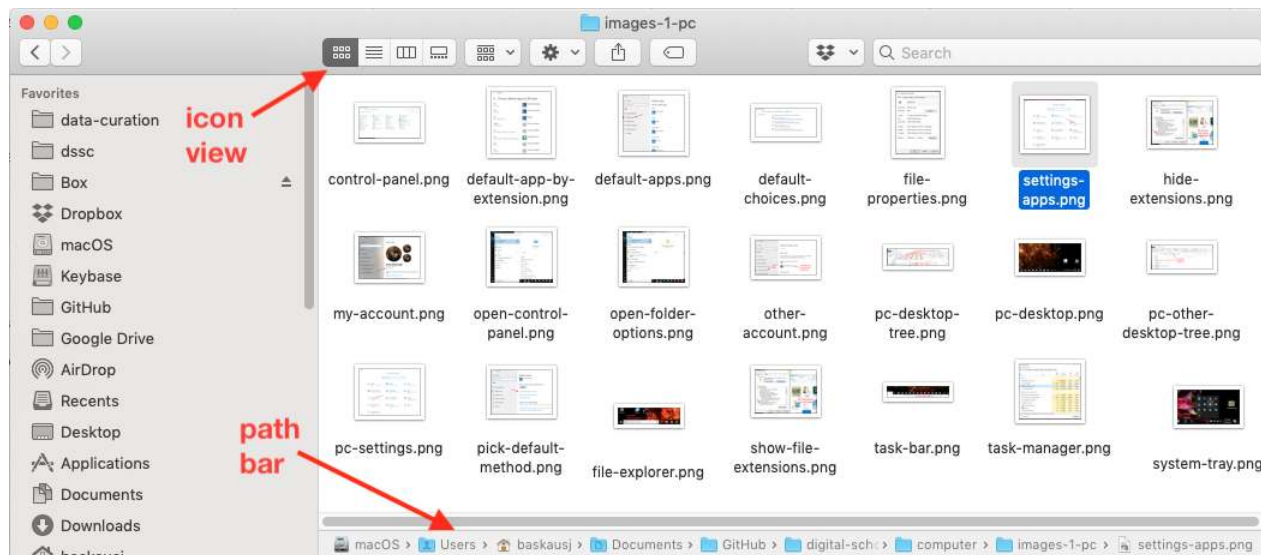
You can also add favorite “regular” folders to the sidebar. Click and drag the folder over to the sidebar until a line shows up in the position where you want the folder to be, then drop it. **Note: be careful that you see the line indicating where the folder will be inserted between other folders on the list. If you hold the folder over a folder in the list, you’ll actually move the folder you were dragging into the folder on the list.** If you add a folder to the favorites list, it is also still in its original location in the directory tree.

To remove a “regular” folder from the sidebar, just click and drag it somewhere out of the sidebar so that an X shows up next to its icon. Drop it and it will be removed. (If you drop it from the sidebar into a directory that is being displayed, it won’t be moved there.)

Finder display modes

If you don’t have very many files on your computer, it doesn’t matter much what display mode you chose to use.

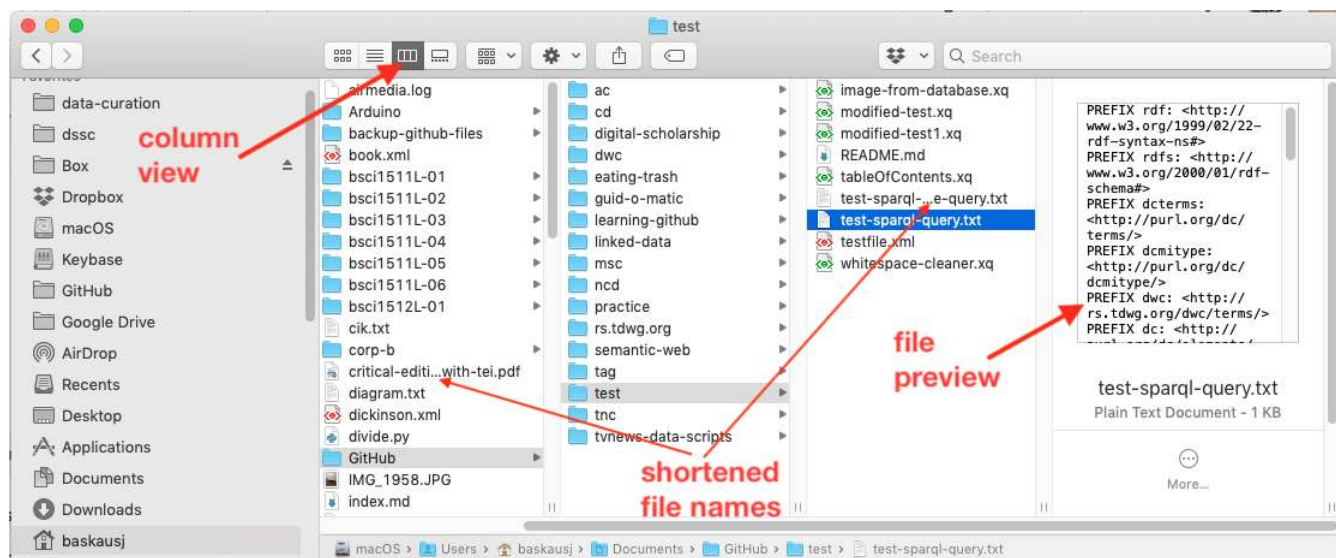
The classic Mac viewing system is *icon view*. The icon view is most useful when looking for images because you can see tiny thumbnails. I find icon view the most annoying because it takes so many clicks to navigate. When you double-click on a folder, you enter that nested folder. To back out of that deeper level, you have to use the back button. It is very easy to get lost if you are deep into the directory tree, but there is a feature that can help you.



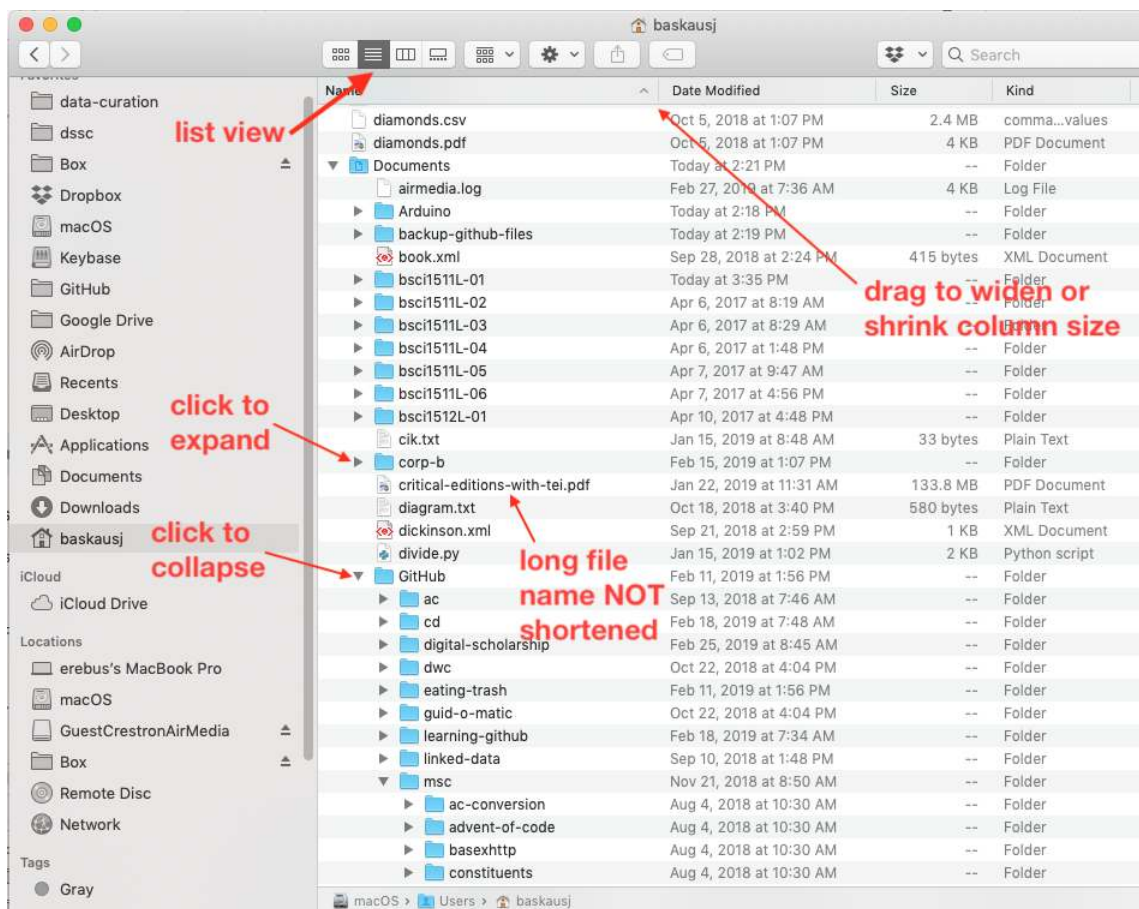
In the Finder View menu, there is an option for **Show Path Bar**. When you enable the path bar, you will see a little list of your path, from the highest level to the folder you are in. This option is available in any display mode.

The *gallery view* is mostly useful if you need to sort through images.

If you have a lot of files and many nested levels of directories, then you probably will either want to use the *column* or *list* view.

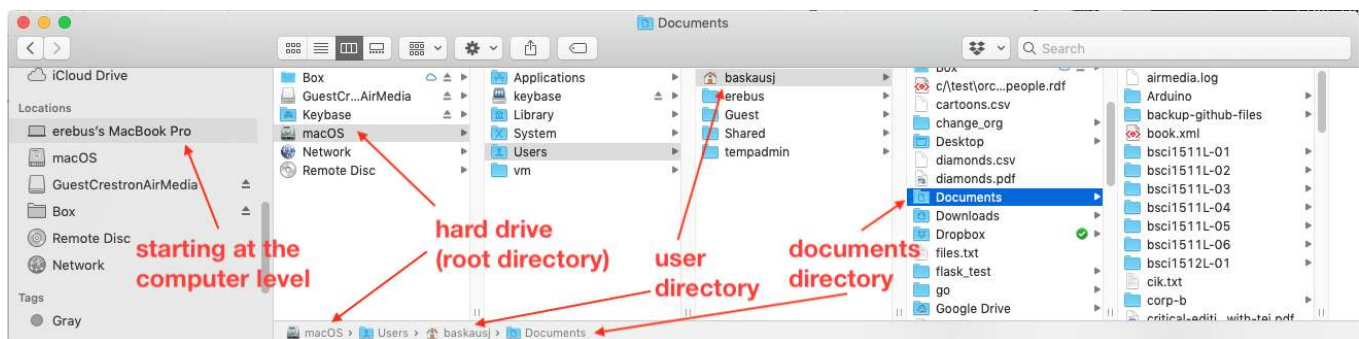


The *column* view is nice because it makes it easy to tell your level in the file hierarchy. Because each level is shown in a different column, it is easy to jump up several level in the hierarchy with a single mouse click. You can also scroll up and down at each level to see what's in the various levels without changing what's selected. The column view also has a nice preview feature that for certain file types can show you what's in the file without you having to open it. The most annoying feature of the column view is that it shortens long file names and there is no way to adjust the column width to make the full names show up. This can be a problem if you have a lot of files with long names that are similar.

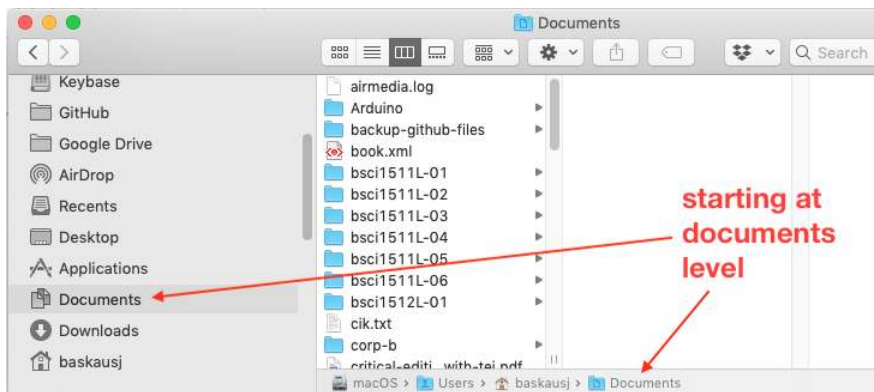


You can avoid some of these problems with the *list view*. In the list view, you can always see the full file name – if necessary, you can click and drag the column divisions at the top of the window to make the column wide enough to see the whole name. You can navigate to deeper layers in the file hierarchy by clicking on the little triangles at the left of the folder names to expand that folder. Each level in the hierarchy is indented to the right of the previous level. An advantage over the column view is that you can see deeper into several folders at once by expanding each of them. The disadvantage of this viewing option is that it requires a lot of vertical space on your computer. If you have a lot of files or folders in a folder, you may not be able to see other parts of the directory tree without doing a lot of scrolling up and down the page, particularly if you have a wide screen that is not very tall. Another disadvantage of this view is that there is no file preview. However, the view does show you detailed metadata about the files and folders, such as when they were last modified, and their size. This is the only view that allows you to see these metadata, and you can quickly sort what's visible on the screen by clicking on the column header for the characteristic that you want to sort by. For example, you can easily tell which files were most recently modified by clicking on the Date Modified column header.

Exploring the entire directory tree



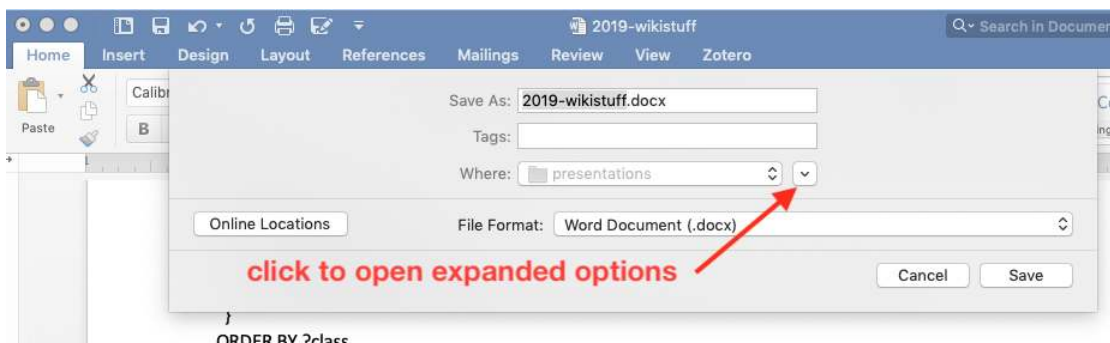
If you included your computer in the sidebar, click on it and select columns view. If your computer isn't in the sidebar, drop down the Finder **Go** menu and select **Computer**. Starting on the level of your whole computer, you can dive down into the directory, starting with the root directory in your hard drive (probably named **macOS**), to the **users** directory, then to your home folder, and finally to your **Documents** folder.



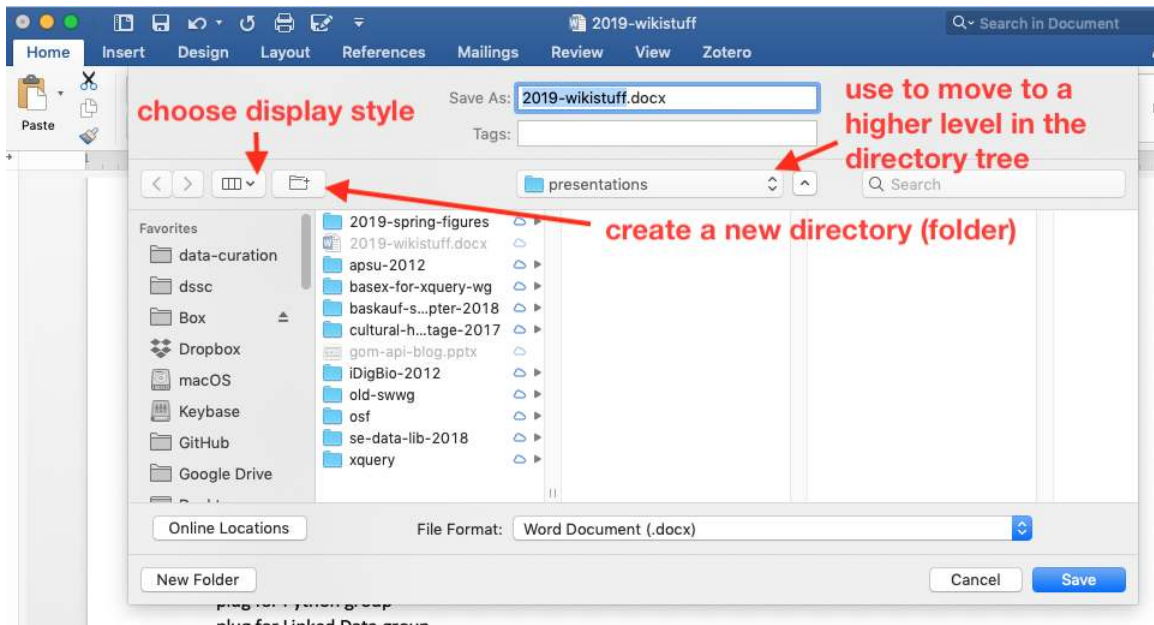
Now for contrast, click on the Documents favorite in the sidebar. You will go directly to your Documents directory. Although if you've enabled the Show Path Bar, you'll know where you are in the directory tree, and you can easily jump to a higher level than the one you chose from the sidebar Favorites by simply double-clicking on the higher level in the path bar. This feature is useful if you start exploring at a low level in the directory tree but later realize that you need to jump up to a higher level.

Save file dialog

As a relatively new Mac user, I was somewhat horrified to discover the large number of users who seem to mostly save documents to their desktop instead of in some organized place in the directory tree. I think part of the reason for that is that they weren't aware of the features available in the **Save as...** (or **Save...**) dialog from the **File** menu. Fortunately, that dialog has many of the same features as Finder, so understanding how to navigate Finder will also help you do understand how to use the **Save as...** dialog effectively.



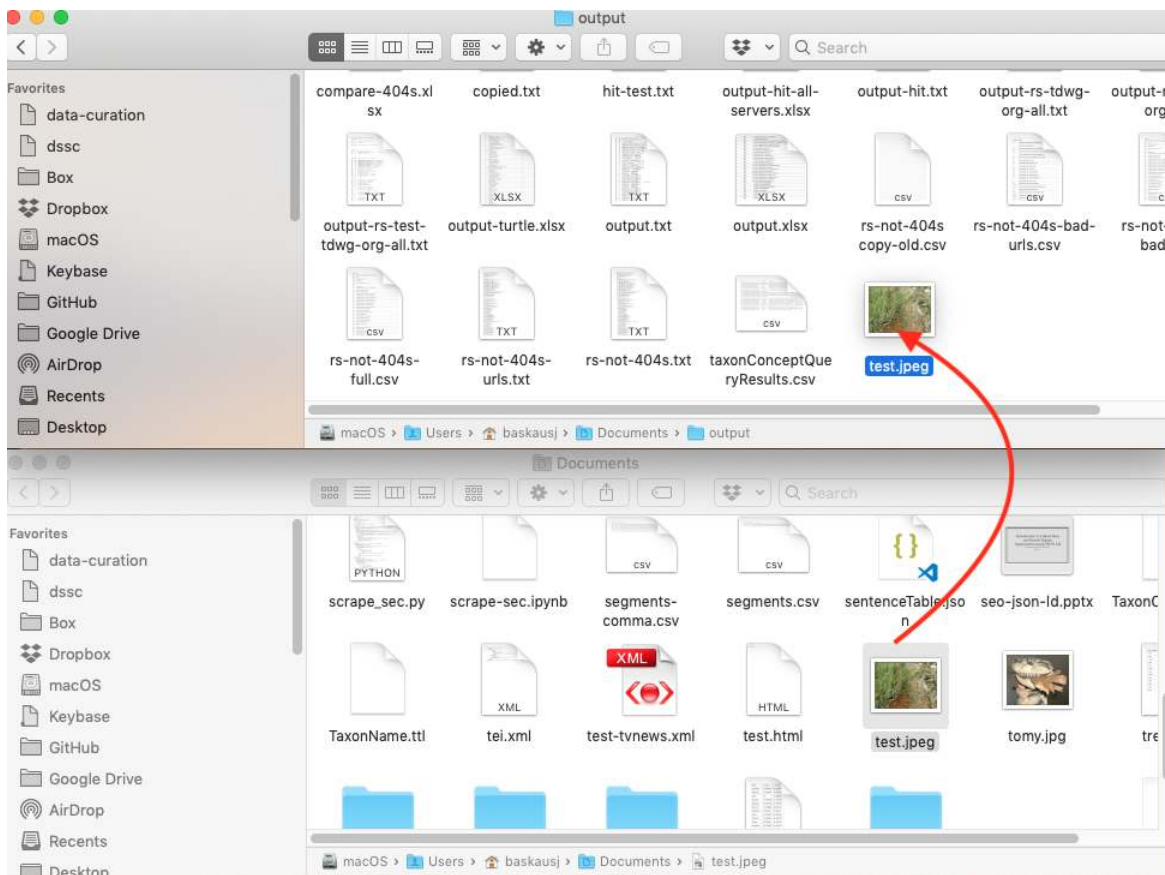
By default, the **Save as...** dialog is in its abbreviated form. Dropping down the **where** list will let you choose any location that normally appears on your Finder sidebar. But to navigate to other locations, you need to click on the small down arrow to the right of the **where** dropdown.



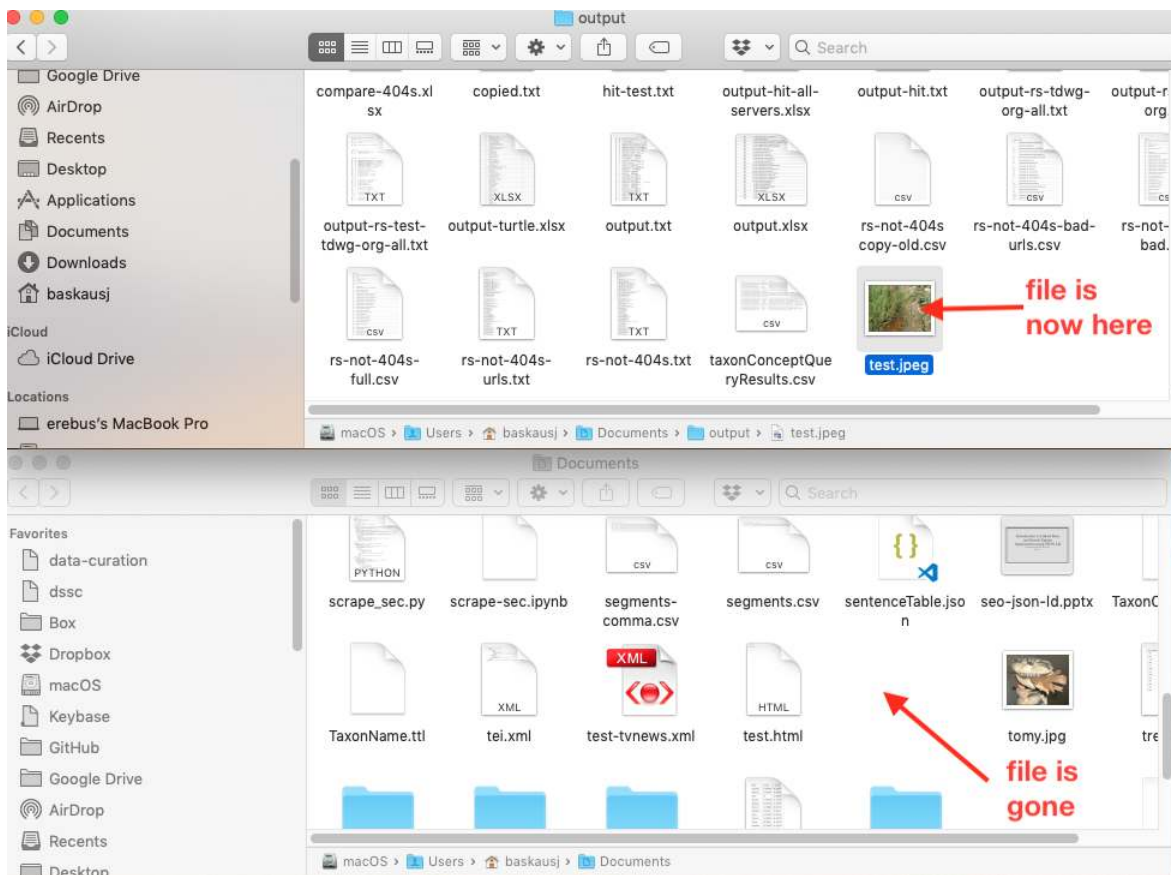
The expanded **Save as...** dialog box allows you to navigate in a manner nearly identical to Finder. To save space, the display style options are in a dropdown. You can create a new folder in the current directory if you want to develop the directory tree in a way that makes sense for storing the file. You can also drop down the **Where** option to jump to a higher position in the directory tree.

Copying and moving files

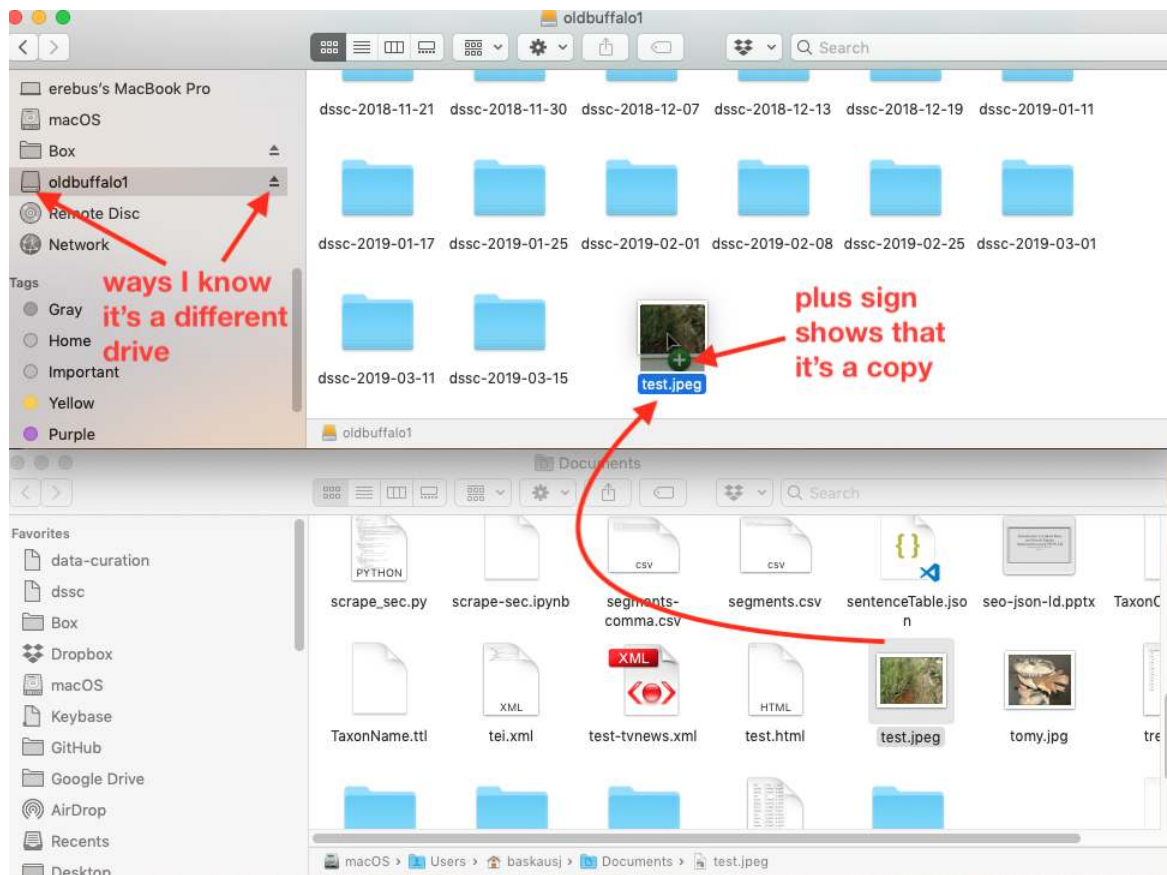
A very important aspect of working with files in Finder is understanding the effect of drag-and-drop. In some cases, dragging and dropping a file or folder causes it to be moved to the new location (moving), while in other cases, it causes a copy of the file to be created in the new location (copying). Whether drag-and-drop results in copying or moving depends primarily on the place where the file is dropped relative to its starting location.



In the example above, I'm dragging and dropping a file from the **Documents** directory to a subdirectory of **Documents** called **output**. Both directories are located on my hard drive (called **macOS** by default), so Finder assumes that I want to **move** the file.

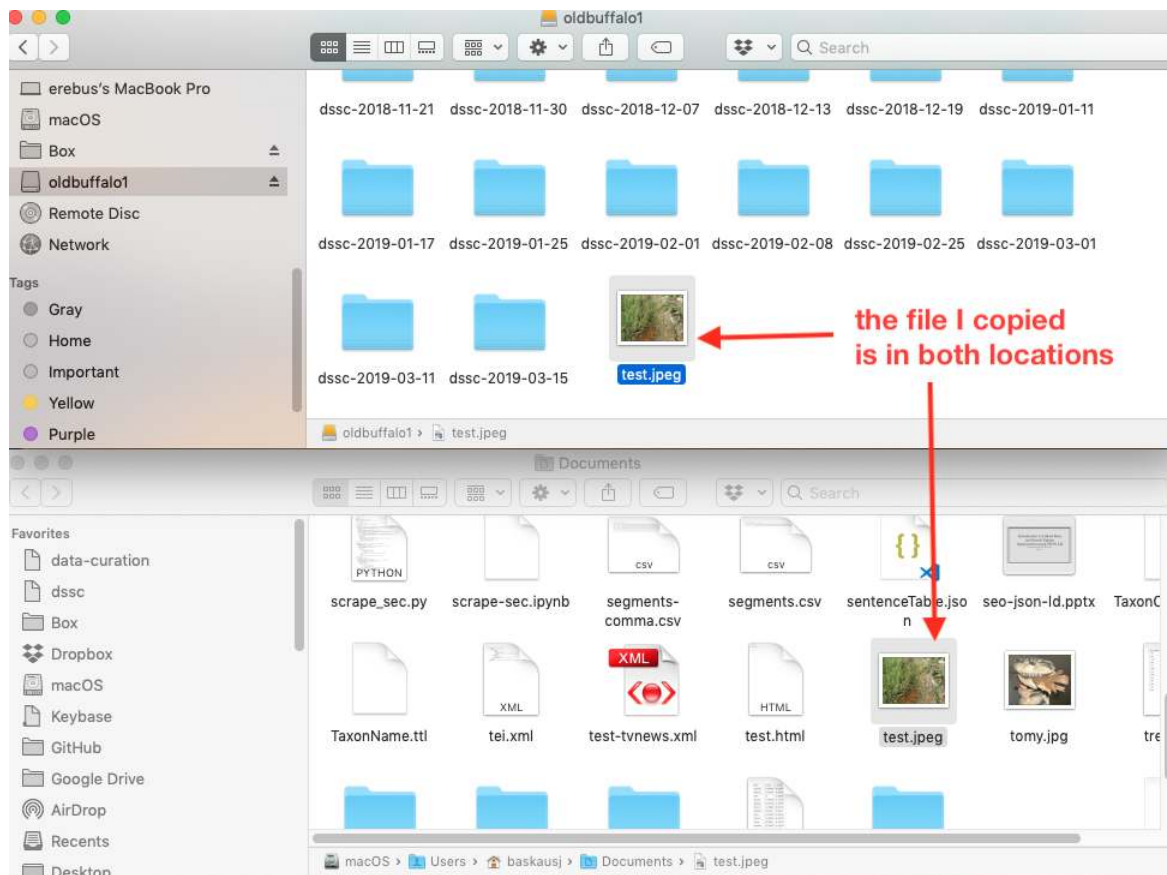


After I drop the file, I see that it has been moved to the new folder and is no longer in the old one.



In the second example, I'm dragging and dropping a file from my Documents folder to an external drive that I've connected to my system, called **oldbuffalo1**. There are two ways I can see that Finder considers this to be a different drive rather than just a folder within my **macOS** drive. To the left of the drive name, I see a little hard drive icon instead of a folder icon. To the right of the drive name, I see an **eject** symbol that I should use when I want to remove the drive from the system. Because I'm moving a file from one drive to another, Finder assumes that I want to **copy** the file.

This time, when I drag and drop, I see that a green circle with a plus sign inside it appears under the icon when I hover over the drive where I want to drop the file. That means that the file I'm dragging will be added to the other drive as a copy.



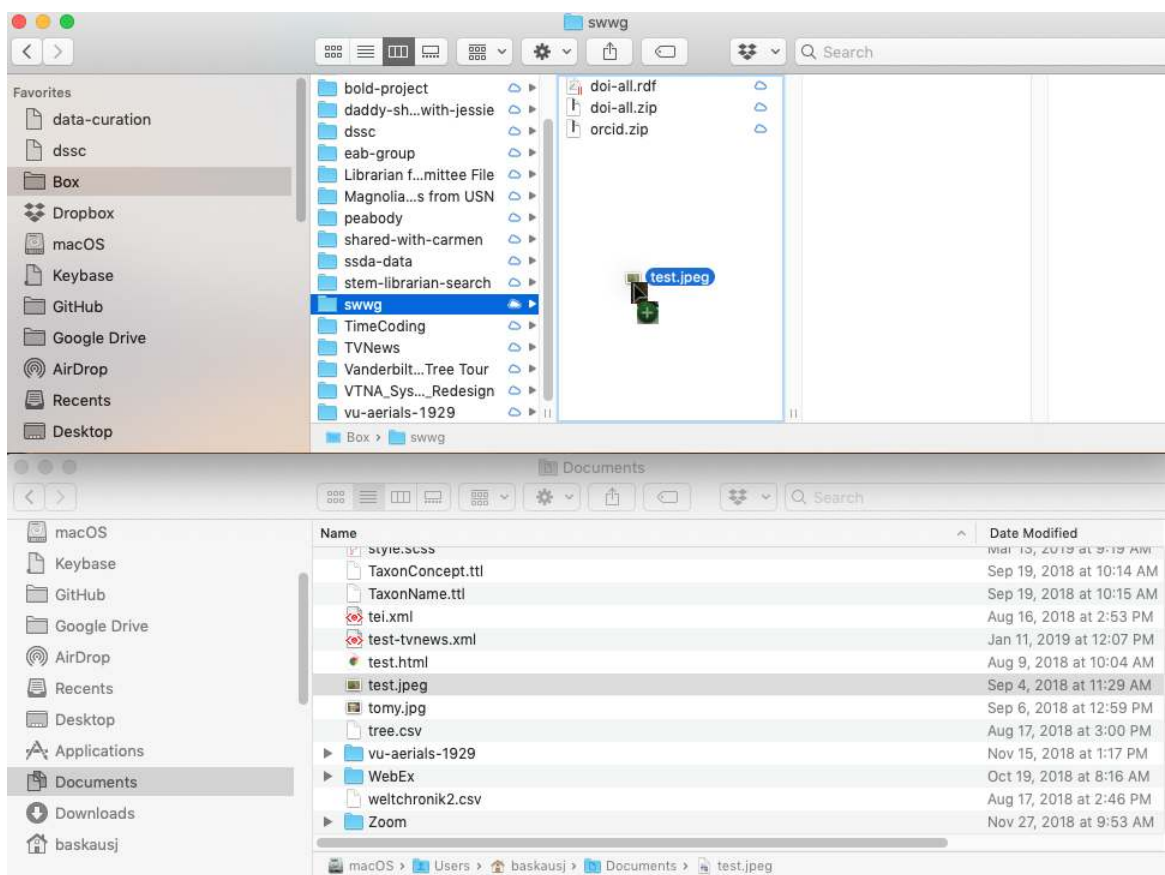
Once I've dropped the file, I can see that Finder did indeed do a copy operation because the original file is still where it was before I did the drag and drop.

The plus sign appears regardless of the display style you've chosen for Finder.

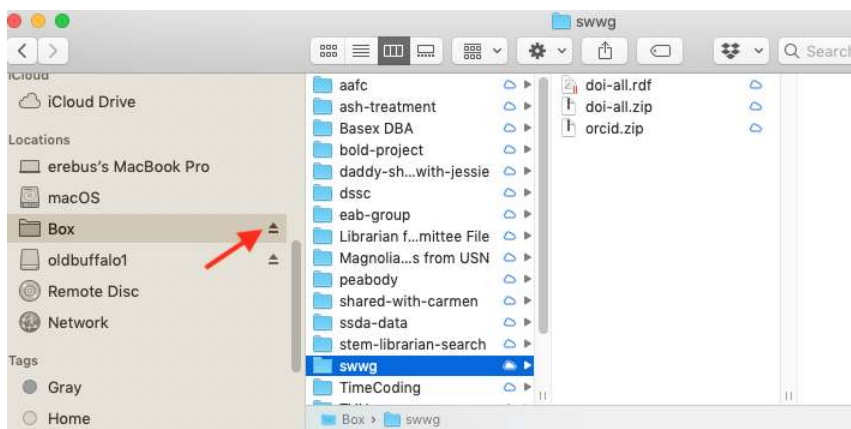
The bottom line is that if you are ever unsure about whether you are copying or moving a file, **look to see whether there is a green plus sign**.

Dropbox and Box

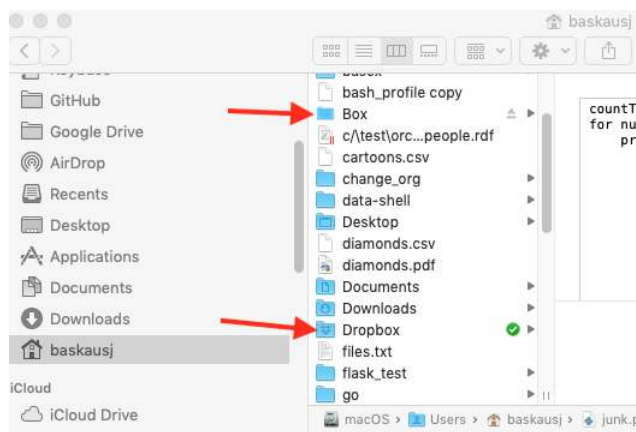
Dropbox and Box are two common and similar systems used to synch local files on a computer with an analogous directory tree in the cloud. You can use either system entirely by uploading and downloading files using a web interface, but it is far more convenient to set up folders in the cloud to be synched directly with directories on your local computer. This section assumes that you have enabled this kind of synch to your local computer.



A very confusing thing happens when I compare what happens when I drag and drop to a Dropbox folder and a Box folder. When I drag and drop to a Box folder, I see the plus sign (indicating that I'm performing a copy), but when I drag and drop to a Dropbox folder, I don't see the plus sign (indicating that I'm performing a move).



I can get to the bottom of this apparent contradiction by scrolling down my Finder sidebar to the Locations section. I see that Box is listed there (with an eject symbol), but Dropbox is not. This tells me that the two systems are set up to operate in different ways. Box folders are considered to live in a sort of virtual external drive, while Dropbox folders are just considered to be a sort of magical "regular" folder located on my hard drive.



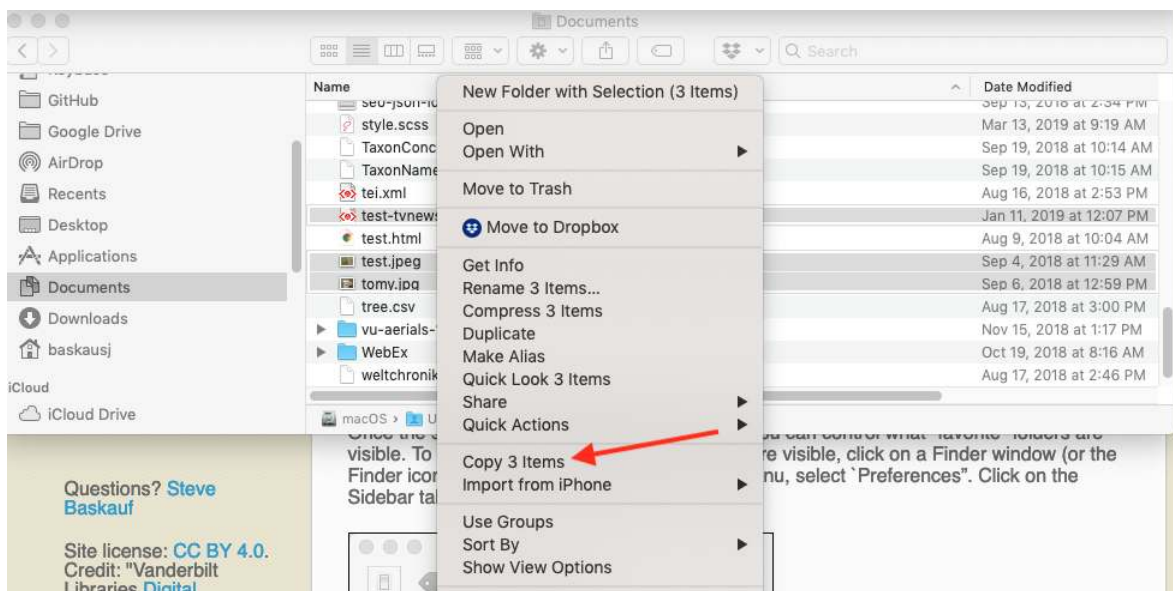
I can understand the true situation by clicking on my home folder. I see that actually both the root Box folder and the root Dropbox folder are subdirectories of my home folder. The difference between them is some feature of the way that the synch application is set up to keep those folders synched with the server in the cloud - the operating system just considers them to be regular directories, more or less. Locating them in the user directory makes sense because different users of a computer might have different Box/Dropbox accounts and putting them in the user directory allows the operating system to distinguish between the different user accounts.

Alternatives to drag and drop

Dragging and dropping files is OK for moving single files, but selecting and moving/copying a particular set of files (or a large number of files) can be a bit unnerving. Most people have probably had the experience of dropping files in the wrong place and struggling with how to undo the damage, particularly if a bunch of copied files get mixed in with a bunch of other files. (A quick answer to the problem is to hold the **Command** key and press the **Z** key, which nearly always will undo the last action you've taken.) The other issue we will deal with here is what to do if you actually want to copy (NOT move) files within a drive, or move (NOT copy) files between drives.

The best way to handle this situation is to select the files you want to copy, then copy and paste them. You can select files by clicking and dragging, but you can get better control using shift-click or command-click.

To select a *range* of files in a list, click on the first file in the list, then hold down on the **shift** key and click on the final file in the list. To select *particular* files, click on the first one, then hold down on the **command** key and click on each of the other files to select them (or click a second time to de-select them). You can also hold on the **command** key, then press on the **A** key to select *all* of the files in a directory.



Once you have selected the set of files you want to copy, right-click on one of the files and select **Copy x Items** (where **x** is the number of items). Alternatively, you can select **Copy x Items** from the Edit menu.

To **copy** the files, click on or in the directory where you want the files to be copied to, then right-click and select **Paste x Items** (or select **Paste x Items** from the Edit menu). The files you selected should be copied (not moved) to the new folder. The sortcut for this action is holding on the **command** key, then pressing the **V** key.

To **move** the selected files to the new location instead of copying them, select and copy the files you want to move as described above, then click in the folder where you want them to go. Hold down on the **command** and **option** keys at the same time, then press the **V** key. (On a PC external keyboard, press the **command** key that looks like a window and the **alt** key at the same time, then press the **V** key.)

Note: using the copy and paste method distinguishes between moving and copying **solely based on how you do the paste**. It does not depend on whether the operation is done within or between drives.

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3.1.5: Creating Screenshots

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Print Screen

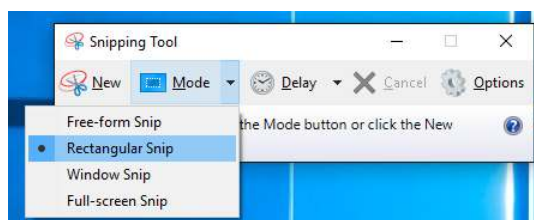
Most keyboards have a key labeled Print Screen, PRT SC, or PRT. Alternatively for a PC, you can select the Windows Key + Shift + S. The shortcut for a Mac is Command + Shift + 3.



Figure 3.1.5.1: PC Keyboard, By [Gresel](#) (Copyright; Adobe Stock, Education License)

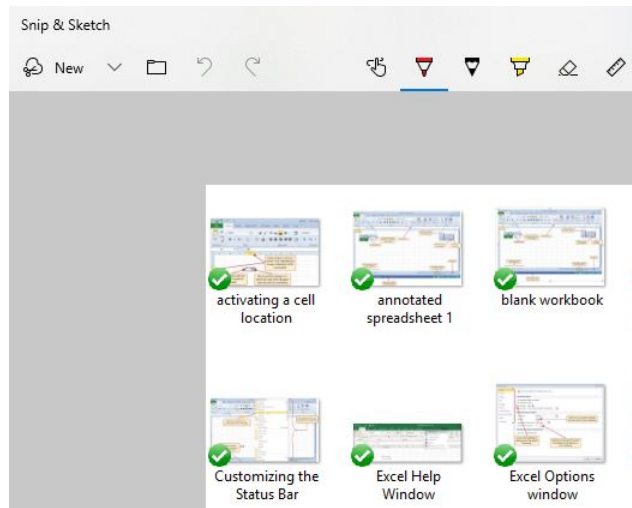
Clipping Tool

One of the first steps to securing assistance with computer-related issues requires sharing the error or screen output with a teacher or technical support staff. Often, these support resources are not available to view the screen in-person. Therefore, capturing the screen output is a vital skill to help resolve computer issues. Screenshots, also known as screen captures, screen grabs, or print screens, are the technical terminology assigned to this piece of data. A **screenshot** is a digital image of what appears on a computer or television screen. Producing a screenshot can be a confusing task, which should be broken down into two parts. The first part is the capturing of the screen image, while the second part is the process of pasting the capture into a storable file. There are numerous methods of capturing a screenshot, and they vary from one computer device to another due to operating system versions and keyboard differences.



Snipping Tool

The most consistent method for Windows users to create screenshots is by utilizing the Windows Snipping Tool. As of late 2018, the new tool is called Snip & Sketch. Most images in this documentation have been generated with the help of these tools. To open the Snip & Sketch tool, select the Start button, type “snip” in the search box on the taskbar, and then select the



Snip & Sketch

Snip & Sketch app from the list of results. In addition to capturing a full-screen snip, the Snip & Sketch Tool provides the convenience of capturing a more specific “snip” of data by using the mouse to draw a rectangular or free-form block of specific data to be captured. This allows for more focused data to be collected versus an entire screen of potentially competing images. Once the drawing is selected, the screenshot should automatically open in a new window. You can modify the screenshot by cropping, highlighting annotating or drawing on the image. This image can then be pasted into a new program (similar to how the above image was added to this document) or saved as a separate file to be stored on a permanent or cloud storage device. The Snip & Sketch tool also be set to a timer to take a screenshot in three or ten seconds. To take a screenshot with Snip & Sketch, just press PrtScn. Screenshots will be quite useful for providing feedback or asking questions to/from students/teachers, particularly in distance education environments.

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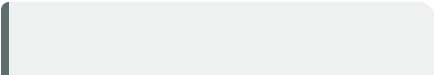
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