

DEFINITION OF A COMPUTER

A computer is a programmable electronic device that accepts raw data as input and processes it with a set of instructions (a program) to produce the result as output and stores data/information for future use.

UNDERSTANDING A COMPUTER SYSTEM

A computer system is a basic, complete and functional hardware and software setup with everything needed to implement computing performance. It includes all the physical hardware parts, the software programs that control them, the data being worked on, the people using the system, and the procedures or rules followed to achieve a task.

CHARACTERISTICS OF A COMPUTER

Speed; Computers can process millions of instructions per second compared to human beings. Be it logical decisions or arithmetic computations, the time taken by computers for their operations is microseconds and nanoseconds. A powerful computer can handle trillions of instructions per second. With this speed, computers can reduce the amount of time needed to perform any digital task.

Accuracy; Computers have a very high degree of accuracy. They can perform calculations with 100% accuracy. Exceptions for errors may occur due to data inconsistency or inaccuracy/wrong human input as the term goes Garbage in Garbage out (GIGO)

Diligence; Computers can perform millions and millions of instructions with the same consistency and accuracy, repeatedly without getting tired or losing concentration. They can carry out instructions day and night yet the human brain and body is programmed to work for just 8 hours before a human being starts to wear out.

Versatility; Computers can perform different tasks with the same accuracy and efficiency at the same time. For example, one can use a computer to create invoices/bills and at the same time carry out inventory management or any other multimedia tasks.

Reliability; A computer is capable of giving consistent results for similar sets of data i.e; if we gave the same set of input any number of times, we will get the same result.

Automation; Computers can be used to automate routine tasks with the help of a task scheduler such as launching a specific application or software, sending an email, scanning for viruses, software updates, system diagnosis and many other maintenance tasks. Computers can also be programmed to perform many complex tasks without any supervision or manual intervention.

Memory; A computer has built-in memory called primary memory where it stores data. Secondary storage are removable devices such as cds, pen drives, etc., Which are also used to store data.

BASIC APPLICATIONS OF COMPUTER SYSTEMS

Computers play a role in every field of life. Some of the fields and how they are used include;

Education

Computers support teaching and learning by enabling online classes, digital examinations, research activities, and access to electronic learning materials. They help manage student records, generate reports, and provide tools for skill development in areas such as typing, word processing, and data analysis. Computers also allow educators to deliver lessons remotely and students to access educational resources from anywhere.

Banking & Financial Services

Computers manage financial transactions, store customer information, and ensure secure processing of deposits, withdrawals, transfers, and loan applications. They support automated systems such as ATMs and mobile banking platforms, reduce manual errors, and enable real-time monitoring of accounts. Computers also assist in fraud detection by analyzing transaction patterns and maintaining accurate financial records.

Government & Public Services

Computers handle large-scale data processing, maintain national databases of citizens, and support paperless administrative processes. They are used for electronic tax filing, issuance and management of identification documents, payroll processing, and service delivery to the public. Computers improve efficiency in government operations, reduce corruption through transparent systems, and enable remote access to public services.

Entertainment & Media

Computers enable the creation, editing, distribution, and consumption of digital entertainment content. They support streaming of videos and music, online gaming, content production, and social media sharing. Computers provide platforms for interactive experiences and allow creators to reach large audiences through digital channels.

Business & Commerce

Computers are fully integrated into business operations to manage transactions, track inventory, process payments, and analyze performance data. They support e-commerce

activities, online marketing, customer relationship management, and communication with suppliers and clients. Computers improve accuracy in record-keeping, enable remote collaboration, and help businesses reach wider markets through digital platforms.

Healthcare

Computers maintain patient records, store diagnostic information such as x-rays and test results, and support live monitoring of health conditions. They assist in managing hospital databases, scheduling appointments, and enabling telemedicine consultations. Computers also facilitate advanced procedures such as robotic surgery and remote monitoring of patients.

Transport

Computers support navigation, route planning, vehicle tracking, and online booking systems for transport services. They enable real-time monitoring of fleets, processing of payments, and coordination of logistics and delivery operations. Computers improve safety, efficiency, and customer convenience in transport services.

Agriculture

Computers assist farmers by providing access to market prices, weather forecasts, and advisory services through digital platforms. They support farm management tasks, data recording, and analysis of crop and soil conditions. Computers help improve planning, decision-making, and productivity in agricultural activities.

Communication

Computers enable fast and reliable exchange of information through electronic mail, instant messaging, video conferencing, and social media platforms. They support file sharing, online collaboration, and global connectivity between individuals and organizations. Computers facilitate both personal and business communication in real time.

Activity: *For each sector, think of at least one real-life example from Uganda or your own experience to share with the class.*

COMPUTER HARDWARE

Computer hardware describes any of the physical parts of a computer system and other peripheral devices. A peripheral is a piece of computer hardware that is added to a computer in order to expand its abilities for example a scanner, printer.

TYPES OF COMPUTER HARDWARE

Computer hardware can be classified as internal or external, which relates to the placement of the physical parts in or around the device. Generally, internal hardware is required for the computer to run, while external hardware enhances the use or functionality.

INTERNAL COMPUTER HARDWARE

The internal components of a computer system consist of the hardware installed inside the computer that's required to process data and to allow the processor to communicate with other devices such as secondary storage, display screens and printers. Examples of internal computer hardware include;

Motherboard: The motherboard is the main circuit board inside a computer that serves as the central connection point, linking all the different parts together so they can communicate and function as a single system. It is also commonly known by several other names, such as mainboard, planar board, logic board, system board, mobo, or MB. The motherboard provides sockets where essential components are installed, including the CPU (processor), RAM (memory modules), and expansion cards like graphics or sound cards. It connects internal parts such as hard drives, optical disc drives, and front panel ports (for the power button, USB ports on the case, and audio jacks) using cables and wires. Through its built-in circuits and pathways, the motherboard enables the CPU to access and control all the other separate components of the computer. In addition to managing internal connections, the motherboard distributes electrical power from the power supply unit to the various parts that need it and coordinates the activities of those devices while maintaining communication between them. Furthermore, the motherboard includes ports that allow external devices to be connected to the computer, such as the monitor, speakers, headphones, microphone, keyboard, mouse, modem, and other USB devices like flash drives, external hard disks, printers, or scanners. Different motherboards come in various sizes and layouts, including ATX, micro-ATX, mini-ITX, and others, which determine the types and number of components that can be installed. Without a properly functioning motherboard, the other hardware components cannot work together effectively, making it the essential backbone of the entire computer system.

Central Processing Unit (CPU)/Processor: The Central Processing Unit is the main processing device in any computer system. It performs basic arithmetic, logic, controlling, and input/output (I/O) operations specified by the instructions in the program. To be specific; The CPU is made up of the Arithmetic and Logical Unit (ALU) and the Control Unit (CU). The Arithmetic Unit performs mathematical computations

such as addition, subtraction, multiplication and division while the Logical Unit performs logical operations such as comparing of data and the selection of the desired problem-solving procedure or a viable alternative based on predetermined decision criteria. The Control Unit regulates and integrates the operations of the computer. It selects and retrieves instructions from the main memory in proper sequence and interprets them so as to activate the other functional elements of the system at the appropriate moment to perform their respective operations. The speed of a processor is based on its clock speed which is measured in Gigahertz (GH) or Megahertz (MHz).

Random Access Memory (RAM) : This is the hardware in a computing device where the operating system (OS), application programs and data in current use are kept so they can be quickly reached by the device's processor. RAM is part of primary memory/main memory in a computer and is embedded on the motherboard. When the computer system is turned on, RAM fetches all necessary data and instructions from the hard disk and stores them. The CPU uses the fetched data by RAM to perform the specific tasks. It is much faster to read from and write to than other kinds of storage, such as a hard disk drive (HDD), solid-state drive (SSD) or optical drive because it is closest to the CPU. RAM is volatile memory i.e; contents are lost when power is switched off. It is the fastest memory which means that the computer is not kept waiting for data to process. It is used to store temporary data/information that's in active use. It is more expensive than secondary memory.

Read Only Memory (ROM): The memory from which we can only read but cannot write on it. It is part of primary memory/main memory and holds 30% of it. This type of memory is non-volatile. The data is stored permanently in such memories during manufacture. This makes it a more reliable form of storage. You cannot change the data on it or rewrite on it, you can only read it. ROM stores such instructions that are required to start a computer. this operation is referred to as bootstrap. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.

Cache Memory: Cache, which is pronounced "cash" (not "catch" or "cashay"). Stores recently used information so that it can be quickly accessed at a later time. Supplementary memory system that temporarily stores frequently used instructions and data for quicker processing by the CPU of a computer. Cache holds a copy of only the most frequently used information or program codes stored in the main memory. Computers incorporate several different types of caching in order to run more efficiently, thereby improving performance. Common types of caches include browser cache, disk cache, memory cache, and processor cache. Most caching is done in the background, so

you won't even notice it is happening. In fact, the only cache you can control is the browser cache, because for it you can open your browser preferences to view the cache settings and alter the size of your browser cache or empty the cache if needed.

Hard drive: Sometimes known as the hard disk drive (HDD) or hard disk is the secondary storage that reads, writes and stores data on hard disks. HDDs are often inside a computer attached to the motherboard, or in an external case connected by a USB cable. The hard drive contains a spinning disk with a thin magnetic coating. A spinning disk is the mechanism within a hard disk drive to which memory is written. With rotating plates attached to an arm that writes the data, the spinning disk mechanism physically resembles a record player (although it is sealed within an enclosure). The plates are magnetized (similarly to cassette tapes) in order to store data that is written using copper heads. The hard drive's performance is measured in the speed that the data can transfer from the platters storing the bits to the computer (known as data throughput). Usually, the higher the density of the platters and revolutions per minute translates in higher performance. Although nowadays, you can find hard drives spinning up to 15000 RPM, the most popular ones for desktops and laptops are between 5400 and 7200 RPM.

Power supply unit (PSU): This is an internal hardware component that converts direct current (DC) voltage to internal computer components. It changes the incoming electricity to a format that the computer can use.

Video card: A video card, also known as a graphics card, is an internal hardware output device which is responsible for handling the processing of the visual data you see on your display. This device can either be a separate component which plugs into a slot on the computer's motherboard, or what is referred to as "onboard", which is actually integrated into the motherboard itself.

Network Interface card (NIC): This is an internal hardware communication device that connects a computer to a computer network, usually a LAN. Without this card, a computer cannot be connected over a network. It is a circuit board installed in a computer that provides a dedicated network connection to the computer. It is also known as a Network Interface Controller, Network adapter or LAN adapter.

Bluetooth card (or adapter): This is an internal hardware communication device that allows computers to connect to peripheral devices like mice, keyboards and headsets as well as communicate and share files with other Bluetooth-equipped devices such as smartphones.

A **modem (modulator-demodulator)**: This is a hardware networking device that converts data to a signal so it can be easily sent and received over a phone line, cable or satellite connection.

EXTERNAL COMPUTER HARDWARE

External hardware components (including peripheral components), are those hardware components that are often externally connected to the computer to control either input or output or storage or communication functions. External describes a hardware device that's installed outside of the computer. Examples include;

Computer case/System Unit: This is a metal enclosure that holds the internal hardware components used to make desktop computers operate. On laptop computers, the device itself may be considered a computer case, but traditionally this term is used to refer to a desktop computer. Computer cases come in many shapes and sizes, but most are built in tower-form, ranging between 15 and 25 inches tall. They are used to mount items such as the motherboard, the hard drive, and the optical drive. Most computer cases come bundled with a power supply to allow them to operate. The largest benefits that computer cases offer are to protect internal hardware from dust, hair, and other hazards; and to keep the surrounding area cooler, as heat is contained within. Computer cases for desktop computers also contain external ports to connect external hardware to the internal components. Output devices such as printers, speakers, and monitors; and input devices such as keyboards, microphones, cameras, image scanners, or a mouse can be attached to the computer case via a USB cord or cable in order to increase the usability of the computer. Ethernet cables may also be connected via a special Ethernet port to establish a more stable and wired internet connection.

Mouse: A computer mouse is a handheld hardware input device that controls a cursor in a GUI (graphical user interface) for pointing, moving and selecting text, icons, files, and folders on your computer. In addition to these functions, a mouse can also be used to drag-and-drop objects and give you access to the right-click menu.

Keyboard: A computer keyboard is an input device used to enter characters and functions into the computer system by pressing buttons, or keys.

Microphone: A microphone is a hardware peripheral and input device that allows computer users to input audio into their computers.

Camera: A camera is a hardware peripheral and input device that captures either still images or motion video.

Speakers: Speakers are output devices that are used to connect to a computer to generate sound.

Monitor: A monitor is an output device that is also known as a **video display terminal** (VDT) or a **video display unit** (VDU). It is used to display images, text, video, and graphics information generated by a connected computer via a computer's video card.

Printer: A printer is basically an output device which prints a hard copy of the electronic data that is stored in the computer or any other devices. The electronic data may include documents, text, images or even the combination of all three.

Projector: A projector is an output device that takes images generated by a computer or Blu-ray player and reproduce them by projection onto a screen, wall, or another surface. In most cases, the surface projected onto is large, flat, and lightly colored.

Scanner: A scanner is a hardware input device that reads an image and converts it to a digital signal. For example, a scanner may be used to convert a printed picture, drawing, or document (hard copy) to a digital file that can be edited on a computer.

Memory card: A memory card is a type of secondary storage hardware device that is used to store videos, photos or other media files in digital form.

USB flash drive: A USB flash drive is a type of secondary storage hardware device that is designed to store files which can be anything from text documents to multimedia files as well as software.

Touchpad: A touch pad is an input device for pointing (controlling input positioning) on a computer display screen. It is an alternative to the mouse.

Router: A router is a hardware networking device that forwards data packets between computer networks.

Modem: Short for modulator/demodulator is a hardware communication device that allows a computer to send and receive information over telephone lines.

Network Interface card: A Network Interface card is a hardware component that enables a computer to connect to a computer network.

COMPUTER SYSTEM CONFIGURATION

A computer system configuration refers to the way the various components of a computer (hardware, software, data, users, and procedures) are arranged, connected, and organized to perform computing tasks. Different configurations suit different needs, sizes of organizations, budgets, and levels of complexity. Below are the four main types of computer system configurations, explained in detail.

Standalone Computer

A standalone computer is a single, independent computer system that operates completely on its own without being connected to any other computer or network. It contains all the necessary hardware (processor, memory, storage, input/output devices) and software to function independently. This type of configuration is simple and self-contained. It does not rely on external connections for its basic operations. Standalone computers are easy to set up, maintain, and secure because there is no network involved, which reduces the risk of external attacks or data sharing issues. However, standalone systems have limitations: they do not allow easy sharing of files, resources, or data between multiple users or locations. If the single computer fails, all work stops until it is repaired, and there is no automatic backup or remote access.

Networked System

A networked system, also called a peer-to-peer network or local area network (LAN), consists of several computers connected together within a limited area so that they can share resources and communicate with each other. In this configuration, each computer can act as both a client and a server, meaning any computer can share files, printers, internet access, or applications with the others directly. Networked systems are created using cables, Wi-Fi, or a combination of both, along with a network switch or router. This setup allows multiple users to access shared resources such as a single printer, common files, or an internet connection without needing a central powerful server. It is cost-effective for small to medium-sized organizations because it does not require expensive dedicated servers. However, networked systems can be slower when many users access the same resource at the same time, and security is more challenging because a problem on one computer can spread to others.

Client-Server System

A client-server system is a configuration where one or more powerful computers, called servers, provide resources and services to multiple less powerful computers, called clients, over a network. The server stores data, runs central applications, manages security, and handles requests from all the clients. Clients send requests to the server and receive responses or access to shared resources. This is the most common configuration in medium to large organizations because it centralizes control, data storage, and security. The server is usually more powerful with large storage, fast processors, and strong backup systems, while clients can be simpler and less expensive. Advantages include centralized data management (easier backups and updates), better security (controlled access from the server), and scalability (add more clients without changing the server). Disadvantages include higher initial cost for the server, reliance on network

reliability (if the network fails, clients lose access), and a single point of failure (if the server crashes, the whole system is affected).

Cloud-Based System

A cloud-based system is a modern configuration where computing resources (storage, processing power, software, databases, and services) are delivered over the internet from remote servers managed by third-party providers, rather than being installed locally on the organization's own hardware. Instead of buying and maintaining physical servers, organizations rent what they need from cloud providers. Users access these resources through the internet using any device. This configuration eliminates the need for expensive on-site servers, allows instant scaling (add more storage or users anytime), and provides automatic backups, updates, and security managed by the provider. Advantages include low upfront costs (pay only for what you use), access from anywhere with internet, easy collaboration, and reduced maintenance responsibility. Disadvantages include complete dependence on internet connectivity (no internet means no access), recurring monthly fees that can add up over time, potential data privacy concerns (data is stored on someone else's servers), and risk of vendor lock-in (difficult to switch providers later).

These configurations represent the main ways computer systems are organized today, from simple personal use to complex enterprise-level operations. Understanding them helps in choosing the right setup for different business sizes, budgets, and requirements. For each type, think of real-life situations or organizations in Uganda that might use it and explain why that configuration would be suitable.

COMPUTER HARDWARE ACQUISITION

Computer hardware acquisition is the act of buying or obtaining hardware equipment at a cost pursuant to the acquisition agreement by and between an organization/business and computer hardware vendor. Computer hardware can be purchased, rented or leased from the manufacturer (vendor) or from a leasing company.

Under these arrangements, hardware is acquired, installed in the organization's facilities, and operated by the organization's personnel. It should be noted that an organization preferring not to own or manage its own computer facilities can use any of the outsourcing options such as service bureau or an ASP, to fulfill its hardware needs.

Buying / Outright Purchase

Buying, also known as outright purchase, is the method of paying the full price of the computer hardware in a single payment in order to own the equipment completely and permanently.

Advantages

Having full ownership of the equipment provides complete control, meaning the machine is always available for use and can be used, modified, or disposed of as desired, offering great flexibility. In terms of overall cost, purchasing for cash usually results in the lowest total acquisition cost over time because there are no ongoing payments or interest charges. The buyer has the ability to customize the equipment to meet unique needs without being restricted by any contract or leasing agreement. In some cases, the equipment qualifies for tax advantages through accelerated depreciation, allowing the organization to deduct or write off the value of the asset for tax purposes over a shorter period.

Disadvantages

This method requires a large capital investment upfront, which reduces the organization's available cash flow and ties up funds that could be used for other purposes. There is a risk of obsolescence because hardware depreciates quickly and may become outdated after a few years, requiring further investment to replace it. The needs of a business may change over time, but it is difficult to adapt or dispose of the equipment when a significant amount of money has already been invested. The buyer bears full responsibility for the equipment, including all maintenance, repairs, liabilities, and management, which can become costly over the life of the asset.

Leasing

Leasing is a contractual agreement between a lessor (the owner or financing company) and a lessee (the user) for the temporary hire of computer hardware for a specific period in exchange for regular payments or fees. At the end of the agreed term, the lessee typically either returns the equipment to the lessor, extends the lease to continue using it, or, depending on the agreement, purchases the equipment outright.

Advantages

Leasing requires no large capital investment or tied-up funds because the hardware is paid for gradually through regular instalments. No separate financing is required, and maintenance costs are often minimized or eliminated because the lessor is typically responsible for upkeep and repairs during the lease period. It allows the organization to use a computerized asset without actually owning it, which can be beneficial when ownership is not a priority. Leasing is more flexible, especially for short-term or medium-term commitments, and it makes upgrading equipment easier because the organization is not locked into long-term ownership. Lease payments are often considered an operating cost, which can be written off against profits for tax purposes. The leasing

company bears most of the risks if the equipment breaks down or becomes obsolete during the lease term.

Disadvantages

The organization does not own the system at the end of the lease period unless a purchase option is exercised, which may involve additional cost. There is usually a heavy penalty for terminating the lease early, and the business can be locked into inflexible medium- or long-term agreements that are difficult to end if needs change. Leasing over a long term may not be cost-effective because the total payments can exceed the actual value of the equipment, making it more expensive in the long run compared to buying. When leasing an asset, the organization does not own it during the term, although it may be allowed to buy it at the end of the agreement.

Renting

Renting involves hiring computer hardware equipment for a temporary and short period of time in exchange for a fee. The rental period can range from a few days to a few months. The main difference between renting and leasing is the duration: a rental agreement usually covers a short term (typically 30 days or less), while a lease contract applies to longer periods (usually 12 months, although 6-month and 18-month contracts are also common).

Advantages

Renting requires no capital investment or tied-up funds because the hardware is paid for only during the short period of use. No separate financing is required. It is easy to change systems or upgrade to different equipment as needs evolve because the commitment is short-term and non-binding. Maintenance and insurance are usually included in the rental agreement, reducing the user's responsibility for repairs or damage.

Disadvantages

The organization does not own the computer hardware equipment at any point during or after the rental period. The cost is very high because the vendor assumes all the risks (such as depreciation, maintenance, and potential failure), making renting the most expensive option per unit of time compared to other methods.

Donation

Donation is the method of receiving computer hardware at no cost or very low cost from external parties such as non-governmental organizations, government programs, international partners, or private companies that are disposing of surplus or upgraded equipment.

Advantages

Donation requires no capital investment or payment, making it the least expensive way to obtain hardware. It allows organizations to access computing resources that would otherwise be unaffordable, especially for educational institutions, community centres, or non-profit groups. It can support social and developmental goals by providing technology to underserved areas or causes.

Disadvantages

Donated equipment is usually older, refurbished, or surplus, which means it may have limited performance, outdated specifications, or missing modern features. There is often little or no warranty, and repairs can be difficult or expensive if the equipment fails. The organization has no control over the type, quantity, or specifications of the hardware received, and it must accept whatever is donated. Additional costs may arise for setup, software updates, or adaptation to current needs.

Second-hand / Refurbished Purchase

Second-hand or refurbished purchase involves buying used or previously owned computer hardware that has been repaired, tested, cleaned, and restored to working condition by a seller or refurbisher.

Advantages

This method is significantly cheaper than buying new equipment, allowing organizations to acquire higher-specification hardware at a lower price. It enables access to good-quality machines that would otherwise be unaffordable. It is environmentally beneficial because it reuses existing equipment instead of discarding it.

Disadvantages

There is a higher risk of hidden faults, reduced lifespan, or premature failure because the equipment has already been used. Warranty coverage is usually short, limited, or non-existent, and repairs may be costly or difficult to arrange. The hardware is often older, which means it may not support the latest software, operating systems, or security updates. There is no guarantee of consistent performance or reliability compared to new equipment.

Building Your Own

Building your own involves purchasing individual hardware components (such as processor, motherboard, RAM, storage, power supply, case, and peripherals) and assembling them into a complete computer system yourself or with technical assistance.

Advantages

This method allows complete customization, enabling the selection of components that exactly match specific performance needs and preferences. It can be cheaper than buying a pre-assembled branded system with similar specifications because there is no manufacturer markup. The system is fully upgradeable over time by replacing or adding individual parts as requirements change.

Disadvantages

It requires technical knowledge to select compatible components, assemble the system correctly, and troubleshoot any issues that arise. There is no single comprehensive warranty; each component has its own warranty, which complicates repairs if something fails. The process is time-consuming and involves sourcing parts from multiple suppliers. It carries the risk of incompatibility between parts or assembly errors that can damage components.

For each method, think critically about real-life situations in Uganda where it would be most suitable or problematic, and be prepared to discuss your own examples in class.

CLASSIFICATION OF COMPUTERS

Computers are classified according to; *Purpose, Process* and *Size*.

CLASSIFICATION BY PURPOSE

Computers can be classified according to the tasks executed. These include;

General purpose computers: These computers can do various everyday tasks such as writing a word processing letter, document preparation, recording, financial analysis, printing documents, creating databases, and calculations with accuracy and consistency.

The size, storage capacity, and cost of such computers are mainly less. The ability of these computers is limited in performing specialized tasks. Still, it has versatility and useful for serving people's basic needs at home or in the workplace in the environment. Examples include; Desktops, laptops, smartphones, and tablets used on a daily basis for general purposes.

Special purpose computers: These computers are designed to perform a particular or specialized task. The size, storage capacity, and cost of such computers mainly depend on the nature and size of the work. The function of these computers is consistent with any particular task. A special computer needs specific input and output devices as well as a compatible motherboard with the processor to conduct work efficiently. These

computers are used for special purposes in weather forecasting, space research, agriculture, engineering, meteorology, satellite operation, traffic control, and research in chemical sciences. Examples: Automatic teller machines (ATM), Surveillance equipment, Weather-forecasting simulators, Traffic-control computers, Defense-oriented applications, Oil-exploration systems, Military planes controlling computers.

CLASSIFICATION BY PROCESS

Computers can be classified based on how data is processed/handled in a computer system. These include; Analog computers, digital computers and hybrid computers.

Digital Computers; These solve problems by processing data in discrete form. In form of 0s and 1s. examples include; desktops, laptops, smartphones, tablets, Chromebook, digital watch, accounting machines, digital clock, etc. these computers can perform arithmetic operations such as addition, occurrence, subtraction, multiplication, or division and all types of logical(mathematical) operations at a very high speed. Most computers available on the market today are digital computers.

Analog computers; These are used to process data in a continuous form. They are used primarily to measure physical units like the voltage, pressure, electric current, temperature, and convert them into digits. They obtain all their data from some measurement way. Analog computers are mainly used in the fields of science and engineering. They are slow and equipped to measure things rather than count or check. They are used in the fields of technology, science, research, engineering, etc. This is because quantities like voltage, pressure, electric current, temperature are used more in these areas. These types of computers give only approximate estimates. Examples; An analog computer installed on a petrol pump measures the amount of petrol coming out of the pump and it appears in liters then calculates its value.

Hybrid computers; These computers exhibit features of both analog and digital computers. The purpose of designing hybrid computers is to provide functions and features that can be found on both analog and digital devices in order to maximize the benefits of both computers in one combination. Incorporating the properties of both (analog and digital) computers into hybrid computers makes it possible to resolve more difficult equations immediately. Hybrid computers are most commonly used in vast industries, research centers, organizations, and manufacturing firms (where many equations need to be solved). Also, the solutions and uses of hybrid computers have proved to be much more detailed, accurate, and useful. Hybrid computers are used in scientific calculations, for nations' defense and radar systems as well. Examples may include an Auto gasoline pump, a device installed on a petrol pump not only to measure

the amount of petrol but also to calculate its value, in this way it is capable of both functions i.e. hybrid function.

CLASSIFICATION BY SIZE

Computers can be classified based by size. These include; supercomputers, mainframes, mini-computers, personal computers/microcomputers. The size of the computer determines the processing abilities. Larger computers have higher processing speeds while smaller ones offer a better experience for personal computing keeping in mind that each category excels at a specific function.

Super Computers; These computers are the largest in terms of size. They can occupy anything from a few feet to hundreds of feet. They are expensive to acquire but worth the cost especially for big organizations. These are the most powerful in terms of speed and accuracy. They are used in solving complex mathematical computations. They are capable of executing trillions of instructions per second yet the typical personal computer used at home and the office is only capable of calculating millions of instructions per second.

Uses of Super Computers

Due to their superiority, supercomputers are not intended for your everyday tasks. They handle exhaustive scientific applications that require complex and real time processing.

- In the field of science, researchers use these machines to compute and model properties of biological compounds like protein and human blood. They are also used to interpret new diseases and strains and predict illness behavior and treatment.
- The military uses supercomputers to test new aircraft, tanks, and a host of weaponry and camouflage. They also use them to understand the effects they will have on soldiers and wars. These machines are also used to help encrypt and decrypt sensitive data.
- In entertainment, supercomputers are used to help make a flawless online gaming experience. Games like world of Warcraft demand intense processing. When thousands of gamers around the world are playing, supercomputers help stabilize the game performance.
- Meteorologists use them to simulate weather behavior. They can also be used to predict earthquakes.
- Scientists use them to simulate and test the effects of nuclear weapon detonation.

- Scientists also use them to simulate the events of the big bang and other space-related projects.
- Hollywood uses supercomputers to create realistic animations.

Main frames; They are large sized computer types. Equally powerful but fall short in terms of the computation ability in supercomputers. They are like big file servers, enabling multiple users from nearby and remote locations to access resources at the same time. They can handle massive amounts of data going in and out simultaneously. This makes them popular with businesses. They are also resilient as they are capable of operating for over 10 years without failing. Users access the mainframe using terminals or personal computers. This can happen within the same building or via a Wide Area Network (WAN).

Uses of Mainframes

They are used in large organizations where thousands of clients have to access data simultaneously. For example;

- Performing ATM cash withdrawals and deposits. During the process, communication between the mainframe and remote computer will help accomplish the financial transactions at hand.
- Business transactions that use credit cards or pre-paid cards.
- Online electronic transactions.
- Cloud storage.
- Handling of patient records in major hospitals.
- Making reservations and travel schedules for airline companies.
- Manipulation and tallying of data for census and electoral purposes.

Mini computers; These are smaller than mainframe computers. Their processor power is below that of mainframe systems but above the capabilities of personal computers. They have become almost extinct because of the popularity of personal computers. The latter can now perform most of the tasks reserved for mini computers.

Uses of Mini computers

They became popular for control related functions as opposed to computing prowess. Over the years, their usage was limited to dedicated control assignments in mid-range organizations. Minicomputers were intended for a number of activities listed below:

- Switchboard control.
- Dedicated applications for graphics and computer design.
- Time-sharing, to allow multiple users to interact concurrently on a single system.
- Control and monitoring of manufacturing activities.
- Monitoring and control of laboratory equipment.

Micro computers/Personal computers; Microcomputers are the smallest, least expensive and the most used types of computers. They have a small memory, less processing power, are physically smaller, and permit fewer peripherals compared to super and mainframe computers. They are more commonly known as personal computers or simply pcs. They are more affordable for office use and create cheaper networking environments.

Uses of Microcomputers/Personal computers

- Personal microcomputers are often used for education and entertainment. Beyond laptops and desktops, microcomputers can include video game consoles, computerized electronics and smartphones.
- In the workplace, microcomputers have been used for applications including data and word processing, electronic spreadsheets, professional presentation and graphics programs, communications and database management systems. They have been used in business for tasks such as bookkeeping, inventory and communication; in medical settings to record and recall patient data, manage healthcare plans, complete schedule and for data processing; in financial institutions to record transactions, track billing, prepare financial statements and payrolls, and auditing; and in military applications for training devices, among other uses.

COMPUTER HARDWARE SPECIFICATIONS

Computer hardware specifications are technical descriptions of the computer's components and capabilities. Such specifications include;

- Random Access Memory (RAM), this is typically indicated in gigabytes (gb) and the more RAM in a computer the more it can do simultaneously.
- Hard disk space. This is typically indicated in gigabytes (GB) and refers generally to the amount of information (like documents, music and other data) your computer can hold.

- Other specifications might include network (Ethernet or Wi-Fi) adapters or audio and video capabilities.

Businesses mostly purchase PC hardware such as desktop computers. Hardware specifications are key in determining the cost of hardware. These specifications are determined by some key components such as;

- Central Processing Unit
- Random Access Memory
- Hard Disk

Central Processing Unit; The CPU is the brain of your PC. Hence, if you want to ensure great performance, you'll need to pick the right one. The most important specifications to look at in regards to CPU include;

Processor Manufacturers: AMD and Intel:- There are only two choices to choose from that is; AMD and Intel. The brand you may end up choosing depends on your specific needs and what you'd personally prefer. AMD had had a reputation for being the low-cost option for years, but not until four years ago when their critically-acclaimed Ryzen processor series came out. As of late, AMD Ryzen is the preeminent choice if you want to build a high-spec rig, whether for gaming or productivity. On the other hand, Intel has a reputation for offering premium products that are lauded for their track record and overall reliability. They still lord it over AMD in processor market share but haven't been performing well against Ryzen for the past four years--until their 12th generation Alder Lake chips.

Cores/Core Count: - This is one of the most (if not the) most important processor specs to look at. Cores refer to the microprocessors inside an Intel or AMD CPU, which allow the chip to work on multiple tasks at the same time. Most of the time, the more cores, the better and faster your PC will perform. But it all depends on what you intend to use your computer on. If you plan to use it on gaming, for instance, you will do well with a bare minimum of four cores, with the recommended core count at six or more. For productivity workloads such as video editing (which are known for using a lot of processor power), you'd do well with eight cores or more. The lineup of Core processors includes the Intel Core i3 with 2 cores, Intel Core i5 with 4 cores, Intel Core i7 with 4 cores, and Intel Core i9 with 8 cores, along with the X-series of Intel Core CPUs.

SMT/Hyperthreading: - Modern CPUs can at times not only come with multiple cores, but also multiple threads. AMD has SMT (simultaneous multithreading, specifically on their newer Ryzen processor series), and Intel has hyperthreading. SMT and hyperthreading mean that a single CPU core could do the job of two cores by giving it two individual processing threads. A single core would be recognized by the OS as two CPU cores with

SMT or hyperthreading enabled. This is why you might see a processor like AMD's Ryzen 7 3700X, which possesses 8 cores and 16 threads. This means that for each core, there are two processing threads. The more threads, the better the CPU is at multitasking. *Clock Speed:* - The clock speed measures the number of cycles your CPU executes per second, measured in GHz (gigahertz). For example, if you see a processor that has a rating of 3.1 GHz, it means that it operates at 3.1 billion cycles per second. Generally, a higher clock speed refers to a faster processor. A lot of modern chips from Intel and AMD are programmed to dynamically adjust their clock speeds based on what task they're doing and their operating temperatures. As such, you'll often see two different clock speeds on the box: a base clock and a boost/turbo or max clock. *TDP (Thermal Design Power):* - TDP refers to the total heat output of the CPU, which is measured in watts. Most of the time, a high TDP is an indicator of great performance, but at the cost of having to buy an expensive CPU cooler. *Cache:* - This spec refers to the CPU's "short term memory," if you will. Its main purpose is to offer extremely fast data access, which speeds up the performance of the chip overall. Cache comes in three main types: L1, which is the fastest but offers the smallest capacity; L2 has more capacity but is a little slower--and L3 is the most spacious and the slowest. A big L1 cache often coincides with faster performance. *CPU Socket:* - A CPU socket designates which type of motherboard it will be compatible with. In layman's terms, you'll never be able to make an AMD CPU work with an Intel socket, and vice versa. And there are also so many kinds of sockets under these two brands. The socket is clearly indicated in the product box when you buy a new chip. It depends on which generation products are out, but modern AMD Ryzen CPUs use the AM4 socket, while the newest 12th gen Intel Alder Lake chips use the LGA 1200 socket. *Memory Support:* -Just like the socket, you can't use memory that the processor doesn't support in the first place. This spec will also be indicated firsthand in the box and main product pages as either DDR, DDR2, DDR3, DDR4, or even the newest DDR5. Modern AMD Ryzen and Intel chips support DDR4, with the newest Alder Lake CPUs supporting DDR5. Make sure to pick compatible memory when you buy a new CPU.

Random Access Memory (RAM); Computer memory is a crucial component within computers, largely responsible for the computer's speed and performance. Random Access Memory (RAM) allows you to open and use the programs on your computer, including your operating system. There are many types and sizes available and different systems require different types. RAM comes shaped in physical strips. Each strip has a set amount of memory storage space ranging from 2GB to 32GB. Most laptop's motherboards come with 2 to 3 slots for RAM. If your laptop has 8GB of RAM, it probably uses two 4GB strips of RAM in separate slots. Understanding the technical specifications

associated with RAM helps you determine what type and amount your computer can use and these include;

Physical size-RAM modules vary in physical size based on the type of computer they're used for and the number of pins on the module. Dual Inline Memory Modules (DIMMs) with 168 pins are 5.25 inches long. DIMMs with less pins are typically smaller, with more pins meaning a physically larger module. DIMMs are commonly used in desktop computers, whereas laptops typically use Small Outline Dual Inline Memory Modules (SODIMMs). SODIMMs use the same technology but they're physically smaller, allowing them to fit in laptops. *Amount*- The amount is another important specification to remember. Your computer can only hold so much RAM and while going over the specified limit won't harm your computer; your PC will only use as much of it as it was designed to use. Amount is commonly measured in gigabytes (GB); though older or low-end computers may measure maximum RAM in megabytes (MB). A gigabyte contains roughly 1,000 megabytes, meaning the RAM is much faster. Be sure to consider how many memory slots your computer has, as well. Some computers have two slots to install memory, others have four and some have even more. *Type*- The memory type is important because this is where the majority of RAM's compatibility issues lie. Multiple variations of Double Data Rate (DDR) memory technology are used in various computers. DDR2 is faster than DDR memory, while DDR3 memory is faster than both. If your computer requires DDR3 memory, DDR2 memory won't work. *Speed*- The speed and performance of your system directly correlate to the amount of RAM you have installed. If your system has too little RAM, it can make your computer system to be slow and sluggish. Your computer must have enough memory to make the most of the processor speed. You should have at least 4 gigabytes (GB) of RAM in order to use multiple modern software applications effectively and preferably 8 GB or above for more memory intense software applications such as video editing, photography or design. When selecting RAM, be sure that it's compatible with your motherboard. Memory speed is frequently denoted by "PC-" followed by a number that denotes the peak transfer rate and bandwidth of that type of memory. For example, PC-2400's peak transfer rate is around 2,400 megabytes per second (MB/s). The peak transfer rate basically denotes the best performance possible for that memory. "PC2" and "PC3" simply refer to DDR2 and DDR3 memory, respectively. The specifications may list the memory under a name known as the "friendly name," which looks something like "DDR3-1066." In this case, 1066 represents the data transfer rate in millions per second. All together, the memory specification may read something like "2 GB PC3-6400 DDR3 SODIMM."

Hard Drives; A computer hard drive (or a hard disk or HDD) is one kind of technology that stores the operating system, applications, and data files such as documents, pictures and music that your computer uses. It is a non-volatile storage device. Every computer has an internal hard drive, but you can also get external hard drives that can be used to expand the storage of a computer. All computers require drives to store data on a long-term basis. Hard drives are considered to be secondary storage and these come in two forms, i.e; the hard disk drive (HDD) and the solid state drive (SSD).

The *Hard disk drive* is a more traditional type of hard drive. Hard disk drives are made up of magnetized disks—known as platters—that spin rapidly, typically somewhere between 5,400 and 15,000 RPM (Revolutions per minute). The higher the RPM means faster transfer of data to and from the drive. The faster the magnetic disk rotates, the quicker your computer is able to access information from it. All digital data comes in the form of binary code—a series of ones and zeros that can represent any piece of information. The read/write heads of a hard disk drive are used to input these ones and zeros by magnetizing portions of the platter. Each tiny portion of the platter houses a bit, which will be equal to either 1 or 0. The head can detect the magnetism of each portion, thus “reading” information from it. The same head that can “read” data can also “write” it, by changing the magnetization of bits on a platter. Any time a change is made—such as a new file being saved or a file being deleted—the head of the hard drive will adjust the magnetism of the platter accordingly. Because data is stored magnetically, HDDs are non-volatile devices, meaning that they retain data even when the computer is turned off. These days, internal HDDs can reach a maximum capacity of 20 TB. The most common form factors for HDDs in enterprise systems are 2.5-inch, also known as small form factor (SFF), and 3.5-inch, also known as large form factor (LFF)

Since the emergence of *Solid State Drive*, hard disk drives are rarely used as a computer’s secondary storage, but are still reliable as an external storage option. SSDs (solid state drives) are the newer of the type of hard drive. They have become the preferred format for high-end laptops’ internal hard drives, and all smartphones and tablets also use a form of SSD. Solid-state drives use flash memory, which is also what’s used in USB flash drives and memory cards for digital cameras. There are no magnets involved here, SSDs use semiconductors that store data by altering the electrical state of the trillions of circuits contained within the SSD. Because they have no moving parts, not only do they work faster (as you don’t need to wait for disks to spin and heads to gather information), they also tend to last longer than HDDs. SSDs are a lot more expensive to manufacture, so while they’re increasingly prevalent as the primary disk drive for high-end laptops and PCs, hard disk drives are still preferred by many as a cheaper external option. SSDs for computers are available between 120GB to 30.72TB. The standard form factor for an SSD is 2.5-inch, which fits inside the drive bay of most laptop or desktop computers.

Other specifications might include network (Ethernet or Wi-Fi) adapters or audio and video capabilities.

FACTORS TO CONSIDER WHEN PURCHASING COMPUTER HARDWARE

Cost/Price Vs Budget: Costs have to be weighed against the benefits that the hardware will yield. This may be about reducing costs by automating routine tasks or improving customer service. Of course, price does matter. Even though you have listed your priorities and precisely know what you require, a lower and/or more reasonably priced option is what users settle for, especially if you are sticking to a budget. Many users favor performance over appearance.

Scalability: Does the hardware have the ability to increase or decrease in performance and cost in response to changes in application and system processing demands? For example, how well can the hardware system perform when the number of users is increased or how well can an operating system perform on different classes of hardware. So enterprises that are growing rapidly should pay special attention to scalability when evaluating hardware.

Hardware specifications: Look at the components and capabilities of the hardware. Consider the processor speed, how many gigahertz, because the higher the number the faster the computer. How much memory of RAM because the more RAM in a computer, the more it can do simultaneously. Hard disk space, how much information like documents, music and other data can be stored on it? Because these specifications largely affect the utility of the computer. It is these specifications that will ensure the correct operation of the software.

Compatibility with software: Hardware requires software to run correctly. Without the correct hardware, your software may not run efficiently or at all. So it is important to choose hardware that is effectively compatible with the software in question as it can affect the way you work and your productivity.

Warranty: Hardware warranty covers the repair and if repair is not possible, replacement of any PC, laptop, tablet, monitor, printer/scanner purchased from an IT house. So before you buy hardware, ask yourself, what is the warranty, is it limited to just specific parts, certain types of defects or other conditions. Warranty may be 90 days, 1,2,3,4 or 5 years and above. So when purchasing hardware, its recommended that you add a more comprehensive warranty which can save your business from high costs related to hardware break down.

Peripherals: If you're looking forward to connecting to watching dvds in your laptop, for example, make sure that you consider your machine has a built-in DVD reader or optical drive in it. Keep in mind that the more peripherals a machine can handle, the bulkier and more expensive it may get. If you can live without installing something on your laptop via an optical drive, it may be a great option for you to simply skip it to avail of a thinner and cheaper model.

The monitor is the computer's display screen. Most modern monitors use some form of liquid crystal display (LCD) technology. Monitors are normally measured diagonally in inches - typically 22, 24 or 27 inches. Larger or ultra wide-screen monitors allow you to compare two documents on-screen. Which LCD technology you should use will depend on the cost of it, and whether you require true color reproduction or high screen refresh rates. The aspect ratio of a monitor is the proportion of image width to height. A common aspect ratio for monitors is 16:9 but other aspect ratios may be required for specialist purposes such as CCTV monitoring or movie editing.

The keyboard and mouse usually come as part of a bundle, but you may be able to select wireless devices that make desktops neater. There are alternative computers to conventional desktop pcs available, such as apple, macs. These have historically been used to support desktop publishing software but now also offer a comparable system for general office use.