Computer Fundamentals

<center>**Chapter One**</center>

<center>**Computer and Operating Systems**</center>

Unit Introduction

This chapter will provide an overview of computers, discuss the significance of computers in everyday life, and describe what it means to have computer literacy. In addition, the lesson emphasizes the component of a computer that has the greatest influence on the quality of your interactions with the device: the operating system (OS) (Tanenbaum & Van Renesse, 1985). In addition to understanding the functions an operating system is designed to do, you will identify the many classifications of operating systems and investigate the most recent release of Microsoft Windows (Wigley & Kearney, 2002).

> **Tip:** An operating system (OS) is the program that, after being initially loaded into the computer by a boot program, manages all of the other application programs in a computer.

Learning Objectives

At the end of this chapter, readers will be able to:

1. Describe the importance of computers in daily life.

2. Explain the difference between system software and application software.

3. Describe the four major types of operating systems.

4. Identify the tasks an operating system performs.

5. Start a computer.

6. Use an operating system and start an application.

7. Lock and shut down a computer.

Key Terms

1. Computer Systems

2. Operating Systems

3. Computer Literacy

4. Types of Soft wares

5. Personal Computer

6. Embedded Operating Systems

7. Embedded Operating Systems

8. Server Operating Systems

9. Hardware

10. Controlling Hardware

1.1. Understanding the Importance of Computers

There are computers everywhere. On an average day, you might use your phone to make plans to meet for lunch with a friend and play music while walking to class. Do you know when you use an automated teller machine (ATM) you're also using the computer too? You also use computer to adjust thermostat in your home, or put your car on cruise control. Look at Figure 1-1 (Weizenbaum, 1967).

Listen to music


Withdraw cash from an ATM

Change the temperature setting

Set the cruise control in a car

Figure 1-1. Computers are everywhere (Source: UiB, Creative Commons License).

Depending on your position, you might utilize computers at work to process a sale, take a customer's order at a restaurant, or operate a robot on a factory floor. In general, computers help you with the majority of your daily tasks. They are essential to international trade, entertainment, education, and corporate endeavors. Computers had existed since the late 1940s when they were large, and specialized devices had names like UNIVAC & ENIAC intended for use by the government & military only (Huot, 1996). These early machines cost millions of dollars, took hours to perform a computation, and took up small buildings or entire city blocks. Today's smartphones fit in the palm of your hand, have more computing power than a UNIVAC, and are less expensive than any of its parts. The future holds advancements like computer-controlled microrobots that can treat and possibly eradicate cancer, wearable computers that take human thought as input, and more. Look at Figure 1-2 (Teo et al., 2008). So, what precisely is a computer? What does it do? You can appreciate and use computers more effectively if you know what they are and how they operate (Miranda & Russell, 2012).
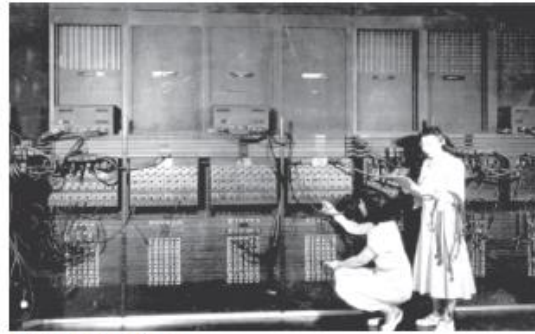
Early computer

Smartphone

Computer glasses

Figure 1-2. Past, present, and future of computers (Source: Cybr, Creative Commons License).

A computer is a piece of electrical equipment that processes, stores, and outputs data (input) (output). Data, which includes text, figures, music, photos, and video, is a collection of unprocessed, raw information. Both hardware and software are found in a computer. ***Hardware*** refers to the physical components of the machine—the wires, transistors, and circuits. The ***software*** comprises programs or instructions that direct the computer to carry out specific activities (Vee, 2013). A computer uses an input device like a keyboard to accept data and processes that data to produce information shown on a monitor. Then it saves that information on a storage device to do tasks*. **Peripheral*** hardware also refers to input & output devices attached to computer, like keyboards and displays. Information is created when raw data is transformed into something meaningful. Look at Figure 1-3 (Morrison & Krugman, 2001).

Figure 1-3. Computers include hardware and software (Source: Data Flair, Creative Commons License).

> **Remember:**
>
> To run other programs, every computer has to have at least one operating system installed. Windows, Linux, and Android are operating systems that enable users to use programs like MS Office, Notepad, and games on the computer or mobile phone.

If you work as a shop clerk, you may need a computer to perform the following sale for the customer:

i. *Input data*: When you scan an item using the barcode scanner, the computer saves the item's name & code.

ii. *Process data*: The computer processes the information—item name & code—by seeking price using software instructions (El-Gazzar et al., 2016).

iii. *Output information*: The computer shows details, including the item's name & price, on a screen before printing them on the receipt.

iv. *Store data & information*: The computer temporarily remembers code & item name as it looks up prices. Afterward, it permanently saves sale information on a hard drive, called data storage hardware.

The information processing cycle is the term used to describe this sequence of actions, which stands for input, processing, output, and storage (IPOS). The computer processes the data after the input step is

completed by you, the computer user. Frequently, the computer momentarily saves the data, presents the result, and then stores the data while still in the loop. See **Figure 1–4** (Kinnunen et al., 2018).
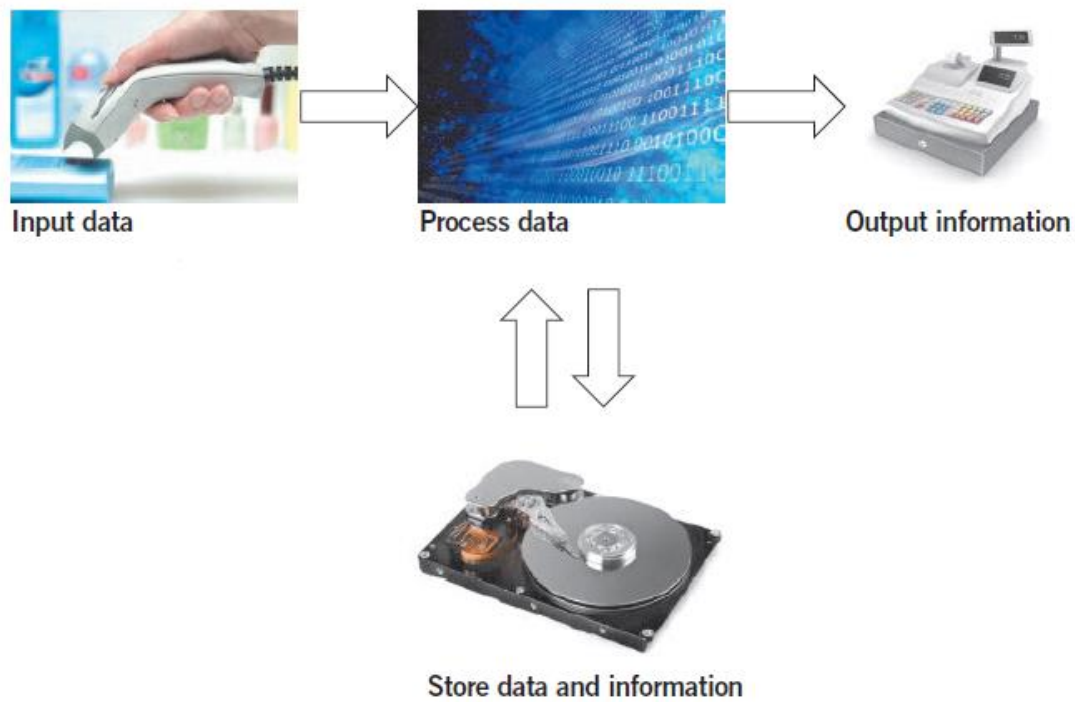
Figure 1-4. Information processing cycle (Source: Dr G Sucharitha et al, Creative Commons License).

1.1.1. Computer Literacy

Since the advent of the computer, technological advancements in this field have accelerated. It would help if you were computer literate to stay up with the pace of change, effectively utilizing the technology and software available today to improve your life as well as the lives of people around you. Being computer literate also means comprehending broad range of facts about contemporary computer technology & how it's applied to solve problems. But not everyone has a chance to learn how to use computers (Hoffman & Blake, 2003). The economic discrepancy between those who are computer proficient & have access to technology & those who do not care is known as the "digital divide." The phrase can describe someone cut off from technology due to socioeconomic class, age, region, or education. Learning how to use a computer is crucial because it may further your profession, keep you in touch with people around the globe, and enable you to be a productive, engaged member of modern society (Horton, 1983).

1.2. Types of Software

While purchasing a computer in a physical store, the salesperson will focus on hardware specifics like processing speed, the rate at which input is converted into information, and storage space (storage capacity.) Yet, a computer's software, not hardware, determines its value (Chapin et al., 2001).

A computer is a casing containing various electronic parts without software. The software gives you the tools to communicate with computer's hardware by sending & receiving data via user interface. Most personal computers come with software with a graphical user interface (GUI), which shows images known as icons & other visual components that let you interact with data & issue commands. For instance, you may choose a printer icon on the computer screen to print a document created and stored there. The computer's software instructs a printer attached to the device to provide the data required to print the page. Several of the items in the Windows 8 graphical user interface are identified in **Figure 1-5** (Guttag et al., 1978).
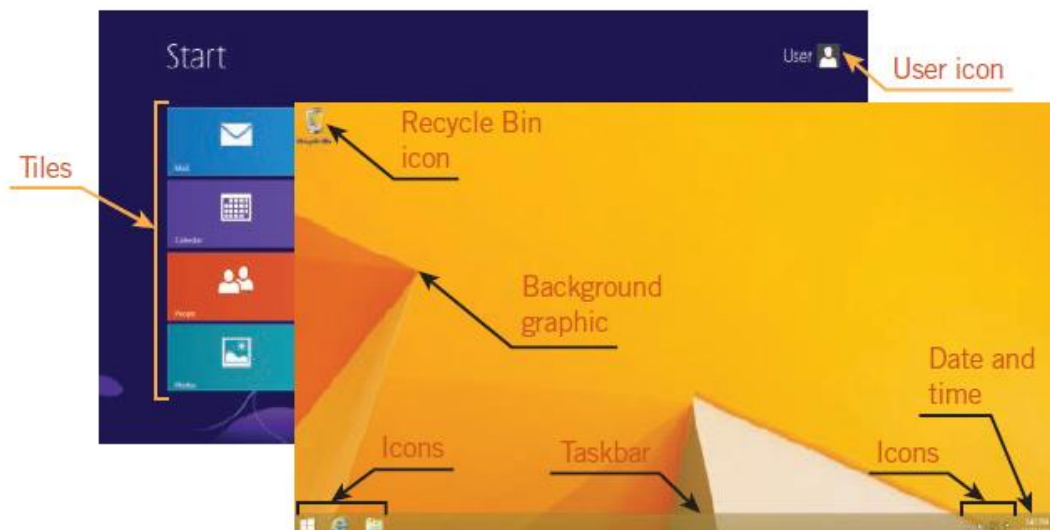
Figure 1-5. Graphical user interface (Source: Conceptdraw.com, Creative Commons License).

You must write text commands to communicate with the computer when using certain software. DOS (short for Disk Operating System), which features a *command-line interface*, as illustrated in **Figure 1-6.** Many expert computer users prefer command-line interfaces because they provide them precise control over system details, despite requiring you to memories and write complex commands and leaving little opportunity for error (Lethbridge et al., 2005).Graphical user interfaces, instead of command-line interfaces, are more aesthetically appealing and simple for beginners to use with rudimentary instruction. But they don't often provide direct user access to intricate technical settings like command-line interfaces (Kastner & Apel, 2008).

Figure 1-6. Command-line interface (Source: Comms Express, Creative Commons License).

1.2.1. Application Software & System Software

Application software and *system software* are the two primary categories of software that computer uses. The *operating system* & utility software are all considered part of the system software which powers a computer. A computer's operating system is software that manages its resources & operations. A *utility program* aids the operating system with a computer's configuration, upkeep, and security. For instance, you use a utility application to connect your computer to the Internet, global network of linked computers (Lientz et al., 1978).

The software you use to create something electronically or mostly carry out a specific task is called *application software*. It is operated by system software, which manages hardware in the background as you use a computer (Voss, 1985). You can complete tasks like writing a report, making a movie, viewing a website, or emailing images to a buddy using application software. Typically, computer runs system software to carry out computer functions, whereas you run application software to complete

work- or personal-related tasks. Operating systems and application software are contrasted in **Figure 1.7** (Lientz & Swanson, 1981).

	OPERATING SYSTEM	APPLICATION SOFTWARE
Purpose	Operates and controls computer hardware and runs application software	Provides services and information directly to users
Role in a computer system	Coordinates the activities of users, application software, and hardware	Performs tasks based upon user input
Typical tasks	Monitors hardware Manages resources Controls input and output Processes data	Creates documents such as reports and charts Provides entertainment Displays photos

Figure 1-7. Comparing operating systems and application software (Source: pediaa. com, Creative Commons License).

1.3. Types of Operating Systems

According to the type of device they are built for, *operating systems* can be divided into four main groups: servers, mobile computing devices personal computers, & devices other than computers. The operating system is pre-installed when you buy a personal computer or mobile device. Thus the machines you can consider buying are frequently based on your desire for an operating system (Yang & Hawblitzel, 2010).

1.3.1. Personal Computer Operating Systems

Desktop or personal operating systems are installed on single computer. Because only one person is interacting with these operating systems simultaneously, they are called single-user operating systems. Because they enable you to utilize multiple programs simultaneously, they are also *multitasking operating systems*. For instance, while working on a paper and checking your email on your laptop, you can search for definitions online (Chen et al., 1995).

Windows, Mac OS, and Linux are the top three operating systems for personal computers. More personal computers currently run Microsoft Windows than any other operating system. The 2001 release of Windows XP was the most frequently used version of Windows for many years. Recently, Windows XP was exceeded in popularity by Windows 7, which was introduced in 2009 (Denning & Brown, 1984). The most current major iteration of Windows, **Windows 8**, came out in 2012. Because Windows could be used on low-cost personal computers made by numerous computer manufacturers, it gained popularity. Because it is simple to use, customizable, and supports more application kinds than other operating systems, it has maintained its appeal (Chen et al., 1996).

Mac OS, on the other hand, is exclusive to Apple Macintosh computers. Mac OS X, where X stands for Roman numeral 10, is the name of the operating system's most recent version. *Mac OS X* versions up to 10.8 include large cat names like Snow Leopard and Mountain Lion. A Macintosh computer running Mac OS X Mountain Lion is seen in **Figure 1-8**. Mavericks, the name of Mac OS X version 10.9, heralds the start of shift in the naming convention from big cats to locations in California. A surfing spot in northern California is called Mavericks. The first GUI operating system was Mac OS. Users of Mac OS X have given it reputation of being extremely safe, dependable, and simple-to-maintain operating system (Redell et al., 1980).

Figure 1-8. Mac OS X Mountain Lion (Source: Mac OS X Mountain Lion .com, Creative Commons License).

An operating system for personal computers called ***Linux*** is connected to UNIX, which was created in the 1960s for powerful, special-purpose machines that scientists and programmers commonly use. Linux is available to public as open-source software, which entitles anyone to use, modify, & distribute it (Xin, 2019). In contrast to Windows & Mac OS, that are proprietary operating systems solely owned & updated by their companies, Linux is made available to public as open-source software. Programmers worldwide have worked together to expand Linux and provide tools, apps, and innovations (Novac et al., 2017).

Commercial distributions like Fedora, openSUSE, Ubuntu, and Mandriva are examples of available Linux versions. Debian, Slackware, and Gentoo are among the non-commercial Linux distributions available (Redell et al., 2001). Ubuntu (called after the African concept that promotes humanity towards others) is seen in **Figure 1-9** and has characteristics similar to those of Windows and Mac OS. Some Linux distributions, like BSD, include command-line interfaces. All distributions have the benefits of being free to install and use, operating on any hardware, and offering great security (Phail, 1991).
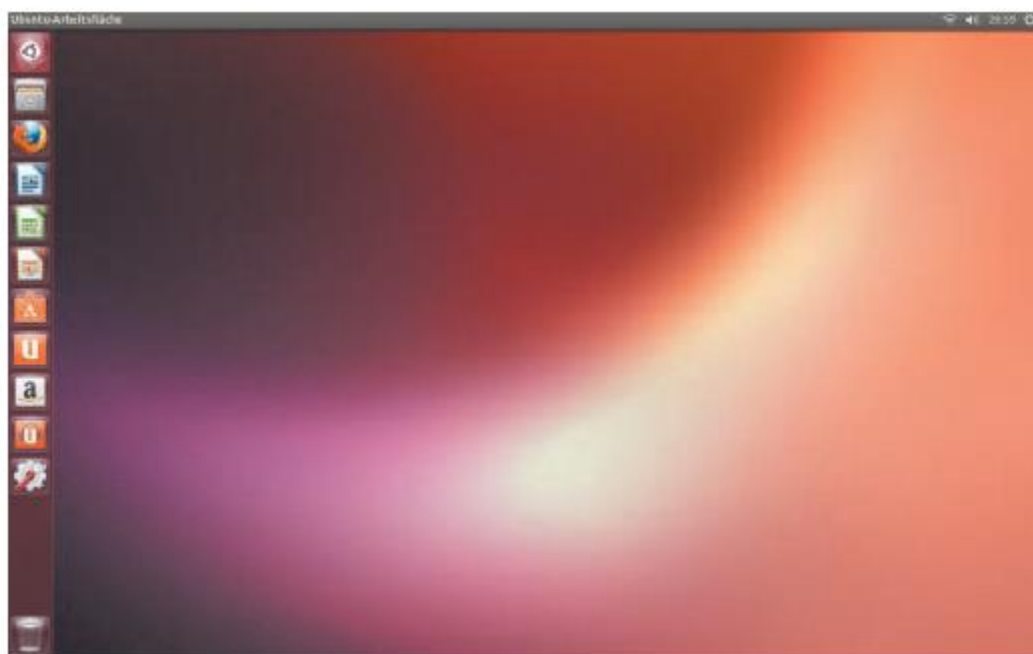
Figure 1-9. Linux Ubuntu (Source: Mac OS X Mountain Lion .com, Creative Commons License).

1.3.2. Mobile Operating Systems

A mobile operating system is created for compact handheld computer, like a tablet or smartphone. A mobile operating system is substantially smaller and has fewer functions than a personal operating system. ***Smartphones*** are cell phones with several computer-like features, enabling them to run general-purpose computing programs. ***Tablets*** are one-piece mobile computers larger than smartphones and

frequently have touchscreens, which you may use to interact with graphical user interface (GUI). Mobile operating systems are designed to function nicely with mobile hardware and feature like touchscreens, navigational systems, & speech recognition, as well as fit into the limited memory of mobile devices (Okediran et al., 2014).

According to Figure 1-9, there are four well-known mobile operating systems for smartphones and tablets: iOS, Android, *Windows Phone*, and *Windows RT*. The iOS operating system was developed specifically for Apple's mobile devices, such as the iPhone and iPad, as depicted in **Figure 1-10**. Google created Android as an open-source operating system that can be used with various smartphones and tablets. From Linux, Android is derived. Windows 8 is comparable to Windows Phone and Windows RT. Because they only allow one user to execute one operation at a time, mobile operating systems are primarily single-user, single-task operating systems. You can do various things simultaneously on some more contemporary mobile operating systems, such do an Internet search and a phone conversation. They might be regarded as single-user, multitasking operating systems, even though they only let you carry out two tasks at once (Jindal & Jain, 2012).

Apple iPhone (left) and iPad (right) running iOS

Smartphone (left) and tablet (right) running Android

Smartphone running Windows Phone (left) and tablet running Windows RT (right)

Figure 1-10. Mobile operating systems (Source: Brainpulse, Creative Commons License).

1.3.3. Embedded Operating Systems

Embedded operating systems, which power gadgets like ATMs, navigational systems, digital video recorders, portable media players, and other consumer goods, are comparable to mobile operating systems (Tan et al., 2005). A standalone device's hardware includes an embedded operating system. Unlike mobile operating systems, embedded operating systems are made to serve a particular function and carry out a single kind of work, providing maps & directions. An embedded operating system also functions with little to no assistance from you or other users. The embedded operating system provides the output, such as directions, once you supply a particular input, such as a destination. Look at **Figure 1-11** (Pillai & Shin, 2001).

Embedded operating systems, like most mobile operating systems, are designed for a single user executing one task at a time. Embedded operating systems for mobile devices, mobile operating systems like Android, were created with the sole purpose of storing, retrieving, and making phone calls. Embedded operating systems changed into mobile operating systems as cell phones developed into smartphones with greater features, including the capacity to take pictures, record videos, play music, connect to the Internet, and organize personal information (Dick et al., 2000).

Figure 1-11. Portable and built-in navigation devices have embedded operating systems (Source: Brainpulse, Creative Commons License).

1.3.4. Server Operating Systems

A *network* is collection of two or more connected computers, and it is managed by a server operating system, that's housed on a server. A *server* is computer which offers other computers or clients network services like email. Server operating systems are also known as network operating systems due to their function. Several client computers connect to single server in Figure 1-12 (Kaashoek et al., 1996).

Figure 1-12. Server computer on a network (Source: Nex Datacentre, Creative Commons License).

While each client computer on network runs its operating system, the server manages client computers' service requests using a server operating system. For instance, if a network user wishes to print document, server operating system responds to request. It delivers print job to printer, positioned among other print jobs in specific order. In this manner, printer won't be overburdened with print jobs from numerous network users (Narayan & Tauch, 2010). The server operating system is used by a specialist known as the network administrator to manage the network and its users. Since they permit multiple users to run programs & utilize server's resources concurrently, server operating systems are multiuser operating systems. A server operating system balances user needs to guarantee that everyone has access to resources & services they desire & that a problem with one user will never affect all users.

Windows Server and Mac OS X Server are names of the server versions of each operating system, respectively. UNIX and Linux distributions are also included in the category of server operating systems. Indeed, many servers controlling email and Internet access utilize UNIX (Soloviev, 2008).