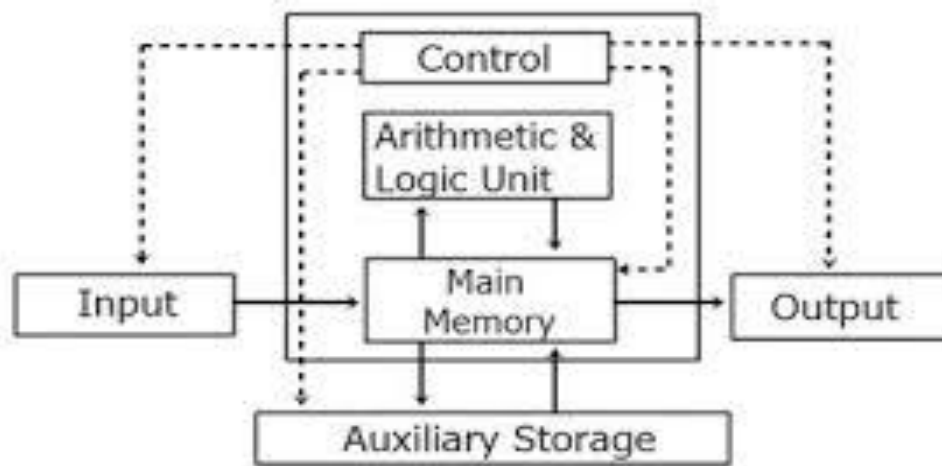


COMPUTER FUNDAMENTAL



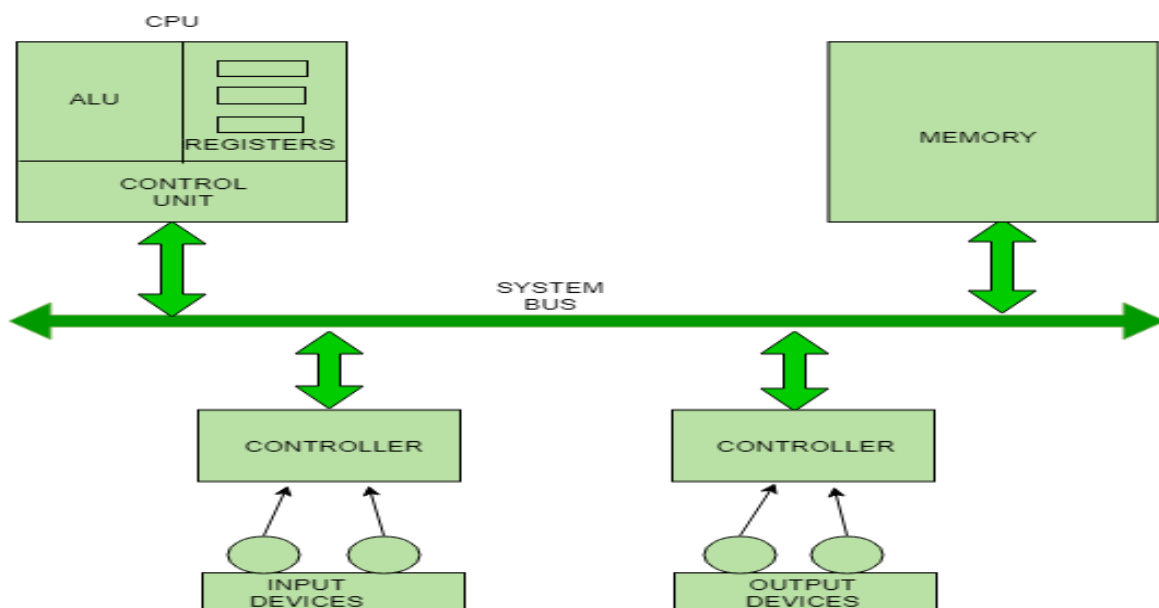


Block Diagram of Computer

Interconnection between Functional Components

A computer consists of input unit that takes input, a CPU that processes the input and an output unit that produces output. All these devices communicate with each other through a common bus. A bus is a transmission path, made of a set of conducting wires over which data or information in the form of electric signals, is passed from one component to another in a computer. The bus can be of three types – Address bus, Data bus and Control Bus.

The address bus carries the address location of the data or instruction. The data bus carries data from one component to another and the control bus carries the control signals. The system bus is the common communication path that carries signals to/from CPU, main memory and input/output devices. The input/output devices communicate with the system bus through the controller circuit which helps in managing various input/output devices attached to the computer.



- **Input Unit** :The input unit consists of input devices that are attached to the computer. These devices take input and convert it into binary language that the computer understands. Some of the common input devices are keyboard, mouse, joystick, scanner etc.
- **Output Unit** : The output unit consists of output devices that are attached with the computer. It converts the binary data coming from CPU to human understandable form. The common output devices are monitor, printer, plotter etc.
- **Central Processing Unit (CPU)** : Once the information is entered into the computer by the input device, the processor processes it. The CPU is called the brain of the computer because it is the control center of the computer. It first fetches instructions from memory and then interprets them so as to know what is to be done. If required, data is fetched from memory or input device. Thereafter CPU executes or performs the required computation and then either stores the output or displays on the output device. The CPU has three main components which are responsible for different functions – Arithmetic Logic Unit (ALU), Control Unit (CU) and Memory registers
- **Arithmetic and Logic Unit (ALU)** : The ALU, as its name suggests performs mathematical calculations and takes logical decisions. Arithmetic calculations include addition, subtraction, multiplication and division. Logical decisions involve comparison of two data items to see which one is larger or smaller or equal.
- **Control Unit** : The Control unit coordinates and controls the data flow in and out of CPU and also controls all the operations of ALU, memory registers and also input/output units. It is also responsible for carrying out all the instructions stored in the program. It decodes the fetched instruction, interprets it and sends control signals to input/output devices until the required operation is done properly by ALU and memory.
- **Memory Registers** : A register is a temporary unit of memory in the CPU. These are used to store the data which is directly used by the processor. Registers can be of different sizes(16 bit, 32 bit, 64 bit and so on) and each register inside the CPU has a specific function like storing data, storing an instruction, storing address of a location in memory etc.
- **Memory** : Memory attached to the CPU is used for storage of data and instructions and is called internal memory .The internal memory is divided into many storage locations, each of which can store data or instructions. Each memory location is of the same size and has an address. The internal memory is also called the Primary memory or Main memory. This memory is also called as RAM, i.e. Random Access Memory.

The Four Primary Functions of the CPU

The CPU processes instructions it receives in the process of decoding data. In processing this data, the CPU performs four basic steps:

1. **Fetch:** Each instruction is stored in memory and has its own address. The processor takes this address number from the program counter, which is responsible for tracking which instructions the CPU should execute next.
2. **Decode:** All programs to be executed are translated to into Assembly instructions. Assembly code must be decoded into binary instructions, which are understandable to your CPU. This step is called decoding.

3. **Execute:** While executing instructions the CPU can do one of three things: Do calculations with its ALU, move data from one memory location to another, or jump to a different address.
4. **Store:** The CPU must give feedback after executing an instruction, and the output data is written to the memory.

MEMORY

The **computer memory** is a [temporary storage area](#). It holds the [data](#) and [instructions](#) that the Central Processing Unit (**CPU**) needs. Before a [program](#) can run, the program is [loaded](#) from some [storage medium](#) into the memory. This allows the CPU direct access to the computer program. Memory is needed in all [computers](#).

A computer is usually a [digital electronics](#) device, which understands only **electricity on** and **electricity off**. This is expressed by using two [symbols](#) – 0 and 1 – which are called [binary digits](#) or [bits](#).

The computer's memory consists of many millions or billions of bytes. For example, 64K bytes of memory is the same as 65,536 ($1,024 \times 64 = 65,536$) bytes. For larger memory capacities, the units *mega* and *giga* can be used. One [megabyte](#) of computer memory usually means 1024 kilobytes, which is 1,048,576 bytes, whereas one [gigabyte](#) means 1024 megabytes, which is 1,073,741,824 bytes. The size of the [memory address](#) that the computer uses limits the number of bytes it can handle.

Read only memory

There are some programs and instructions which the computer will always need. [Read only memory](#) (ROM) is the [permanent](#) memory which is used to store these important control programs and systems software to perform functions such as [booting](#) up or starting up programs. ROM is non-volatile. That means the contents are not lost when the power is switched off. Its contents are written when the computer is built, but in modern computers, the user can change the contents using special software.

Random access memory

[Random access memory](#) (RAM) is used as the working memory of a computer system. It stores input data, intermediate results, programs, and other information temporarily. It can be read and/or written. It is usually volatile, which means that all data will be lost when the power is turned off. In most cases it is loaded again from the [hard disk](#) which is used as [data storage](#).

Input Devices

A device that can be used to insert data into a computer system is called as input device.

It allows people to supply information to computers without any input devices, a computer would only be a display device and not allow users to interact with it, Examples of input devices include keyboards, mouse, scanners, digital cameras and Light pen, joysticks, Touch-screen, OMR, OBR, OCR.

Keyboard

Most common and very popular input device is keyboard. The keyboard helps in inputting the data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing



some additional functions.

Mouse

Mouse is most popular Pointing device. It is a very famous cursor-control device. It is a small palm size box with a round ball at its base which senses the movement of mouse and sends corresponding signals to CPU on pressing the buttons.



Generally it has two buttons called left and right button and scroll bar is present at the mid. Mouse can be used to control the position of cursor on screen, but it cannot be used to enter text into the computer.

Advantages

- Easy to use
- Not very expensive
- Moves the cursor faster than the arrow keys of keyboard.

Scanner

Scanner is an input device which works more like a photocopy machine. It is used when some information is available on a paper and it is to be transferred to the hard disc of the computer for further manipulation.

Scanner captures images from the source which are then converted into the digital form that can be stored on the disc. These images can be edited before they are printed.

Joystick

Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The Joystick can be moved in all four directions.

The function of joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.



Light Pen

Light pen is a pointing device which is similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

When light pen's tip is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.



Magnetic Ink Card Reader (MICR)

MICR input device is generally used in banks because of a large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.

This reading process is called Magnetic Ink Character Recognition (MICR). The main advantage of MICR is that it is fast and less error prone.

Optical Character Reader(OCR)

OCR is an input device used to read a printed text. OCR scans text optically character by character, converts them into a machine readable code and stores the text on the system memory.

Bar Code Readers

Bar Code Reader is a device used for reading bar coded data (data in form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books etc. It may be a hand held scanner or may be embedded in a stationary scanner. Bar Code Reader scans a bar code image, converts it into an alphanumeric value which is then fed to the computer to which bar code reader is connected.



Optical Mark Reader (OMR)

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked. It is specially used for checking the answer sheets of examinations having multiple choice questions.



Touch screen

Touch screen is a input device. Touch screen technology is the direct manipulation type gesture based technology. Direct manipulation is the ability to manipulate digital world inside a screen without the use of command-line-commands. A device which works on touch screen technology is coined as Touch screen. A touch screen is an electronic visual display capable of 'detecting' and effectively 'locating' a touch over its display area.

It is sensitive to the touch of a human finger, hand, pointed finger nail and passive objects like stylus. Users can simply move things on the screen, scroll them, make them bigger and many more.



Output Devices

A device which is used to display result from a computer is called as output device. It allows people to receive information from computers. An **output device** is any peripheral that receives or displays output from a computer. The picture shows an inkjet printer, an output device that can make a hard copy of anything being displayed on a monitor. Output device is electronic equipment connected to a computer and used to transfer data out of the computer in the form of text, images, sounds or print. Examples of output devices include : Digitizers, Plotters, LCD, Plasma Display, Printers, etc.

Digitizer

Digitizer is an input device which converts analog information into a digital form. Digitizer can convert a signal from the television camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Digitizer is also known as Tablet or Graphics Tablet because it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for doing fine works of drawing and images manipulation applications.



Plotters

A plotter is a printer that interprets commands from a computer to make line drawings on paper with one or more automated pens. Unlike a regular printer, the plotter can draw continuous point-to-point lines directly from vector graphics files or commands. There are a number of different types of plotters: a drum plotter draws on paper wrapped around a drum which turns to produce one direction of the plot, while the pens move to provide the other direction; a flatbed plotter draws on paper placed on a flat surface; and an electrostatic plotter draws on negatively charged paper with positively charged toner.

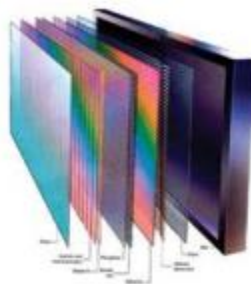


Monitors

Monitor commonly called as Visual Display Unit (VDU) is the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the no. of the pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Liquid Cristal Display (LCD)
- Plasma Display



Printers

Printer is the most important output device, which is used to print information on paper.

There are two types of printers

- Impact Printers
- Non-Impact Printers

Impact Printers

The printers that print the characters by striking against the ribbon and onto the paper are called impact printers.

Characteristics of Impact Printers are following

- Very low consumable costs
 - Impact printers are very noisy
 - Useful for bulk printing due to low cost
 - There is physical contact with the paper to produce an image
- These printers are of two types

- Character printers
- Line printers

Character Printers:

Character Printers are printers which print one character at a time. These are of further two types

- Dot Matrix Printer(DMP)
- Daisy Wheel

Dot Matrix Printer

In the market one of the most popular printer is Dot Matrix Printer because of their ease of printing features and economical price. Each character printed is in form of pattern of Dot's and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which comes out to form a character that is why it is called Dot Matrix Printer.



Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

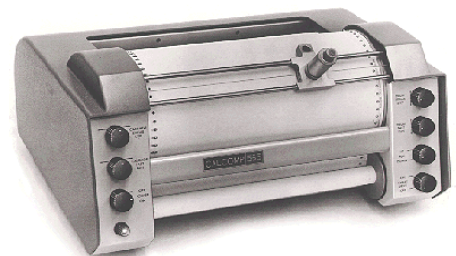
Line Printers

Line printers are printers which print one line at a time. These are of further two types

- Drum Printer
- Chain Printer

Drum Printer

This printer is like a drum in shape so it called drum printer. The surface of drum is divided into number of tracks. Total tracks are equal to size of paper i.e for a paper width of 132 characters, Drum will have 132 tracks. A character set is embossed on track.



Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts can not be changed

Chain Printer

In this printer chain of character sets are used so it called Chain Printers. A standard character set may have 48, 64, 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.



Disadvantages

- Noisy
- Do not have the ability to print any shape of characters.

Non-impact Printers

The printers that print the characters without striking against the ribbon and onto the paper, are called Non-impact Printers. These printers print a complete page at a time, also called as Page Printers. These printers are of two types

- *Laser Printers*
- *Inkjet Printers*

Characteristics of Non-impact Printers

- Faster than impact printers.
- High quality.
- Support many fonts and different character size.

Laser Printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed.
- Very high quality output.
- Give good graphics quality.
- Support many fonts and different character size.

Disadvantage

- Cannot be used to produce multiple copies of a document in a single printing.

Inkjet Printers



Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.



Processor Families

- As the microprocessor processes data, it looks first in the cache memory. Cache memory is responsible for speeding up computer operations and processing. The processors here are grouped by "families", where we consider a family of processors to be a group of processors that vary only in clock speed, not in architecture.
- We will discuss here about all the major processor families used on PC-compatible computers. It covers every major x86 processor on the market, from the first Intel 8088 used in the original IBM PC, to the latest released hot chips

CPUs with speed and word length

CPU	CLOCK SPEED (MHz)	WORD LENGTH (Bits)
8088	4.77	8
80286	6-12	16
80386	25-40	32
80486	50-80	32
Pentium (80586)	96-200	64
Pentium Pro	100-200	64
Pentium II	233-300	64
Pentium III	350MHz-1.13GHz	64
Pentium IV	1.5GHz -3.2GHz	64

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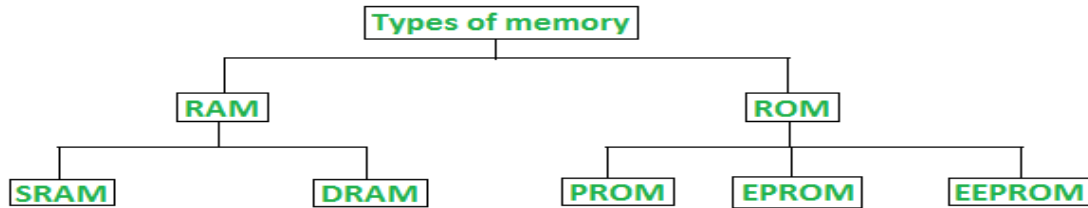
Storage Device

A storage device is any computing hardware that is used for storing, porting and extracting data files and objects. It can hold and store information both temporarily and permanently, and can be internal or external to a computer, server or any similar computing device.

A storage device may also be known as a storage medium or storage media.

Random Access Memory (RAM) and Read Only Memory (ROM)

Memory is the most essential element of a computing system because without it computer can't perform simple tasks. Computer memory is of two basic type – Primary memory / Volatile memory and Secondary memory / non-volatile memory. Random Access Memory (RAM) is volatile memory and Read Only Memory (ROM) is non-volatile memory.



Classification of computer memory

1. Random Access Memory (RAM) –

- It is also called as *read write memory* or the *main memory* or the *primary memory*.
- The programs and data that the CPU requires during execution of a program are stored in this memory.
- It is a volatile memory as the data loses when the power is turned off.
- RAM is further classified into two types- *SRAM (Static Random Access Memory)* and *DRAM (Dynamic Random Access Memory)*.

2. Read Only Memory (ROM) –

- Stores crucial information essential to operate the system, like the program essential to boot the computer.
- It is not volatile.
- Always retains its data.
- Used in embedded systems or where the programming needs no change.
- Used in calculators and peripheral devices.
- ROM is further classified into 4 types- *ROM, PROM, EPROM, and EEPROM*.

Types of Read Only Memory (ROM) –

1. **PROM (Programmable read-only memory)** – It can be programmed by user. Once programmed, the data and instructions in it cannot be changed.
2. **EPROM (Erasable Programmable read only memory)** – It can be reprogrammed. To erase data from it, expose it to ultra violet light. To reprogram it, erase all the previous data.
3. **EEPROM (Electrically erasable programmable read only memory)** – The data can be erased by applying electric field, no need of ultra violet light. We can erase only portions of the chip.

RAM	ROM
1. Temporary Storage.	1. Permanent storage.
2. Store data in MBs.	2. Store data in GBs.
3. Volatile.	3. Non-volatile.
4. Used in normal operations.	4. Used for startup process of computer.
5. Writing data is faster.	5. Writing data is slower.

Difference between RAM and ROM

Cache memory

Cache memory, also called CPU memory, is high-speed static random access memory ([SRAM](#)) that a computer microprocessor can access more quickly than it can access regular random access memory ([RAM](#)). The purpose of cache memory is to store program instructions and data that are used repeatedly in the operation of programs or information that the CPU is likely to need next. The computer processor can access this information quickly from the cache rather than having to get it from computer's main memory. Fast access to these instructions increases the overall speed of the program.

First generation (1940 - 1956)

The first generation of computers used [vacuum tubes](#) as a major piece of technology. Vacuum tubes were widely used in computers from [1940](#) through [1956](#). Vacuum tubes were larger components and resulted in first generation computers being quite large in size, taking up a lot of space in a room. Some of the first generation computers took up an entire room.

The [ENIAC](#) is a great example of a first generation computer. It consisted of nearly 20,000 vacuum tubes, as well as 10,000 capacitors and 70,000 resistors. It weighed over 30 tons and took up a lot of space, requiring a large room to house it. Other examples of first generation computers include the [EDSAC](#), [IBM 701](#), and [Manchester Mark 1](#).

Second generation (1956 - 1963)

The second generation of computers saw the use of [transistors](#) instead of vacuum tubes. Transistors were widely used in computers from [1956](#) to [1963](#). Transistors were smaller than vacuum tubes and allowed computers to be smaller in size, faster in speed, and cheaper to build.

The first computer to use transistors was the TX-0 and was introduced in 1956. Other computers that used transistors include the IBM 7070, Philco Transac S-1000, and RCA 501.

Third generation (1964 - 1971)

The third generation of computers introduced the use of IC (integrated circuits) in computers. Using IC's in computers helped reduce the size of computers even more compared to second-generation computers, as well as make them faster.

Nearly all computers since the mid to late 1960s have utilized IC's. While the third generation is considered by many people to have spanned from 1964 to 1971, IC's are still used in computers today. Over 45 years later, today's computers have deep roots going back to the third generation.

Fourth generation (1972 - 2010)

The fourth generation of computers took advantage of the invention of the microprocessor, more commonly known as a CPU. Microprocessors, along with integrated circuits, helped make it possible for computers to fit easily on a desk and for the introduction of the laptop.

Some of the earliest computers to use a microprocessor include the Altair 8800, IBM 5100, and Micral. Today's computers still use a microprocessor, despite the fourth generation being considered to have ended in 2010.

Fifth generation (2010 to present)

The fifth generation of computers is beginning to use AI (artificial intelligence), an exciting technology that has many potential applications around the world. Leaps have been made in AI technology and computers, but there is still much room for improvement.

One of the more well-known examples of AI in computers is IBM's Watson, which has been featured on the TV show Jeopardy as a contestant. Other better-known examples include Apple's Siri on the iPhone and Microsoft's Cortana on Windows 8 and Windows 10 computers. The Google search engine also utilizes AI to process user searches.

Classification of Computer based on Size , Proccsors

Computer can be classified into four categories based on size namely Micro, Mini, Mainframe and Super computer. Micro computers are smallest and based on the use of microprocessors. Microprocessor is combined or integrated circuit which contains all the elements of processing. Smaller than mainframe and have low speed, low storage capacity. Basically used for small business application are known as home computers.

Minicomputers are little larger than micro computer also use same microprocessor but with more speed. They can be lined with other systems to form network. Support multiuser and multi task. These are used in business and commerce such as payroll, stock control.

Mainframe computer can handle hundreds of users at same time because of high speed and large memory. They are designed for distributing system . Data is physically

separate but logically they are treated as one unit. These computers are mainly used in website or internet

Supercomputers are the fastest computers. They can solve a wide range of large scale problems which require exclusive arithmetic operations. Super computer uses 'Non-Von New Mann' Design. These computers are used in multiprocessing, multitasking and parallel processing for different tasks. Specially these computers are used in molecular structural analysis, weather forecasting etc.

Importance of Binary Number in Computer System

With binary, it became possible to have exact states which would not have small errors. Way back in history, computers made use of something called analog in order to solve problems. But this wasn't as accurate as binary code and so those computers were largely replaced by the digital computer which used binary code. The analog method of using continuously changing attributes – such as electrical, mechanical or hydraulic qualities – could cause small errors which, when iterated, could cause complex issues. But with binary numbers, these errors are avoided and the chance of committing errors is much, much smaller.

Binary numbers simplify the design of computers and related technologies. Computers need many transistors to accomplish what they have to accomplish, but through binary numbers, it became easier and less expensive. It needs the least amount of necessary circuitry, which results in the least amount of space, energy consumption, and cost. It also provides safety for reliability.

The use of binary numbers increased the expressive power of the binary circuits that cut down the cost of a computer and made a more powerful computer for the same amount of money. Also, the use of binary numbers maximises the expressive power of binary circuits.

Number systems

Number systems are the technique to represent numbers in the computer system architecture, every value that you are saving or getting into/from computer memory has a defined number system.

Computer architecture supports following number systems.

- **Binary number system**
- **Octal number system**
- **Decimal number system**
- **Hexadecimal (hex) number system**

1) Binary Number System

A Binary number system has only two digits that are **0 and 1**. Every number (value) represents with 0 and 1 in this number system. The base of binary number system is 2, because it has only two digits.

2) Octal number system

Octal number system has only eight (8) digits from **0 to 7**. Every number (value) represents with 0,1,2,3,4,5,6 and 7 in this number system. The base of octal number system is 8, because it has only 8 digits.

3) Decimal number system

Decimal number system has only ten (10) digits from **0 to 9**. Every number (value) represents with 0,1,2,3,4,5,6, 7,8 and 9 in this number system. The base of decimal number system is 10, because it has only 10 digits.

4) Hexadecimal number system

A Hexadecimal number system has sixteen (16) alphanumeric values from **0 to 9** and **A to F**. Every number (value) represents with 0,1,2,3,4,5,6, 7,8,9,A,B,C,D,E and F in this number system. The base of hexadecimal number system is 16, because it has 16 alphanumeric values. Here **A is 10, B is 11, C is 12, D is 13, E is 14** and **F is 15**.

ASCII

ASCII (American Standard Code for Information Interchange) is the most common format for text files in computers and on the Internet. In an ASCII file, each alphabetic, numeric, or special character is represented with a 7-bit binary number (a string of seven 0s or 1s). 128 possible characters are defined.

UNIX and DOS-based operating systems use ASCII for text files. Windows NT and 2000 uses a newer code, Unicode. IBM's S/390 systems use a proprietary 8-bit code called EBCDIC. Conversion programs allow different operating systems to change a file from one code to another. ASCII was developed by the American National Standards Institute (ANSI).

EBCDIC

EBCDIC is an 8-bit character encoding widely used in IBM midrange and mainframe computers. This encoding was developed in 1963 and 1964. EBCDIC was developed to enhance the existing capabilities of binary-coded decimal code. This code is used in text files of S/390 servers and OS/390 operating systems of IBM.

Need for an Operating system

An operating system (OS) handles your computer needs by finding resources, applying hardware management and providing necessary services. Operating systems are essential for computers to be able to do everything they need to do.

List the various operating System used presently

- ❖ Microsoft Windows
- ❖ Apple iOS
- ❖ Google's Android OS
- ❖ Apple macOS
- ❖ Linux Operating System

DOS

DOS (Disk Operating System) is an operating system that runs from a hard disk drive. The term can also refer to a particular family of disk operating systems, most commonly MS-DOS (Microsoft Disk Operating System)

1.Internal commands: The internal commands are those commands that are automatically loaded in the memory. Some commonly used DOS internal commands are

- | | | | | |
|-----------|----------|---------|---------|--------|
| 1. Cls | 2. Dir | 3. Date | 4. Time | 5. Ver |
| 6.Copycon | 7. Type | 8. Ren | 9. Del | 10.CD |
| 11. RD | 12. Copy | 13. MD | | |

2. External commands: - These commands are not a permanent part of the memory. To execute or run these commands, an external file is required. Some commonly used DOS external commands are .

- | | | | |
|-------------|-------------|-----------|----------|
| 1. CHKDSK | 2. Diskcopy | 3. Format | 4. Label |
| 5. Scandisk | 6. Move | 7. Print | 8. Tree |
| 9. Deltree | | | |

Files and Directories

A *file* is a collection of data that is stored on disk and that can be manipulated as a single unit by its name.

A *directory* is a file that acts as a folder for other files. A directory can also contain other directories (*subdirectories*); a directory that contains another directory is called the *parent* directory of the directory it contains.

Autoexec.bat and config.sys information

The autoexec.bat and the config.sys were files created for [MS-DOS](#) and [Windows 3.x](#) as an easy way to load the files required for devices as well as the operating system to properly run. These files are required for later revisions of MS-DOS and Windows 3.x to load. However, with newer versions of Windows, they are no longer needed.

Wildcard

Alternatively referred to as a **wild character** or **wildcard character**, a **wildcard** is a [symbol](#) used to replace or represent one or more characters. The most common wildcards are the [asterisk](#) (*), which represents one or more characters and [question mark](#) (?) that represents a single [character](#). In the examples below of how a wildcard may be used, realize that wildcards are relatively universal.

Features of window Desktop

Type of Processor

The higher the speed of the processor, the faster the computer will be able to handle multiple programs and activities.

Hard Drive

The hard drive is where your computer stores all of your computer's files and software programs. You may end up having to invest in an external hard drive if your computer's existing hard drive cannot accommodate for larger files such as videos, audio files, and even digital images.

Random Access Memory (RAM)

The higher the RAM, the more efficiently and faster the computer will run.

Dual Monitor Options

Many employees can benefit from working with a dual monitor because the dual display can make it easier to work with multiple windows at once and stay organized.

Display Type

Keep in mind that a large screen size with high resolution will make it easier for employees involved with managing graphics, video, and other multimedia to perform their job duties. This is one of those computer features that is easy to overlook but is still an important component of the workstation.

Wireless Connectivity

This can be very beneficial for a busy office setting where you want to limit wires and cables around a work space.

Operating System

Apple computers are equipped with OS X operating systems while PCs are designed with Windows. Consider the types of computers the majority of your employees will be using or have experience using so that you don't have to spend a lot of time and resources for employee training.

Graphics Card

If your business works in a field that relies heavily on graphics, such as website design, game production, or video production, you will need to make sure your laptop or desktop computers are designed with a graphics card or graphics chip. The graphics card works to display images clearly.

Components of Windows

1. Start Menu

The start menu is like a road map for your computer. It lets you launch applications, shut down your computer, access system settings, and much more. To read more about the start menu see Windows 10 Start Menu .

2. Search Box

The search box allows you to quickly search your computer and the Internet at a point, right from the taskbar.

3. Task View / Timeline

The task view button, in version 1709, allows you to manage your virtual desktops and move application windows between them. To read more about the task view see Use Multiple Desktops .

The timeline button, in version 1803, allows you to again manage your virtual desktops, but also view websites and files that have been used for the last 30 days, if you choose to activate it.

4. Pinned Apps

Applications that you use commonly can be pinned to your taskbar. By default, Windows has a couple that it pins for you.

5. Task Tray

If an application is open, and has not been pinned to the taskbar, it will show in the task tray.

6. Notification Tray & Clock

The notification tray shows icons of applications that are running in the background and provides access to Internet and sound settings. The clock displays the current time and date.

7. Action Center

The Action Center is Windows' main notification system. Any slide-out notification that you receive will be stored in this panel until you clear them. The Action Center also provided quick access to system features such as Wi-Fi, Bluetooth, and Projection. To read more about the Action Center see Windows 10 Notifications

8. Desktop Icons

The desktop holds application icons. By default, we include shortcuts to log off or restart your computer, and Firefox. You are free to add your own.

9. Desktop

The desktop holds your desktop icons and has a customizable background image.

Method of starting a program using Start button

How to Open a Computer Program

1. Choose **Start**→**All Programs**. ...
2. Double-click a **program** shortcut icon on the desktop.
3. Click an item on the taskbar. ...
4. If you used the **program** recently and saved a document, choose it **from** the list of recently used **programs** displayed when you first **open** the **Start menu**.

Maximizing, Minimizing, and Closing a Window

After you've opened a window, you can maximize it to display full-screen. You can also minimize it so that it disappears from the desktop and resides as a button on the Windows Taskbar, and you can close it completely.

Windows Explorer

1. Click "Start" and select "Computer" to open Windows Explorer.
2. Double-click the hard drive's letter from the right pane's Hard Disk Drives section to view the drive's contents. To view files within folders, double-click the folder.
3. Right-click the drive letter and select "Eject" when you are finished browsing the drive.

Viewing All Files

1. Click "Organize" in the Windows Explorer toolbar and select "Folder and Search Options."
2. Click the "View" tab.
3. Click "Show Hidden Files, Folders, and Drives" in the Advanced Settings section.
4. Uncheck "Hide Protected Operating System Files (Recommended)" in the Advanced Settings section and click "Yes" in the confirmation dialog box. Click "OK."

Steps for finding a file using search option

1. Press the Windows key, then type part or all the file name you want to find. See the search tips section for tips on searching for files.
2. In the search results, click the **Documents**, **Music**, **Photos**, or **Videos** section header to view a list of files that meet the search criteria.
3. Click the file name you want to open.

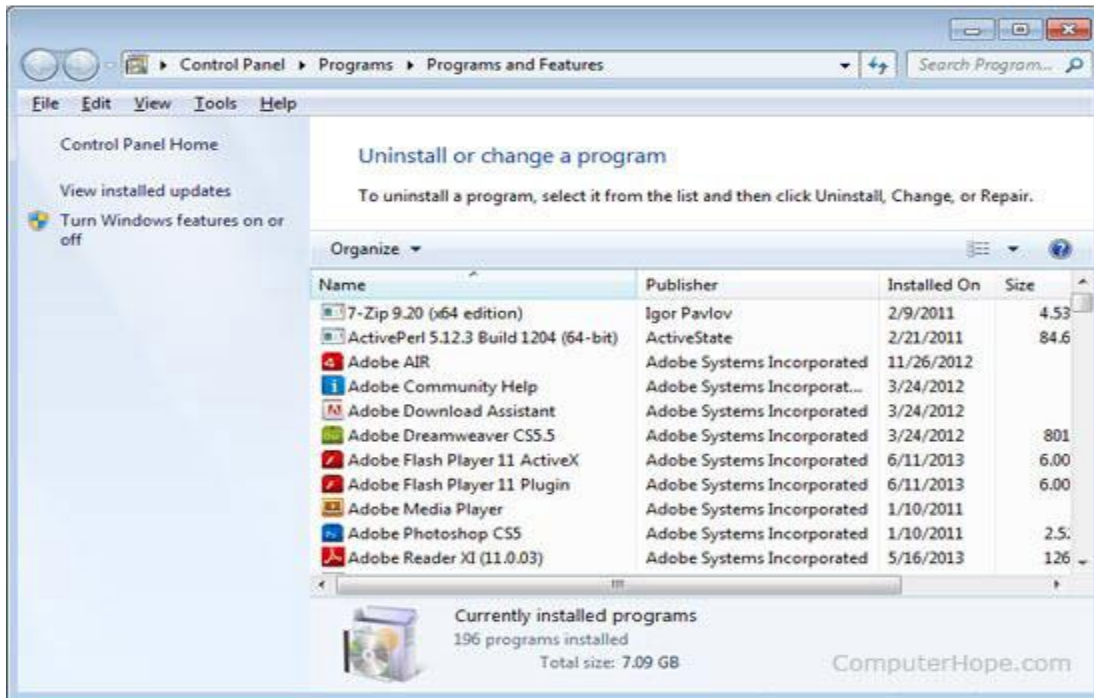
To format a floppy disk in Windows NT 4.0, 2000, or XP:

1. Click or double-click My Computer to open it. Right-click the 3 1/2 Floppy icon (this is usually the **A:** drive), and select Format....
2. The **Format** dialog box will open. Click Start.
3. The status of the formatting process will be displayed across the bottom of the **Formatting** dialog box. Do not eject the disk until formatting is 100% completed. Your disk is now ready for use.

Install and Uninstall a Software using Control Panel

1. Open the Control Panel or press the Windows key, type **Control Panel**, and then press **Enter**.
2. Double-click **Add or Remove Programs**, **Uninstall a program**, or **Programs and Features** depending on your version of Windows.
3. In the new window, select the program you want to uninstall and click the **Change**, **Remove**, or **Uninstall** button.

Windows 7 Add or remove programs



Installing a new Hardware using Control Panel

1. Choose Start→Control Panel and click Classic View on the left.
2. Double-click the Add Hardware icon, click Continue (if prompted), and then click Next to let the wizard search for and install the hardware automatically.
3. If Windows Vista locates your new part, select the newly installed part's name from the Windows Vista list and click Finish.
4. If the wizard doesn't find your new part, click Next and follow the instructions.

Uninstalling a new Hardware using Control Panel

1. Start Control Panel, click **Hardware and Sound**, and then click **Device Manager**.
2. Expand the node that represents the type of device that you want to uninstall, right-click the device entry, and click **Uninstall**.
3. On the **Confirm Device Removal** dialog box, click **OK** to start the uninstall process.
4. When the uninstall process is complete, remove the device.

Defragmentation

The **process of defragmentation** moves the data blocks on the **hard drive** around to bring all the parts of a file together. **Defragmentation** reduces file system

fragmentation, increasing the efficiency of data retrieval and thereby improving the overall performance of the computer.

Defragmentation is the opposite of fragmentation, which is an inefficient use of computer storage.

Installing a Printer using Control Panel

1. Click the Start button on the Windows taskbar and then click Control Panel on the right side of the Start menu.
2. Click the Printers and Other Hardware hyperlink if the Control Panel window is in Category View. Otherwise, double-click the Printers and Faxes icon if the Control Panel window is in Classic View.
3. Click on the Add a Printer hyperlink in the Printers and Other Hardware window to start the Add Printer Wizard and then click the Next button or press Enter to advance to the Local Printer or Printer Connection dialog box. If you are in Classic View, start the wizard by clicking on the Add a Printer option on the left, under Printer Tasks.
4. Make sure that the Add Printer Wizard selects the Local Printer radio button, and that the Automatically Detect and Install my Plug and Play Printer check box beneath this radio button is also selected before you click the Next button.
5. If the wizard is unable to detect your printer in the New Printer Detection dialog box, click Next to install the printer manually.
6. Select the port for the printer to use in the Use the Following Port drop-down menu in the Select a Printer Port dialog box and then click the Next button. You should select either LPT1 (if you are connecting your printer using a parallel connector) or USB.
7. Click the manufacturer and the model of the printer in the Manufacturers and Printers list boxes, respectively. If you have a disk with the software for the printer, put it into your floppy or CD-ROM drive and then click the Have Disk button: Select the drive that contains this disk in the Copy Manufacturer's Files drop-down menu and then click OK.
8. Click the Next button to advance to the Name Your Printer dialog box. If you want, edit the name for the printer in the Printer Name text box. If you want to make the printer that you're installing the default printer that is automatically used whenever you print from Windows or from within a Windows program, leave the Yes radio button selected beneath the heading, Do you want your Windows-based programs to use this printer as the default printer?
9. Click the Next button to advance to the Printer Sharing dialog box. If you want to share this printer with other users on the network, click the Share Name radio button and then, if you want, edit the share name that the wizard gives the printer in the Share Name text box (this is the name that the other users on the network will see when they go to select this printer for printing their documents).
10. Click the Next button to advance to the Print Test Page dialog box. To print a test page from your newly installed printer, make sure the Yes radio button is selected in this dialog box.

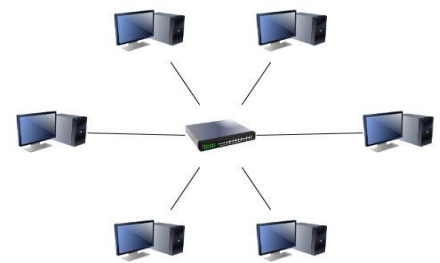
- Click the Next button to advance to the Completing the Add Printer Wizard dialog box, where you can review the settings for your new printer before you click the Finish button or press Enter to finish installing the new printer.

Steps of Changing the System date and time

- Right-click on the time in the bottom-right of the screen and select **Adjust Date/Time**.
- Click on the **Change date and time...** button.
- Use the arrows to the left and right of the month/year and the arrows to the right of the clock to change the time to the correct time.

Computer Network

A **computer network** is a set of **computers** connected together for the purpose of sharing resources. The most common resource shared today is connection to the Internet. Other shared resources can include a printer or a file server. The Internet itself can be considered a **computer network**



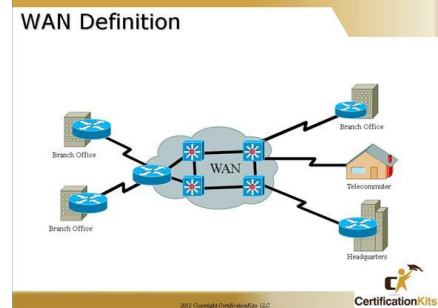
LAN

A **local-area network (LAN)** is a **computer network** that spans a relatively small **area**. Most often, a **LAN** is confined to a single room, building or group of buildings, however, one **LAN** can be connected to other LANs over any distance via telephone lines and radio waves.



WAN

A computer network that spans a relatively large geographical area. Typically, a **WAN** consists of two or more local-area networks (LANs). Computers connected to a wide-area network are often connected through public networks, such as the telephone system. They can also be connected through leased lines or satellites.



ISP (Internet Service Provider)

An ISP (Internet service provider) is a company that provides individuals and other companies access to the Internet and other related services such as Web site building and virtual hosting. An ISP has the equipment and the telecommunication line access required to have a point-of-presence on the Internet for the geographic area served. The larger ISPs have their own high-

speed leased lines so that they are less dependent on the telecommunication providers and can provide better service to their customers. Among the largest national and regional ISPs are AT&T WorldNet, IBM Global Network, MCI, Netcom, UUNet, and PSINet.

MODEM

Modem is short for Modulator Demodulator. It's an electronic device used to **access** the **Internet** that modulates carrier waves to encode information to be transmitted and also demodulates incoming carrier waves to decode the information they carry.

Purpose of Web Browser Software

Short for **web browser**, a **browser** is a **software** application used to locate, retrieve and display content on the World Wide **Web**, including webpages, images, video and other files. As a client/server model, the **browser** is the client run on a computer or mobile device that contacts the **Web** server and requests information.

Internet Security Software Internet security software is an active type of protection, which permanently runs in the background of your system. The software scans all incoming data to your computer or mobile device, whether that's an e-mail coming from a work colleague or an image you're downloading. Viruses can come from nowhere and the best internet security software makes sure that there's always a barrier to entry. Scanning, quarantining and removing any potential

URL

In plain language, it means the following: due to the **URL** address, the user gets information about where the needed information is located. **URL** is an abbreviation which stands for the term Uniform Resource Locator. It contains a link to the server which is a storage of the searched resource. **URL** (or **URL-address**) is a special form of individual address of a certain resource on the Internet. It can refer to the website, some particular document, or an image. The Internet user just needs to insert this code into the location bar to find the needed website, document, folder, or image. In plain language, it means the following: due to the URL address, the user gets information about where the needed information is located.



INTERNET VERSUS INTRANET

INTERNET

A global system of interconnected computer networks that use the internet protocol (TCP/IP) to link devices worldwide

A public network

Anyone can access the information

Less secure

A global system and it has a large number of users

Has more traffic because it is a worldwide network

INTRANET

A private network that is contained within an enterprise

A private network

Only the users of the organization have access

More secure

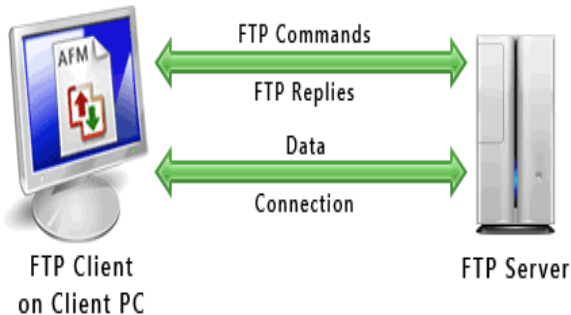
A small network and has a limited number of users

Has minimum traffic because it has a less number of users

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WORLD WIDE WEB

The **World Wide Web**, commonly referred to as the **Web**, is a system of interlinked, hypertext documents accessed through the **Internet**. It enables the retrieval and display of text and media to your computer.



FTP

File Transfer Protocol (**FTP**) is a client/server protocol used for transferring files to or exchanging files with a host computer. It may be authenticated with user names and passwords. Anonymous **FTP** allows users to access files, programs and other data from the Internet without the need for a user ID or password.

TELNET

Telnet is a protocol that allows you to connect to remote computers (called hosts) over a TCP/IP network (such as the internet). Using **telnet** client software on your computer, you can make a connection to a **telnet** server (that is, the remote host).

E-mail

Short for **electronic mail**, **e-mail** or **email** is information stored on a computer that is exchanged between two users over telecommunications. More plainly, e-mail is a message that may contain text, files, images, or other attachments sent through a network to a specified individual or group of individuals.

The first e-mail was sent by Ray Tomlinson in 1971. Tomlinson sent the e-mail to himself as a test e-mail message, containing the text "something like QWERTYUIOP." However, despite sending the e-mail to himself, the e-mail message was still transmitted through ARPANET.

By 1996, more electronic mail was being sent than postal mail.



Different Types of Internet Connections

There are many ways a personal electronic device can connect to the internet. They all use different hardware and each has a range of connection speeds. As technology changes, faster internet connections are needed to handle those changes

Dial-Up (Analog 56K) - Dial-up access is cheap but slow. A modem (internal or external) connects to the Internet after the computer dials a phone number. This

analog signal is converted to digital via the modem and sent over a land-line serviced by a public telephone network.

DSL - DSL stands for Digital Subscriber Line. It is an internet connection that is always “on”. This uses 2 lines so your phone is not tied up when your computer is connected. There is also no need to dial a phone number to connect. DSL uses a router to transport data and the range of connection speed, depending on the service offered, is between 128K to 8 Mbps.

Cable - Cable provides an internet connection through a cable modem and operates over cable TV lines. There are different speeds depending on if you are uploading data transmissions or downloading. Since the coax cable provides a much greater bandwidth over dial-up or DSL telephone lines, you can get faster access. Cable speeds range from 512K to 20 Mbps.

Wireless - Wireless, or Wi-Fi, as the name suggests, does not use telephone lines or cables to connect to the internet. Instead, it uses radio frequency. Wireless is also an always on connection and it can be accessed from just about anywhere. Speeds will vary, and the range is between 5 Mbps to 20 Mbps.

Satellite - Satellite accesses the internet via a satellite in Earth’s orbit. The enormous distance that a signal travels from earth to satellite and back again, provides a delayed connection compared to cable and DSL. Satellite connection speeds are around 512K to 2.0 Mbps.

Cellular - Cellular technology provides wireless Internet access through cell phones. The speeds vary depending on the provider, but the most common are 3G and 4G speeds. The goal of 4G is to achieve peak mobile speeds of 100 Mbps but the reality is about 21 Mbps currently.

IP (Internet Protocol)

IP address is short for Internet Protocol (IP) address. An **IP address** is an identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route messages based on the IP address of the destination. Contrast with IP, which specifies the format of packets, also called datagrams, and the addressing scheme.

The Format of an IP Address

The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.

Static Versus Dynamic IP Addresses

An IP address can be static or dynamic. A static IP address will never change and it is a permanent Internet address. A dynamic IP address is a temporary address that is assigned each time a computer or device accesses the Internet.

DNS

Domain Name Servers (DNS) are the Internet's equivalent of a phone book. They maintain a directory of domain names and translate them to Internet Protocol (IP) addresses. This is necessary because, although domain names are easy for people to remember, computers or machines, access websites based on IP addresses.

Directories vs. Search Engines

Directories	Search engines
<ul style="list-style-type: none"> • Lists of Web sites added by a human • May be general or subject-specific • Yahoo : general • Kathy Schrock's Guide for Educators : subject-specific 	<ul style="list-style-type: none"> • An index built by a computer program that goes out and collects data • More inclusive than a directory • Keyword searchable



Most Popular Social Media Sites

Facebook

This is the biggest social media network on the Internet, both in terms of total number of users and name recognition. Founded on February 4, 2004, **Facebook** has within 12 years managed to accumulate more than 1.59 billion monthly active users and this automatically makes it one of the best mediums for connecting people from all over the world with your business. It is estimated that more than 1 million small and medium-sized businesses use the platform to advertise their business.

Twitter

You might be thinking that limiting your posts to 140 characters is no way to advertise your business, but you will be shocked to know that this social media platform has more than 320 million active monthly users who make use of the 140 character limit to pass on information.

Businesses can use Twitter to interact with prospective clients, answer questions, release latest news and at the same time use the targeted ads with specific audiences. Twitter was founded on March 21, 2006, and has its headquarters in San Francisco, California.

Google+

While it's no Twitter, Facebook or LinkedIn, **Google+** has its place among the popular social media sites. Its SEO value alone makes it a must-use tool for any small business. Launched on

December 15, 2011, Google+ has joined the big leagues registering 418 active million users as of December 2015.

YouTube

YouTube — the largest and most popular video-based social media website — was founded on February 14, 2005, by three former PayPal employees. It was later bought by Google in November 2006 for \$1.65 billion. YouTube has over 1 billion website visitors per month and is the second most popular search engine behind Google.

Pinterest

Launched in March 2010, **Pinterest** is a relatively newcomer in the social media arena. This platform consists of digital bulletin boards where businesses can pin their content. Pinterest announced September 2015 that it had acquired 100 million users. Small businesses whose target audience is mostly made up of women should definitely invest in Pinterest as more than half of its visitors are women.

Instagram

Like Pinterest, **Instagram** is a visual social media platform. The site, launched on October 6, 2010, has more than 400 million active users and is owned by Facebook. Many of its users use it to post information about travel, fashion, food, art and similar subjects. The platform is also distinguished by its unique filters together with video and photo editing features. Almost 95 percent of Instagram users also use Facebook.

Tumblr

Tumblr is one of the most difficult to use social networking platforms, but it's also one of the most interesting sites. The platform allows several different post formats, including quote posts, chat posts, video and photo posts as well as audio posts, so you are never limited in the type of content that you can share. Like Twitter, reblogging, which is more like retweeting, is quick and easy. The social networking website was founded by David Karp in February 2007 and currently hosts more than 200 million blogs.

Steps for Problem Solving

1. Define the problem

Diagnose the situation so that your focus is on the problem, not just its symptoms. Helpful problem-solving techniques include using [flowcharts](#) to identify the expected steps of a process and [cause-and-effect diagrams](#) to define and analyze [root causes](#).

2. Generate alternative solutions

Postpone the selection of one solution until several problem-solving alternatives have been proposed. Considering multiple alternatives can significantly enhance the value of your ideal solution. Once you have decided on the "what should be" model, this target standard becomes the basis for developing a road map for investigating alternatives. [Brainstorming](#) and team problem-solving techniques are both useful tools in this stage of problem solving.



3. Evaluate and select an alternative

Skilled problem solvers use a series of considerations when selecting the best alternative. They consider the extent to which:




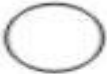



4. Implement and follow up on the solution

Leaders may be called upon to direct others to implement the solution, "sell" the solution, or facilitate the implementation with the help of others. Involving others in the implementation is an effective way to gain buy-in and support and minimize resistance to subsequent changes

Comparison between Algorithm and Flow Chart

BASIS FOR COMPARISON	ALGORITHM	FLOW CHART
Basic	Includes sequence of steps which depicts the procedure of the solution.	An information diagram made up of different shapes shows the data flow.
Comprehensibility	Hard to understand	Easily interpreted
Uses	Text	Symbols
Implements	No rules are employed.	Predefined rules are implemented.
Debugging	Easier	Difficult
Ease of construction	Perplexing	Simple

Symbols used in Flow Charts

Symbol	Name	Function
	Process	Indicates any type of internal operation inside the Processor or Memory
	input/output	Used for any Input / Output (I/O) operation. Indicates that the computer is to obtain data or output results
	Decision	Used to ask a question that can be answered in a binary format (Yes/No, True/False)
	Connector	Allows the flowchart to be drawn without intersecting lines or without a reverse flow.
	Predefined Process	Used to invoke a subroutine or an Interrupt program.
	Terminal	Indicates the starting or ending of the program, process, or interrupt program
	Flow Lines	Shows direction of flow.

Flow Chart for Simple Program

