UACE Subsidiary

INFORMATION & COMMUNICATION TECHNOLOGY

ICT

Simplified Revision Notes for Students

2020 EDITION

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BIGULI SECONDARY SCHOOL - ICT DEPARTMENT

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BIGULI SECONDARY SCHOOL
ICT DEPARTMENT

Dedication

To all Advanced level Subsidiary Information and Communication Technology students at Biguli Secondary School

The struggle continues…

Table of Contents

Introduction to Subsidiary ICT

Aims of Teaching and Learning ICT

At advanced level, Subsidiary ICT is taught to:

- help the learner to develop and consolidate his acquired ICT skills
- help the learner be aware of the new and emerging technologies
- encourage the learner develop as an independent individual user
- help learners develop ICT skills to enhance their work in a variety of fields
- equip the learner with skills for lifelong learning
- help the learner develop new ideas for self-employment
- help the learner get skills used in learning other subjects

The ICT Syllabus and Paper Format

UACE ICT syllabus – teaching sequence
This is the current functional advanced level Subsidiary ICT UNEB syllabus skeleton

1. **Introduction to computing**
   - Introduction to computers
   - World of ICTs
   - Implications of using ICTs
2. **Computer management**
   - The booting process
   - File management
   - Common utilities
   - Print management
3. **Computer lab care and maintenance**
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   - Secure lab environment
   - Servicing and maintenance
4. **Computer word processing 1**
   - Introduction to word processing
   - Working with word processing software
5. **Computer hardware**
   - Input hardware
   - Output hardware
   - Storage devices
   - Processor components
6. **Computer software**
   - System software
   - Application software
7. **Electronic spreadsheet 1**
   - Introduction to spreadsheets
   - Working with spreadsheets
   - Managing spreadsheets
   - Formula and functions
8. **Internet and the www**
   - Introduction to Internet
   - Internet services
   - The worldwide web
9. **Computer word processing 2**

- Page layout
- Data tabulation
- Use of objects
- Document accuracy
- Mail merge, document reference, and printing

10. Electronic presentations

- Introduction to presentations
- Working with presentation software
- Developing a presentation
- Working with charts
- Working with graphical objects
- Presentation output
- Slide show

11. Data communication and networking

- Introduction to data communication
- Introduction to networks

12. Electronic publication

- Introduction to electronic publication
- Publication basics
- Document layout
- Document enhancement
- Output and printing
- Complete publication
- Web publishing

13. Electronic spreadsheet 2

- Working with charts
- Working with page layout
- Printing a worksheet

14. Electronic databases

- Introduction to databases
- Database objects

15. System security, ICT ethical issues and emerging technologies

- Computer system security
- Privacy and ICT ethical issues
- Emerging technologies
- The ICT industry

The UACE ICT Examination format

Subsidiary ICT has three papers paper 1, 2 and 3 that are set. Paper 1 is compulsory. A candidate chooses one of 2 and 3.

Paper 1 S850/1 is a theory paper with 20 equally weighted filling-in compulsory questions, each taking 5 marks. It is marked out of 100 but the mark converted to 40. It requires short and precise answers and takes 2 hours and 30 minutes.

The questions set and fetched from the entire syllabus but with more emphasis on basic ICT concepts and their applications in various fields.

Questions for this paper will be set basing on the question allocation table below.

	Type of question				
Topic	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Total**
Introduction to computers	01	01			02

Lab care and maintenance			01		01
File management		01	01		02
Computer hardware	01	01		01	03
Computer software	01	01	01		03
Internet and www		01	02		03
Data com. and networking	01	01			02
Trends in computing	01			01	02
Computer applications			02		02
Total					20

Papers 2 and 3 (S850/2 and S850/3) are practical papers with 5 equally weighted questions and takes only 2 hours. A candidate attempts only 3. All the work is saved and written to a blank Compact Disc Recordable that is sent along with hardcopies of the work to UNEB.

Numbers will be based on practical applications of Word processing, Spreadsheets, Databases, Presentations and Desktop publishing. They are marked out of 60 and the mark is not converted.

1

INTRODUCTION TO COMPUTING

Introduction to Computers

A **Computer** is an electronic machine that receives data from the user, processes it using stored instructions (programs) into information, stores and outputs the information for future use. A computer processes data into information.

Characteristics of modern computers

Modern computers have the following characteristic features in common

1. **Speed**. Computers operate with extremely high speeds compared to human beings. Computer speed is usually measured in millions of instructions per second (mips)

2. **Automatic**. They are automatic in that they do not need any supervision to do tasks when instructed. They are continuous in action and carry on tasks till they are finished.

3. **Accurate**. Computers cannot make mistakes. Any mistakes made are due to human error. If wrong data is fed into a computer, wrong information is expected hence the saying garbage in garbage out (GIGO)

4. **Versatile**. Modern computers can perform more than one task at the same time

5. **Diligence**. They have ability to do repetitive tasks for long with the same speed and efficiency without getting tired or fatigued

6. **Artificially intelligent**. They can be programmed to assume human capabilities such as learning, reasoning, adaptation and self-correction

7. **Storage capacity**. They have memory to keep data, programs and information either permanently or temporarily before or after processing.

8. **Programmable**. Computers can be programmed and reprogrammed to take on new tasks. They lack natural brains and therefore use stored instructions to do tasks.

9. **Communication**. They can communicate with other computers to share data, information, programs and instructions through networks

10. **Adaptability**. They can be adapted to work with different settings, programs and in different environments. Multiple programs can run on the same computer the same or different times

11. **Flexible**. They can easily switch from one task to another and support a variety of peripheral devices

12. **Processing ability**. They can process data into meaningful information basing on the instructions from the user

13. **Portable**. Can easily be moved from one place to another for example laptop computers and mobile phones

14. **Electronic** in that their operation is powered by electricity

Components of a Computer System

A computer system is a collection of components that work together to process data into information. A computer system comprises components that make it fully useful such as:

Computer hardware refers to the physical devices of a computer that are tangible such as the keyboard, mouse, monitors printer, compact discs, hard discs, system units, speakers etc.

Computer software refers electronic instructions that tell a computer what tasks to do and how to do them.

Computer communication is the transmission of data and information over a channel between computers. Computer communication allows sharing of hardware, software, data and information among networked computers.

Computer users or **Human ware** refers to the people who operate and give instructions to computers. A computer user can be an *ordinary* or *professional* user

- **An Ordinary user** doesn't have much technical knowledge of computers but uses computers for simple personal tasks, learn, have fun such as computer students, typists, etc.

- **A Professional user** has formally been trained in the technical aspects of computers or a trained personnel working in the fields of computing such as programmers, webmasters, ICT teachers etc.

Computer Data and Information

A computer processes **data** into **information**

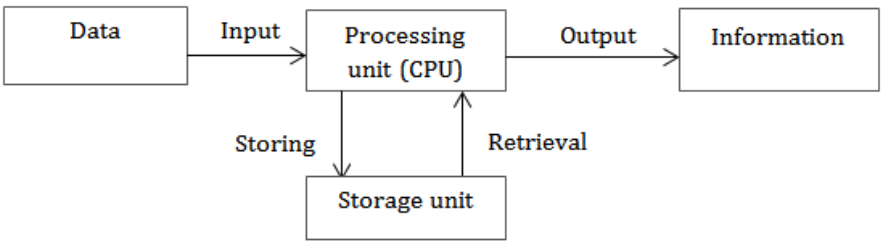
Data is a collection of raw facts that are not meaningful to the user. Data can be in form of text, numbers, images, audio, video or symbols. Examples of data are students' bio data, test scores, population figures, employee bio data, etc.

Information refers to processed data. It is organized, meaningful and useful to the user. Examples of information include words, a mathematical formula, grades, a piece of music, a song etc.

The process of transforming or converting data into information is referred to as **information processing**.

The Information Processing cycle

It is a series of stages the computer system follows to process data into useful information. These stages are illustrated below.



Collection of data - facts to be processed are first gathered from their sources and recorded down on paper, or using recorders, sorted and made ready for input.

Data input - the facts are then entered into a computer with help of suitable input devices. The facts are sent into the processing unit -CPU for processing

Data processing - the CPU processes the data by performing arithmetic and logical operations on it basing on the instructions from the user. The resultant at this point is information.

Storage of information- the results of processing (information) are sent into the storage memory where it is kept for future use. The stored information can be retrieved from memory for output or further processing

Output of information - information is sent out in visual or audible form and provided to the user through output devices.

Forms of information

Information can take one of the following forms:

1. Written information – the common type of information in organizations, often presented on media such as paper
2. Aural information – information presented in form of speech such as in meetings, voice calls, voice mails
3. Audio (audible) - information heard through speakers
4. Visual information, seen by human eyes such as:
   - Video – information in form of moving images
   - Multimedia - combined forms of information such as text, audio, videos, images
   - Text - characters, symbols, letters, numbers and graphics

Softcopy – refers to non-printed information displayed by the visual display unit
Hardcopy – refers to printed information

Qualities of good information

Good and valuable information should be:

- Accurate. It should be error free to help users make correct decisions
- Verifiable. It should be proven whether correct or incorrect
- Timely. It should have a validity time frame i.e. when is should be valid or when it should not.
- Accessible. It should be available when it is needed by the user or decision maker.
- Meaningful and useful. It should have meaning to the people who receive it
- Cost-effective. It should give more value than it cost to produce

Advantages of using computer for information processing

- Computers are very fast
- They are cheap and cost effective
- Computers can process large amounts of data and give correct results
- Use of computer can increase efficiency and productivity, costs lower in the long run
- Security of information can be ensured through passwords
- Computers can store large amounts of data
- Computers can help users share data

Limitations, disadvantages and negative effects of using computers

- Due to computerization, some jobs may be lost e.g. typists
- Face to face interactions among workers may be limited
- The initial investment cost is high on hardware, software, training users
- Information is susceptible to computer errors and viruses
- Computer work on electric power which may not be present
- Computers are not reliable, need humans to control them

- They are unable to learn from past operations
- Computers often are used as means to access inappropriate literature and pornography
- Prolonged use of computer can lead to health problems such as backache, loss of sight
- Prolonged use of computers may result into addiction to games, Internet

The common Hardware parts of a Computer

The basic parts of a computer

1. **The system unit** is a rectangular box that houses the internal electronic delicate parts of a computer.
2. **Mouse** is a small device used to point and select items on the computer screen. It used in the movement of the cursor
3. **Keyboard** is an input device mainly used for typing text and issuing commands into the computer
4. **A monitor** is an output device that displays information in visual form like text and graphics to the user.
5. **A printer** is a device that converts softcopy information into hard copy.
6. **A speaker** is an output device that is used to play sound.

System unit

Speakers

Keyboard

Mouse

Printer

Revision Questions

1. (a) What is meant by data processing?
   (b) Describe the data processing cycle

2. (a) Give the advantages and disadvantages of using computers for data processing
   (b) Give any five activities that take place during data collection

3. (a) Give any three forms of information
   (b) Give any five qualities of good information

4. Give any three threats to computer held information
5. Give any three traditional methods of processing data you know

The World of ICTs

ICT stands for **Information** and **Communication Technology**.

ICT is a collection of related technological tools and methods used to create, store, manage and disseminate or distribute information.

The term information and communication technology combines two terms: *Information technology* and *Communication technology.*

Information technology (IT) is a combination of computers and communication technologies to process data into information

Some of the common ICT devices are laptop and desktop computers, radios, televisions, cellular phones, compact discs, Internet and networking hardware, software platforms, satellite systems, biometric devices, fax machines, etc. However, the term ICTs commonly is used to refer to computers.

Uses of ICTs in our daily Society

ICTs have changed society today; people interact with computers and other ICTs in fields such as: education, business and commerce, health, security, politics, communication, entertainment and leisure, technical and scientific fields.

Uses of ICTs in the area of education

- Use computer of assisted instruction (CAI) to deliver lessons, web based lessons
- Use of computer of computer aided learning (CAL) such as use of projectors to deliver lessons more efficiently
- Printing learning materials such as exam papers, manuals, etc.
- Use computer of computer aided assessment (CAA) to assess learners' progress
- Schools use computers to create school websites for sharing information with the public.

- Productivity tools like desktop publishing are used in projects and other school activities.
- Computers are used for calculating mathematical arithmetic by students and teachers
- They are used to manage school records
- They are used to create students' progressive report cards electronically
- Distance learning through computer based training (CBT). Students can get awards such as degrees without going to class.
- Teachers use simulation software to perform difficult or dangerous experiments in class.
- Special facilities for students with disabilities like text to speech and speech recognition to help blind students can be used
- Used in preparation of school daily documents such as receipts, exams etc.
- Enable students to do online research using online dictionaries and libraries
- Allows studying online, cyber classes via web conferences
- Teachers can use audio-visual methods such as presentations to introduce complex topics
- Computers themselves are used as teaching and learning aids
- They have eased storage of data and information for teachers and students
- Enable edutainment, a form of learning that combines learning and entertainment to make learning interesting and more fun
- Use of interactive whiteboards and projectors to ease learning

Uses of ICTs in Business, Finance and Banking

- Computers enable people to work from home, using a computer connected to the employer's network or via the Internet known as **telecommuting**.
- Computers have created more jobs such as computer technicians, computer teachers, etc.
- Buying and selling computers and components is a source of income to individuals, and companies.
- Through, computer aided design (cad), scale drawings, and excellent designs can be created easily.
- Computers are used to send and receive mobile money, making world-wide money transfers.
- Computers are used to manage transactions and automated teller machines ATMs for 24 hours banking.
- Computers help in business advertisement through creating websites, Internet, flyers, brochures and billboards.
- Computers are used in typesetting business for production of document printouts and publication of books for sale.
- Computers are used for e-commerce: the sale of goods and services over the Internet.
- Online shopping and order of goods
- Product research through online surveys, questionnaires
- Inventory and control management

- Customer care and service through SMS and toll free calls
- Social media marketing and advertisement
- Computer equipment such as CCTV cameras are used to keep security over business premises
- Multinational companies can carry out online seminars and meetings
- They are used to keep basic business records
- Barcode readers are used to read serial numbers on packaged products to examine genius and determine prices
- Magnetic ink character recognition readers are used to read details on customers' cheques
- EPOS terminals are used to record and invoice customers' purchases
- Online banking and money transfer
- Paying bills, prepare budgets using finance software
- Online banking and online investment

Uses of ICTs in the health care

- Hospitals use computers for managing and storing records electronically, rather than paper files.
- Computers are used for printing labels, allocating beds; make appointments, staff rotas, etc.
- Internet helps us get web sites for information on health care, treatments, conditions, etc.
- Monitoring, diagnosis such as heart rate, blood pressure aided by computer expert systems.
- Medical training is facilitated by simulation software and on-line data sources.
- Computers are used to carry out many surgical procedures such as laparoscopic surgeries
- Computerized devices such as CT scan, ultra sound devices and magnetic imaging.(IMR) are used assist in medical tests, diagnosis and cure of diseases
- They enable online consultations by medical professionals.
- Use of computer assisted tests can be carried out before prescribing treatment.
- Use of computer assisted life saver machine.
- Surgeons implant computerized devices such as Pacemakers in the body to allow patients live longer
- Surgeons use computer-controlled device to do operations that need much precision such as laser eye surgery and robot assisted heart surgery
- Telemedicine – doctors can have a conference to discuss medical tests
- Telesurgery – doctors direct robots to do surgery when they are away
- Enable faster communication between patients and doctors through calls, SMS, emails
- Can be used to monitor the patients in hospitals e.g. CCTVs
- Medicals use the web and special software to assist with research and diagnosis

- Pharmacists use computers to file insurance claims
- Computer controlled robots can deliver medications to nursing stations in hospitals
- Doctors use computers and mobile devices to keep patients records
- Tiny implants such as cochlear implants allows a deaf person to hear
- Small camera pills can be swallowed and take images in the body to detect cancer, and other abnormalities
- Electrodes implanted in the brain stops tremors associated with the brain diseases

Uses of ICTs in the area of security

- Computers aid monitoring security through cameras, automatic number plate recognition, etc.
- Communication systems are widely used in the military to coordinate the personnel.
- Some computer systems can detect temperatures and alarm in case of danger of fire outbreaks.
- Computers are used for capturing data for police national computer databases –, vehicle number plates, criminals fingerprints, etc.
- Computers are used to detect presence of illegal devices such as bombs.
- Computers are also used for controlling dangerous weapons such as missiles.
- Computers are used for storing criminal databases and information at police stations.

Uses of ICTs in the area of politics and governance

- Public records -a maintained database of statistical information such as electoral register and census data can be availed online.
- Use of electronic voting during elections. The introduction of biometric voters' verification machines during the 2016 general elections in Uganda.
- Government websites provide citizens with current and up-to-date information about govt activities
- Government departments can use a computer based platform to get feedback from the citizens.
- Citizens can pay online for tickets, taxes, licenses, etc.

Uses of ICT in art, leisure and entertainment

- Computers enable people to play computer games like need for speed, solitaire etc.
- Internet has promoted social networking that has enabled interaction between people
- Computers can be used to play music during free time.
- Computers can be used to watch movies and videos.
- Digital cameras can be used to record and capture videos on parties, tours.

- They are used to compose and edit songs by producers through using audio and video production software.
- Internet enables people to read magazines online.

Uses of ICTs in the area of communication

- E-mail: electronic mail sent from one person to other using connected computers helps a lot in the area of communication.
- Video conferencing enables people in different locations to conduct meeting as if they are in the same location.
- Computers are used for faxing: sending an image of a document electronically.
- Computers enable people to send voice, image, text and data though telephones and mobile cell phones.
- Social networks such as face book, and twitter enable people to stay in touch with their relatives, friends and interests.

Industrial, travel and transport, technical and scientific uses of ICTs

- Astronomists use computers to study the behavior of complex systems in space as regards to their movements, interactions etc.
- Meteologists can use computers to analyze data and predict weather conditions
- Through computer aided manufacture (cam), computers can be used to control the production of goods in factories.
- Computers perform telescope pointing and tracking (including error correction), camera operation, image download and storage, image reduction (the measurement of the image), and data processing.
- Computers are used to tell schedules of water vessels, train, buses to their respective stations. You only need to use your PDA device or cello phone and check it out.
- Computers are used very extensively in design of roads. Roadways and bridges are designed using software programs like cad etc.
- Vehicles with navigation systems (GPS) can help locate their destinations to the user
- Websites are used by travellers to reserve travel tickets
- Directions and maps can be printed to aid travellers
- Monitoring highway traffic
- Computer aided manufacturing assist with production of goods such as in fabrication and assembly

Implications of Using ICTs

The widespread use of computers and related technologies in almost all fields of work and life has imposed both positive and negative effects on people's lives and work.

Positive implications of using ICTs

- Enhancement of efficiency**- ICT** has brought the ability among workers to produce good results by using the available time, money, supplies etc. In most effective manner.
- Communication. This has been enhanced by the development in the communication industry e.g. E-mail, Skype, Facebook etc.
- Networking. This is basically use of computer and other resources thus eliminating duplication of data and other resources in the organization
- Security. Computers have generally improved security through computer development of security conscious gadgets like automated gates CCTV cameras.
- Service delivery. It has stimulated a sustainable flow of information and interlinking the various stakeholders within the various businesses.
- Entertainment**.** For example playing computerized music, games, computer games etc.
- Enhancement of employment opportunities e.g. computer teachers, software engineers etc. which has created employment opportunities.
- ICT explore and facilitates scientific research e.g. solving the problem of physics and engineering design, explore relations of biological and physiological processes.

Negative implications of using ICTs

- Health problem. Computers have affected health standards of human life for stance light from the screen affect eyes, sitting down causes back pain etc.
- Fraud. This is where one commits unacceptable activity as the way of getting organization's information or data without permission from the owner. E.g. stealing money from one account to another in the bank.
- Moral degeneration. Through the pornographic literature, message clips etc. which have led to loss of cultural values
- Increase in the cost of production. This is because computers are expensive to buy and maintain hence increased prices.
- Unemployment. It has negatively affected the society by replacing the workers with no computer skills.
- Computer viruses. These are considered the greatest nightmare because they attack once the computer system and destroy it within a minute leading to loss of information.
- Death and accidents. They cause death and accidents due to computer explosions
- Over reliance on computer. This has come up due to over dependence on computer making them do everything hence causing mental decadence.
- Environmental degradation. Computer resources and hardware components are very harmful to the environment. They have led to soil and air pollution in the environment.

Computers and the Environment

Green Computing

Green computing or **ICT sustainability** refers to environmentally sustainable computing or IT. Green computing is environmentally responsible use of computers and related resources.

Or

Green computing is the study and practice of designing, manufacturing, using, and disposing of computers servers and subsystems in a way that does not harm the environment.

Green computing involves the implementation of energy-efficient CPUS, servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste)

Goals of green computing

- Reduce the use of hazardous materials.
- Maximize energy efficiency during the product's lifetime.
- Promote the recyclability, biodegradability of ICT products and factory waste.
- Make the use of computers as energy- efficient as possible.

Core objectives of green computing strategies

- Minimizing energy consumption
- Purchasing green energy
- Reducing the paper and other consumables used
- Minimizing equipment disposal requirements
- Reducing travel requirement for employees or customers

Ways of promoting Green Computing

Outline any three measures that can be taken to prevent environmental degradation through the use of ICT. *(UACE 2018)*

- Minimize the use of paper by using the Internet to send e-mails than physical letters
- Properly recycling and disposing off of e-waste such as toner cartridges, etc.
- Sensitizing people about environmental management via social media, radio, TV talk shows
- Using Google maps to spot areas where degradation has occurred so as to mitigate the effect
- Using radio announcements to disseminate information about environmental management

- Using of pop-up messages sent to phone to alert or remind people about environmental management
- Use of computer controlled planes to plant trees, spray, irrigate, put off fire in remote areas
- Use of grid computing and cloud computing
- Promoting use of virtualization of computing hardware
- Using low power hardware like LCD monitors and laptops instead of CTRs and Desktops
- Through developing bio-degradable computing devices
- Switch off hardware components such as printers and monitors when not in use
- Using power management features to turn off hard drives and display after several minutes of not in use.
- Employ alternative energy sources for computing workstations, servers, networks and data centers.

Advantages of green computing

- Reduced use of energy lower carbon dioxide emission from fuel used in power plants transportation
- Conserving resources means less energy is required to produce, use and dispose of products
- Saving energy and resources saves money
- Green computing encourages recycling, lowering energy use by individuals and business
- Reduce risks of chemicals that cause cancer, nerve damage, immune reactions in humans

Cloud Computing

It refers to storing, accessing data and programs on remote servers that are hosted on Internet instead of computer's hard drive or local server. It is also referred as Internet based computing or **online storage**

Or

Cloud computing-this is the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, opposed to local server, personal computers

Examples of online file storage sites

1. Amazon Drive
2. Box
3. Google Drive
4. Hightail
5. I-Cloud
6. Media File
7. Drop Box
8. Microsoft One Drive
9. Share File
10. Sugar Sync

Advantages of cloud computing

- It reduces the cost of buying computer hardware and software.
- It is available 24 hours, allows accessibility of user's data anywhere, anytime
- Efficient recovery. It delivers faster more accurate retrieving of applications and data
- Flexibility of growth. It is scalable, companies can add and remove resources based on their needs
- Cloud hosting is very easier to implement in organizations
- It allows automatic updates of software
- It offers great security when any sensitive data has been lost.
- It helps organizations to reduce their carbon print
- Cloud applications enhance collaboration of distant people to virtually meet and exchange information.
- It is very easier to monitor and manage.

Disadvantages of cloud computing

- Very expensive to install and pay subscriptions to cloud service providers
- Requires you to be online in order access the resources and services
- The customer has limited control over the services compared to service providers
- There is always temporary inaccessibility when service providers are upgrading and servicing server
- There is insecurity of data due to hackers

2

COMPUTER MANAGEMENT

Computer Booting

Booting sequence refers to is the initial set of operations that a computer performs when electrical power is switched on.

Booting is the process of starting up a computer. During booting, the operating system (OS) loads from bootable hard disc into the working memory (RAM).

Booting is of two types: **Warm or (soft)** booting and **cold (hard)** booting

Cold or hard booting is the process of turning on a computer after it had been powered off completely (starting a computer) while **Warm or soft booting** is the process of restarting a computer that already is powered on.

(a) Distinguish between cold booting and warm booting
(b) Give three circumstances under which a computer can be warm booted
(UACE 2018)

Reasons for Warm Booting a Computer
(Circumstances under which a Computer may be restarted)

- Before and after installation of a new application or utility software
- After uninstalling an application or utility software
- When a peripheral, hardware component fails to function
- After uninstalling or disconnecting a hardware component
- During and after installation of operating system
- During installation of a new computer hardware
- After configuring a server on a network or changing network settings
- After changing system control settings
- When a user wants to clear a malicious infection like malware, spyware, viruses
- When switching from one operating system to another – multiple OS
- When the computer stops responding to commands (freezes or deadlocks)
- After malware or virus scanning
- When there is suspected system attack or tapping
- When the computer system slows down
- When application software fails to load or work
- When power voltage suddenly lowers
- To activate a boot scan
- After performing a system restore
- When new network configurations have been added to the computer

- When recover from errors that cannot be recovered.
- After updating or upgrading software or hardware
- When a device is not ready
- During troubleshooting the computer
- Automated software can also cause a warm boot.

Benefits of restarting a computer

- It flushes RAM and removes files that could be causing computer freezing
- Fast performance: reboots are known to keep computers running quickly
- Stops memory leaks that occur when doesn't close properly
- Fixes Internet connection
- Recovers the computer from software errors
- Fixes most software bugs

Step-by-step process of booting

1. When power is switched on, the PS sends a signal to the components in the System unit.
2. The processor finds the ROM chip that contains the BIOS (Basic Input - Output System).
3. The BIOS performs the Power-On Self-Test (POST) to check components such as peripherals
4. The results of the POST are compared with data in a CMOS chip
5. The BIOS looks for system files on the hard disk
6. System files and the operating system load into RAM from the hard disk
7. The OS loads configuration information and displays the welcome screen
8. On startup, the OS may require a password for a legitimate user to logo on the system
9. After the user logs on, the desktop and icons are displayed
10. The OS finally runs the programs that open automatically when the computer boots.

Terms used in the booting process

A boot loader - a computer program such as BOOT MGR that loads the main operating system for the computer after POST

A boot drive is the drive from which a computer boots or starts, usually drive C. it can also be a removable device such as a flash or compact disc or DVD

Bootable device (installation disc) – one that contains the OS software from where the computer boots

Computer Application Programs

A computer program is a set of instructions that a computer uses to perform a specific task, also called an application. Common programs are word processors, presentation software, database management systems, web browsers, computer games

Starting Programs

The start menu is the gateway to all of the programs on your computer. To open the start menu, click the start button. The left pane of the start menu contains a small list of programs. To open a program, click it. If you don't see you want to open, but you know its name, type all or part of the name into the search box at the bottom of the left pane. To browse a complete list of your programs, click the start button, and then click all programs

File and Folder management

File management involves operations on files, programs and folders on computers disks.

File management operations include

- Creating files and folders
- Moving files and folders
- Copying files and folders
- Selecting single or multiple files
- Renaming files and folders
- Searching and sorting by name, date or file extension (type)
- Printing files
- Deleting files and folders
- Restoring or emptying recycle bin etc.

A folder is a named storage location where related files and subfolders can be stored. **A folder** is also known as a **directory** in some operating systems

A file is a collection of related data saved with a given name on a storage medium.

Features of a folder

- A folder has a name
- A folder has a path originating from a special directory called root directory
- A folder has special access permissions for authenticated users.
- A folder or directory may be created inside another folder or directory. This is called a subfolder or a subdirectory.

Creating a new folder

- Using my computer icon, on the folder tree on the left pane, select the location (desktop) in which you want to create a new folder.
- On the file menu tab, click new folder
- Type a new name for the folder to replace the temporary name, then press enter key or click the icon once.

Or

- Right click on the free space on the desktop,
- Point to new, click folder. Type a new name for the folder and click away

Renaming a folder or file

Renaming refers to changing the previous name to a new name. To rename a file or folder proceed as follows:

- Using my computer icon, display the explorer window.
- On the folder tree on the left pane, select the file or folder to be renamed.
- On the file menu, clicks rename. Type the new name, and then press enter key.
- **Or** right click on folder or file and choose rename option from the popup menu.
- **Or** select the file or folder icon and press f2 function key, type the new name, and then press enter key

Deleting a folder or file

In Windows, deleted items from the hard disk, are temporarily held in the **Recycle bin** from where they can be restored if necessary.

To delete a file or folder proceed as follows:

- Using my computer icon, display the explorer window.
- On the folder tree on the left pane, select the item that is to be deleted. On the file menu, click delete.
- A message appears on the screen asking whether you actually want to delete the item. Confirm by clicking yes

Restoring deleted files and folders

To restore a file or folder from the recycle bin to its original location:

- Double click the recycle bin icon.
- Select the deleted item(s) to be restored.
- Click file then restore

Empting the recycle bin

- To completely discard files and folders you deleted, you need to empty the recycle bin. To empty the recycling bin proceed as follows:
- Double click the recycle bin icon on the desktop to open.
- Choose empty recycle bin from file menu.
- Click yes when prompted to confirm deletion of the files.

Copying files and folders

Cut or copy command are used to move or create a duplicate of an item respectively. When you cut or copy an item, it is temporarily held in a temporary storage location known as the clipboard. To copy a file or folder:

- Using my computer icon, display the explorer window.
- Select the file or folder to be copied.
- On the edit menu, click copy.
- Select the drive or folder where you want the item to be copied.
- From the edit menu, click paste. Information or item is pasted to a new location.

To move a file or folder proceeds as follows:

- Using my computer icon, display the explorer windows.
- On the edit menu, click cut.
- Select the drive or folder where you want the item moved.
- From the edit menu, click paste.
- Move progress dialog will be displayed on the screen.

Moving a folder

- To move a folder to a desired location:
- Click the folder and hold
- Drag and drop to the desired location

Sorting files and folders:

- Right-click any open space within windows explorer and select sort by.
- Choose to sort by name, date modified, type, or size.
- To view more sorting options, click more

Computer files

Every document, picture, sound or video saved on a computer's storage is a file. A file is associated with is used to read it, so if you double-click a file that was created in notepad, the notepad starts and displays the file. For example, you can edit the text in a document or change the colours in a picture. All files have names, and all file names consist of two parts—the name and the extension—separated by a period. The type of file or in which it was created is indicated by the extension. The **extension** is a short abbreviation of the file type. Its commonly 3 letters

Files and file extensions

By default, windows hide common file extensions.
If you would prefer to see your file extensions, open my documents (or any folder) in windows explorer, and on the tools menu, click folder options, and display the view tab. Clear the hide extensions for known file types check box, and then click ok to close the dialog box and apply your settings.
Files also have icons, which are graphic representations of the file type. Depending on the way you're looking at your files, you might see a large icon, or a small icon.

Creating a new file

Depending on the programs installed in your computer, you can create different types of files such as drawings, text document etc.

To create a new text document:

- On the free space on the desktop, right click.
- Point **new**, click text document. From the list available on application.
- Type a new name for the new file to replace the temporary name and press **enter** key.

NB: in windows, file name can contain up to 255 characters, including spaces but, with no special symbols such as \|/:*?"<>.

Selecting multiple files

Sometimes, though, you'll want to select more than one file at a time. For example, you might need to move a group of files, or copy several files at once.

There are many ways to select multiple files:

- **Shift click:** if the files you want to select are listed one after another, click the first file in the group, hold down shift, and then click the last file in the group.
- **Ctrl+click:** if the files you want to select are not listed together, hold down ctrl while you click each file.

Types of files

There are three types of files namely:

- **System files**: contain information that is critical for the operation of the computer.
- Executable files
- **Application files:** holds programs and are executable.

- **Data files:** contains user specific data

File attributes

Every file has a file name and an optional extension. The name and extension are separated by a period (.) E.g. *Jeff.doc.* In this case, the file name is Jeff and the extension is doc. The size in bytes, date, and time the file was created

Table below shows some common file extensions and file types.

Extension	File type	Description
.doc	Data	Microsoft word document file.
.xls	Data	Microsoft excel document file.
.ppt	Data	Microsoft PowerPoint document file.
.pub	Data	Microsoft publisher document file.
.accdb	Data	Microsoft access document file.
.txt	Data	A plain text file created using note pad editor
.exe	Application files	The file that launches a particular application, e.g. Winword.exe
.bat	System files	Files containing a series of commands loaded during boot up.
.sys	System files	System files that perform fundamental operations in a computer.

Saving a file

After typing the content of the file in the work area, click file and then click save. Otherwise, if the file will be saved with a different name or location then: save as.

- Click file menu and then
- From the save as dialog box, select where the document is to be saved then type its name.
- Click the save button

Finding files

When you are saving your work you must always be aware of:

- The drive it is saved on.
- The folder it is placed in.
- The file name

If you follow these simple rules it will make finding your files much easier. If you lose a file, you can use the search utility in windows explorer to look for the file

File specification and file path

A **file specification** is the name given to identify a file. The path is the first part of the file specification. The **file name** and **extension** make up the remainder of the file specification. Also, in windows, the folder containing information specific to one user, including the documents, desktop and the like is known as the profile.

The file specifications

C:\Users\MDT\Desktop\Music\Gospel\Worship.mp3
identifies the file **named** worship.mp3 in the gospel **subfolder** under music **folder** on the desktop (**location**) under MDT's **profile** in the users' **directory** on **disk drive** C. The **file extension** .mp3 denotes that worship.mp3 is an audio file.

The Windows Desktop

The desktop is the main screen area that you see after you turn on your computer and log on to windows or other operating system with a GUI.
Like the top of an actual desk, it serves as a surface for your work. When you open programs or folders, they appear on the desktop. You can also put things on the desktop, such as files and folders, and arrange them however you want.

Features of a Desktop

Desktop background: Windows lets the user to customize the desktop background by applying favorite themes, colors, pictures and wallpapers.
Icons: an icon is a graphical representation of on the screen.
Taskbar: taskbar is the band where the buttons of currently open windows are displayed.

Basic features of a desktop

System tray or notification area: the notification area, on the far right side of the taskbar, includes a clock and a group of icons that communicate the status of something on the computer or provide access to certain settings.

Start button: the left most button on the taskbar that the user clicks to display the **start menu**.

Customizing the desktop
Windows lets the user change desktop appearance, background, screen savers and resolution

Screensavers display moving designs on the computer screen when you haven't typed or moved the mouse for a while.

To set a screen saver,

- Right-click anywhere on the desktop and click personalize.
- Click screen saver at the bottom of the window.
- Select a screensaver from the screen saver drop-down list.
- Click ok when you're done

Theme and background

To apply a new theme or wallpaper:

1. Right-click anywhere on the desktop and click personalize.
2. Click desktop background at the bottom of the window.
3. When the next window opens, select one of windows' built-in backgrounds from the list.
4. Click save changes.

Common terms used in file management

- **A file** is a collection of logically related records. Or it is an object on a computer that stores data, information, settings, or commands used with a computer program.
- **Folder**-this is a virtual container in a computer's file system in which groups of files and other folders are kept and organized. Or it's a virtual storage area of a file, etc. on a computer
- **File name .**this is a name by which a file is identified .e.g. For **ICTseminar.doc. ICT** seminar is the file name. File names have some invalid characters e.g. / \ : ? " <
- **Icons:** these are small graphic images or pictures that represent a file, program, web page, or a command.
- **Desktop:** this is the first computer screen display before anything opened.
- **File extension.** It's a group of letters that occur after a period after the file name indicating the format of the file

Question: Outline some of the rules followed when naming files

Common System Utilities

A *utility* is system software designed to enhance the working conditions and functionality of a computer. They include:

- **Sorting utility -** arranges data as specified by the user in either ascending or descending order
- **Merging utility** - allows data from many files to be combined into one file
- **Backup utility** - creates copies of data and files away from the computer's memory to safeguard it from loss if accidentally deleted or when the system crashes. These files can be restored whenever desired.

- **Disk compression utility -** reduces compresses or uncompressed the size of files or contents of a disk to increase its capacity.
- **Data or file compression utility -**that can output a smaller file when provided with a stream of file
- **Registry cleaners** - cleans and optimizes the windows registry by removing old registry keys that are no longer in use
- **Network utilities** - analyses computer's network connectivity, configures network settings, checks for data transfer or log events
- **Disk cleaners -** checks for and finds out files that are unnecessary to the computers operation and those that take up much memory space and delete them
- **Disk checkers -** scans and checks the contents of a hard disk and other storage devices and displays the used and unused space
- **Uninstaller -** removes computer application software and its associated entries within the file system
- **Memory testers -** checks for memory failures
- **Diagnostic utility** - compiles technical information about the computer hardware and certain systems software programs and then, prepares a report outlining any discovered problems.
- **Disk defragmenter utility -** re-organizes files, used and unused space on the disk. They increase efficiency by moving data to one side of the disk.
- **Disk partitions -** an individual storage disk drive into multiple logical drives
- **Disk space analyzers -** the size of each folder, sub-folder and files in the folders or drive, showing the distribution of used space
- **Archive utilities** - output a stream of a single file when provided with a directory of a set of files. Archie utilities unlike archive suites usually do not include compression or encryption capabilities.
- **File managers -** provide a convenient method of performing routine data management tasks such as deleting, renaming, cataloging, un cataloging, moving, copying, merging etc.
- **Cryptographic utilities -** out encryption and decryption of streams and files to improve their security
- **Hex editors -** directly modify the text or data in or of a file
- **System monitors -** for monitoring resources and performance in a computer system
- **System profilers** - provide detailed information about installed software and hardware
- **Search utility:** used to locate a file or folder by name located on any of your hard drives in less than a second.
- **File compression utility:** reduces the amount of space used by files stored on a drive.
- **Disk defragmenter: c**onsolidates scattered file fragments so that each file occupies a single, contiguous space on a hard drive.
- **Screen saver:** takes over screen and displays graphics after some period of inactivity.
- **Anti-virus**es a utility used to prevent, detect, scan and remove computer viruses from storage devices and memory.

Using search tools to locate files or folders

You can use the search box on the start menu to find files, folders, programs, and e-mail messages stored on your computer.

Compressing files

Really big files can be difficult to copy or share. Fortunately, windows lets you create compressed folders, which take big files and compress them in size (called a "zipped" file). After the file has been transferred, you can then uncompress / extract the file back to its original state.

To compress files or folders

1. Click the file(s) you want to compress.
2. Right-click the selected file(s) to display the pop-up menu
3. Select send to, compressed (zipped) folder
4. Windows creates a new zipped folder in this same folder that contains copies of the selected files.

Defragmenting a storage medium

If you notice that your system takes longer and longer to open and close files or run applications, it's probably because little fragments of files are spread all over your hard disk. You fix the problem by **putting all the pieces of the fragmented files back next to each other**—which is known as defragmenting your disk.

To defragment disks on windows

- Click the start button and select all programs, accessories, system tools, disk defragmenter.
- To manually defragment your hard drive, click defragment disk.
- To set up automatic disk defragmenting, click configure schedule.

NB: it takes time defragmenting your drive can take an hour or more, especially if you have a large hard drive or your drive is highly fragmented.

Using antivirus programs

Computer viruses can be even very damaging, causing data loss and malfunctioning of the computer. For that reason, you should install on your pc an antivirus program.

Examples of the antivirus programs include:

- AVG anti-virus free edition (free.avg.com)
- MacAfee virus scan plus (www.mcafee.com)

- Norton antivirus (www.symantec.com)
- Zone-alarm antivirus (www.zonealarm.com)
- Kaspersky
- Eset nod32. Etc.
- Avast
- Avira
- Bit defender
- F-secure
- Panda security

One of the more popular antivirus programs is AVG anti-virus free edition, download it from free.avg.com, and install it.

The Print Management

Printing refers to the process of producing softcopies of documents into hardcopy like a plain paper. When you're using a computer, you might want to keep a copy of what you can see on the screen. If you have a printer connected to your computer, or have access to a network printer, you can create a "hard copy" of your work

Selecting a printer

The two most common types are laser printers and inkjet printers. Laser printers work much like copy machines, applying toner (powdered ink) to paper by using a small laser. Inkjet printers shoot jets of ink onto the paper's surface to create the printed image.

Installing a printer

There are several ways to connect a printer to your pc. Which option you choose depends on the device itself, and whether you're at home or at the office.
Always consult the information that came with your model for specific instructions.

Local printers:

The most common way to install a printer is to connect it directly to your computer. This is known as a local printer. If your printer is a universal serial bus (USB) model, windows should automatically detect and install it when you plug it in. If it's an older model that connects using the serial or parallel port, you might have to install it manually. You need to install print drivers which are usually downloadable form the printer manufacturer's website.

Network printers:

In the workplace, many printers are network printers. These connect directly to a network as a stand-alone device.

To select a default printer

If you regularly use multiple printers, you can pick one as your default printer. Windows and other programs will then automatically use that printer whenever you print.

1. Click to open devices and printers on the start menu.
2. Right-click the printer you want to use, and then click set as default printer. (You'll see a check mark on the printer's icon signifying that it's ready and now your default printer.)

Tip: a default printer doesn't have to be an actual physical device. Depending on your computer, you might have the option to send documents as faxes, or to save them as pdf or xps files when you print.

View, pause, or cancel a print job

Once your document or photo has started to print, you can pause or cancel it via the print queue or print spool.

The print queue shows you what's printing or waiting to print. It also displays handy information such as job status, who's printing what, and how many unprinted pages remain.

- Click to open devices and printers from the start menu.
- Select your printer's icon and then click see what's printing on the command bar. The print queue uses the FIFO principle (first in first out)

Modes of printing

- **Multiple page printing**: this is when the user prints more than one page of the same document on a single sheet of paper
- **Multiple copies printing**: this is where the user prints more than one copy of the same document.
- **Handout printing**: this is where multiple slides are printed on one page
- **Slide printing**: this is the mode of printing where a single slide is printed and covers the whole page

3

COMPUTER LABORATORY CARE AND MAINTENANCE

Computer Literacy

It is the ability to use computers and related technology efficiently.

It's the level of familiarity with the basic ICT concepts that allows one to easily use personal computers.

Basic computer literacy skills

- Turning on the computer and logging in
- Opening and creating folders and files
- Working with basic application packages such as word processors, spreadsheets
- Browser basics (Internet and email)
- Basic hardware terminology knowledge
- Caring and maintaining computers and labs
- Virus and security awareness.
- Basic trouble shooting skills
- Basic hardware and software installation

Advantages of computer literacy

- Profitable skills: computer skills such as word processing can aid one to make money
- Leadership and promotions: computer literacy skills may get one promoted to a higher position
- Work performance: knowing how to use a computer often allows users do work more efficient and timely.
- Communication: knowledge of how to access the Internet on a computer opens up possibilities to communicate with coworkers or supervisors.
- Being prepared for the future; computer technology is advancing faster, so if you are familiar well with computer skills now this will makes you ready for bright future
- Ability to use new media; traditional media like newspapers and television are being replaced by computer based media such as social media, and online blogs which require computer literacy skills to use.
- More job opportunities; since almost all workplaces use computers, the need for people having computer skills is really in great demand.

The Digital Divide

Digital divide is the inequality with regard to access to information and communication technologies (ICT). It is the lack of opportunities experienced by those with limited accessibility to technology, especially the Internet. It can be a result of having some societies one with very high levels of computer literacy and others lagging far behind.

How to promote computer literacy

- Through undertaking computer training courses
- Through attending workshops
- Through practical hands on
- Through reading computer related literature.
- Through carrying out research
- By use of resourceful tutorials that can be downloaded for the net

Limitations to computer literacy

- Computer phobia - people fear to use computers.
- Myths about using a computer e.g. you will kill your sight.
- Expensive hardware and software components
- Restricted to well to do people
- Some places lack connection to the power grid.
- High costs of Internet connection

Ways to improve computer literacy in your school

- Through undertaking computer training courses
- Through attending workshops
- Through practical hands on
- Through reading computer related literature.
- Through carrying out research.

System startup

- On start-up, the OS may verify that the person attempting to use the computer is a legitimate user through use of a password.
- After the user logs on, the desktop and icons are displayed on the screen.
- Finally, the operating system also executes programs in the startup folder, which contains a list of programs that open automatically when you boot the computer.
- Microsoft windows users can see each of the programs that startup each time their computer boots by using the **Msconfig** utility.
- The startup folder on windows OS contains a list of shortcuts of those applications that start when windows starts.

Working with Application Programs

An application is a computer program designed to help a user perform specific tasks on a computer. Common applications include word processors, spreadsheets, media players, games.

Options to start a computer program

1. Double-click shortcut icon on the desktop.
2. Click an item on the taskbar.
3. Choose start > all programs. Click the name on the all programs list that appears.
4. You can use the start menu's search feature to launch a program

Secure Laboratory Environment

A computer laboratory is a room that is specially designed and prepared to provide a safe and conducive environment for use and installation of computer systems

Factors to consider when preparing a computer laboratory

- Security of computers, programs and other resources
- Reliability of the power source.
- The number of computers to be installed and the available floor space.
- The maximum number of users the computer lab can accommodate.
- Strength of available furniture

Factors to consider when buying computers

- The need of the organization and the amount and type of data to handle
- System specifications such as hard disc and RAM size
- Cost of system components and their installation, development
- The source of system components and service
- Available space to accommodate the computers
- Areas of laboratory security to accommodate the computers
- Environmental concerns
- Available employee skills

Organizations, libraries, and schools running public computer labs face a variety of complex computer security challenges. These institutions take measures to ensure the safety of the equipment, software, data and users.

Physical security measures

- Burglar proofing avoid unauthorized access to computer room.
- Fit strong locks, doors, windows and roofing to avoid thefts
- Employ security guards to keep watch over data and information centers.
- Apply burglar proofing - reinforce weak access points like windows, doors, roofing with metal grills
- Set up alarms to alert you in case of break-ins.
- Use system locks (locked key systems) to restrict access internal components like hard disks
- Use cables to lock the equipment to desk, cabinet or floor.

- Electronic (biometric) locking mechanism with keys, swipe cards, finger print recognition.
- CCTV cameras to keep watch over computer systems and centers.
- Lock the lab with strong padlocks

Security cameras

Security cameras are used to deter theft and other crimes in computer labs and data centers.
Closed circuit television (CCTV) surveillance cameras are used to record video which can be viewed in the monitoring room and played back in case of any investigations.

Burglar proofing

- Burglar proofing provides protection against any forced physical entry into the computer laboratory.
- Burglar proofing involves fitting metal grills in windows and doors.
- Consider installing security alarms at strategic access points that would alert the security personnel in case of a break-in.
- Fit strong metallic grills and locks on doors, windows and strengthen the roof in case the roofing is weak.
- Use desktop locks, system unit enclosures and laptop locks

Electric power security

- Electric power security: place no more than two computers on each circuit. Do safe well insulated cabling.
- Keep the circuits for computer systems separate from all other equipment such as printers, copiers and coffee makers.
- Plug each computer into a surge protector or ups (un interruptible power supply unit)

Stable power supply

Protect computers from being damaged and data loss due to power instabilities by having:

- Power stabilizers maintain power at required voltages.
- A surge protector can be used to protect computer equipment against under voltage and over voltage.

UPS-uninterruptible power supply

- Computers need the time to shut down properly. Damage to devices and data can occur when there is sudden power loss or fluctuation.
- Ups, or uninterruptible power supply units, keep backup power for devices in the event of a failure or other electrical problems.

- A UPS is essentially a small battery that keeps the power supply on for long enough for you to switch off the computer safely when there is a sudden blackout.

Electric power security

- Properly insulate and lay power cables away from pathways in the room.
- Lay cables along the walls in trunks to prevent electric shock and power disconnections caused by stumbling on cables.
- Install lightening conductors on the lab to protect computers, users from lightning strikes
- Always install lightening conductors to the computer laboratory to protect the machines and the users of the computers.
- Minimize electrical noise in the computer environment. Electrical noise refers to externally radiated signals that cause undesirable additions to the current voltage

Electrical noise

Electrical noise is commonly generated by devices like fluorescent lights of high frequency, motors, battery, chargers, inverters, radios, television, and cell phones

First aid kits and toolkits

A **first aid kit** is a box or bag that contains the necessary items for providing care in case of any emergency in the lab such as shocks.
Tool kits are also necessary for keeping ICT repair and maintenance tools.

Fire extinguisher

Fire extinguishers are a critical component of saving property and lives in the case of a fire emergency. Owning a fire extinguisher is a form of ensuring safety. All computer rooms need it just in case a fire starts.
It can save our property from burning because the use of the device will help prevent it from spreading and can even stop the flame in no time
Have gaseous fire extinguishers like those filled with carbon dioxide. Water based or powder extinguishers should be avoided since they can cause damage to computer components

Heating, ventilation and air conditioning (HVAC)

- Air conditioning units monitor and maintain the temperature, air distribution and humidity in a computer room.
- An air conditioning unit is a device used for cooling and controlling the humidity and purity of the air circulating in a space.
- Have good air circulation in the computer room since users and computers emit heat energy.
- This is possible through having enough ventilation points like windows, installing an air conditioning system.

- Avoid overcrowding of machines and users.
- All the above prevent suffocation and overheating.
- Avoid direct sunlight and high temperatures that may damage hardware components.
- Ventilation should be good. Good aeration enables the computer to cool and hence avoids overheating
- Dump control: humidity must be regulated in the computer laboratory to remain at an optimum 50%.
- Low humidity may cause static electricity to build and damage sensitive components.
- High humidity of over 70% may cause rusting of the metallic parts of the computer system.

Dust control

- Blower: used to blow/remove dust that may have entered inside the computer.
- Dust and water proof covers protect computers from moisture, water and liquids.
- When setting up the computer laboratory, consider a location away from excessive dust.
- The room should have special curtains and computers should remain covered using dust covers when not in use

Antiglare filter screens

- This is used to avoid eye strain and fatigue caused by over bright CRT monitor.
- Reduces electromagnetic rays from the CRT monitor.
- Radiation filter screens should be fitted to reduce the light that reaches the eye
- They reduce the effect of light rays emitted from monitors.

Woolen carpet

- Absorbs dust in the lab.
- Reduces effects on damage when light objects fall.
- Minimizes effects of electric shocks.
- Absorbs electrical radiations from computer devices.

Software security measures

- Computers should have updated antivirus software installed to prevent malware.
- Remote administration software should be considered with high number of computers in a computer center.
- Computer management software to monitor and limit web browsing should be installed for.
- Group policy or security software to prevent malicious software from being executed and installed.
- Assigning unique authorized log-in for authentication before granting network access

Software update and upgrade

- **Software update** provides bug fixes and minor software improvements and is made available by download. While
- **Software upgrade** is the replacement of a product with a newer version of the same product.

Ways computers can be damaged in a laboratory

- Defacing computers by use of sharp objects.
- Eating and drinking in the lab.
- Placing computers on non-flat surfaces.
- Using un-grounded power sources.
- Opening a computer when it is running.
- Moving the computer while it is running.
- Working with a computer in a dusty environment.

Measures to protect users

- Having all cables insulated to avoid electric shock
- Having the room well ventilated and installing air conditioners.
- Having enough space in the lab for movement.
- Avoiding over-crowding.
- Using comfortable and standard furniture to avoid poor posture.
- Using LCD monitors other than CRT monitors or
- Providing antiglare screens and adjustable screens to avoid eye strain brought by over bright light from the monitor screen.
- Cables should be laid away from users' paths to avoid users falling while passing through.

Measures to protect the computers

- Burglar proofing the room.(fitting grills on doors, windows and having a roof)
- Installing the intrusion detection system (ids)
- Employing security guards.
- Installing fire prevention and control equipment. (fire extinguishers)
- Having stable power supply. (surge protectors, standby generator, uninterruptible power supply)
- Installing lightening arrestors
- Insulating all power sockets.
- Follow the computer lab rules and regulations.
- Dust and dump proofing. (cleaning the computers daily, air conditioning systems, fitting curtains into windows

Importance of servicing and maintaining a computer

- To ensure that the computer works continuously
- To ensure performance and efficiency of a computer.

- To take out dust that can spoil the internal parts of the computer
- In order to upgrade and update the computer.
- To reduce the costs of long run replacement and repairs.
- To prevent the computer from viruses and malware.

Activities involved in servicing and maintenance of computers

- Repairing and replacing damaged parts.
- Upgrading software.
- Installing power guards/surge protectors.
- Scanning devices before use
- Disk cleaning
- Emptying recycle bin
- Firewall activation
- Disk defragmentation
- Upgrading software
- Blowing dust off
- Installing software
- Covering computers with dust or water proof jackets.

Tools needed to service and maintain a computer

- Needle-nose pliers
- Blower
- Crimping tool
- Screw drivers
- Wire cutters
- Tweezers

Computer Performance

Computer performance can refer to the amount of productive work a computer can produce in relation to the resources it is given. It is usually gauged by its processing speed, efficiency and productivity.

The following are the reasons why a computer may slow down and possible solutions

Reason	**Solution**
Insufficient memory (ram)	Add more memory
Bad hard drive (disk errors creating delays)	• Perform a test and repair • Replace the hard drive
Low performance CPU	Replace the CPU with another improved and faster CPU
Overheating due to failed fan Excessive dust blocking the heat sink	Clean the accumulated dust using compressed air
Memory leak(software bug causes to use a lot of ram)	• Upgrade the software causing excessive memory usage. • Restart the computer more frequently
Wrong video driver making the display slow	Upgrade the video drivers

Low performance wireless connection due to distant antenna with weak signal	Upgrade the wireless router.
Viruses and spyware stealing memory and processor management.	Use scanning tools to identify and remove extraneous software.
Low performance hard disk	Replace hard disk with a faster one

System Configuration

This is the process of setting up of hardware and assigning them resources so that they work together without problems.

System Specifications

This is a structured collection of information that brings together the requirements of a system

System specifications

- Processor: Intel core 2 duo processor (CPU speed 3ghz)
- Operating system: windows 7, 8, Mac
- Memory: 2gb, 800mhz
- Boot hard drive: 160gb
- Video card:
- Optical storage device: DVD +/- RW
- Monitor: led 17”
- Wireless: LAN (802.11n)
- Battery: 9-cell lithium ion battery

How do you check for a computer’s specifications?

1. Go to the start menu, find the icon for “my computer”,
2. Right click on the “my computer” icon, and choose properties
3. Click the “general” tab
4. The system displays the operating system installed on the computer at the top.
5. At the computer section: it displays the computer name, speed, computer memory,
6. To see the hard drive capacity, go to start button and double click on “my computer” icon

Software Installation

This refers to the act of making a program ready for execution.
An installer is a computer that loads files, such as drivers, applications, and other software onto the computer

Uninstalling a Program

Uninstalling is the process of removing from the computer

Steps followed to uninstall a program

1. Go to the start button
2. Open the control panel
3. Click on the word uninstall under programs.
4. When all the installed programs display,
5. Click on the program you want to remove then click on uninstall at the top.

Requirements to install an operating system (Windows)

- A computer
- A CD, DVD or flash disk with the OS
- Knowledge about installation
- Enough space on the bootable device (HDD)
- Stable power source.

Troubleshooting

Troubleshooting is the process of identifying a problem in the software or hardware component, assessing possible causes and finding possible solutions to the problem.

Or

Identifying and solving problems in computer systems

How do you troubleshoot a computer that cannot start?

- Restart the computer
- Check the cables.
- Check the power source
- Disconnect peripheral devices.
- Check the devices for proper connection.
- Listen to unusual sounds.

Safe Use of the Computer Laboratory

- Always sit upright: to avoid muscle pains and back aches caused by poor sitting posture.
- A computer room should have enough light avoid eyestrain, and headaches.
- Standard furniture: have standard furniture so that the tables are wide enough and strong to bear the weight of the computers and accommodate all peripherals.
- The seat for the user must be comfortable and have a straight backrest that allows someone to sit upright.

General Lab Rules and Regulations

- Avoid smoke and dust that can damage computer components, wearing of moving parts.
- Keep food and drinks away from the lab. Their contact with computers may cause rusting or electrical faults.
- Avoid unnecessary movements in the lab. You may knock down peripherals or get shocked.
- Follow the right procedure to start and shut down a computer. Abrupt switching on and off the computer may damage the computer
- Do not open up computers or peripherals without permission and when power is still on.
- Any repairs to the computer should be done by a trained person
- Switch off the computer before connecting peripherals
- regularly service and keep a regular record of computer servicing and repair
- Never use a computer during a storm.
- Avoid dropping hardware to the ground. This could break or damage components.
- Be careful when using the Internet. Do not accept downloads from websites that you don't know and trust.
- And never open an email attachment unless you know and trust the person who sent it.
- Avoid making hardware connections to the motherboard when the computer is on. E.g. keyboard, monitor and mouse connections.
- Don’t bring magnetic devices to the lab. The computer has magnetic disks which can be spoilt if they come near other magnetic fields.
- Handle delicate storage devices with care. Don’t touch the inner surface of compact disks and floppy disks. Safely remove flash disks from the system.
- Avoid excessively bright and flickering computer monitors. The brightness of the computer monitors should be adjusted to avoid eye strain.

Servicing and Maintenance of Computer Systems

Computer servicing is the routine inspection of to prevent it from breaking down. Servicing involves software update, software upgrade, cleaning, system fine-tuning, etc..

Computer maintenance refers to the practice of keeping computers in a good state of repair.
Computer repair is the process of identifying and resolving faults in a computer system
System fine-tuning refers to making adjustments to the computer system to obtain maximum performance. It involves adjusting system settings such as BIOS and CMOS settings to improve CPU speed, increasing operating system speed, defragmenting disks and closing idle background applications.

Software update is the process of installing the latest update in a software package
Software upgrading refers to replacing a software package with a newer and improved version

Measures to maintain computers in good working conditions:

- Regularly servicing hardware and software updates to ensure proper working conditions of the computers.
- Regularly do special cleaning for hardware parts such as the mouse and keyboard to perform correctly.
- Always use optimizer utilities that modify programs to make computers to improve performance and make them to run more quickly
- Always use updated antivirus software. Viruses can crash a computer system and cause damage.
- Avoid installation marathons (installing many new programs at the same time). Sometimes, installing new software can cause conflicts within the system.
- It is therefore advisable to use the computer long enough to see how your system responds to the installation before installing the next program.
- Carry out disk defragmentation when necessary.
- **Disk defragmentation** is the process in which scattered pieces of individual files and free space are reorganized and stored in an adjacent manner (next to each other) on the disk.
- Defragmentation consolidates fragmented files which makes it easy to access and process them

4

COMPUTER WORD PROCESSING

Introduction to Word Processors

Word processing refers to the process of creating a word document. It involves typing, editing, formatting and printing of text document using a word processor.

A word processor is a computer program that can be used to create, edit, format, store and print a document that contains text and graphics.

Common examples of word processors include: Microsoft Word, Corel WordPerfect, Lotus WordPro, Apple Pages, OpenOffice.org Writer, etc. Kword, Lyx, Libreoffice writer, Text maker, Kingsoft writer, Word pad, WPS office, Quick office.

Word processors are mostly used for writing letters, reports, projects, books, essays, memos, resumes (CVs), Mailings, Labels, Certificates, Brochures, Calendars, Stories, simple calculations

Text editors are simple word processors that are generally used to type without any special formatting. Text editors are mainly used to create small notes, memos and programs.

Examples of common text editors are**:** Notepad, Notepad++, Gedit, etc.

Types of Word Processors

There are two types of word processors but the most common two are

- Manual word processors for example, Type Writers
- Electronic Word Processors – for example, MS Word, Lotus WordPerfect.

Functions of the word processing software

- Editing and proofreading documents
- Formatting documents
- Saving documents for future use
- Printing hardcopies of documents

Common Terms used in Word Processing

1. **Typeface or font type** is the shape of the characters such as Times New Roman, Arial, and Tahoma.
2. **Line spacing** refers to the amount of space between two lines of text, measured in points.
3. **Text alignment** refers to the way text is arranged relative to the margins i.e. in
   - **Left alignment**, text is arranged to the left margin of a document page
   - **Centre alignment**, text is arranged in the center of a document page
   - **Right alignment**, text is arranged to the right margin of a document page
   - **Justification**, text is arranged to both the left and right margins at the same time.

4. **Indent** is the amount of white space set between the margin and the beginning of text. Indents can be: The first line indent, Hanging indent and or Right indent.

5. **Formatting text** is the process of changing the appearance of text in a document. It involves bolding, italics, underlining, changing font color, etc.

6. **Editing text** refers to making changes in the content of an existing document. It involves cutting, pasting, overtype, undo, insert, and deleting.

7. **Copy** makes a copy of the selected text to the clipboard, does not move it from its original position.

8. **Cut** moves the selected text from its original position and to the clipboard. **Note: Copy and paste** duplicates the text, while **Cut and paste** moves the text to a new position.

9. **The clipboard** is an area of memory where copied or cut text or items are temporarily held before being pasted

10. **Paste special** helps avoid pasting the text with all its formatting. The paste special feature provides more control over what to paste.
11. **Format painter** copies formatting effects to the selected text

12. **Header** refers to the text that appears in the top margin of all pages in a document
13. **Footer** refers to text that appears in the bottom margin of all pages in a document
14. **Ruler** is used to set the indent, margin and tab markers.
15. **Tabs Stops** are places where text can be made to line up. Click the ruler bar at the desired position.
16. **Hardcopy** is a printed copy of a document
17. **Soft Copy** is a non-printed copy of a document
18. **Overtype** or **overwrite** mode causes any typed characters to replace the characters at the cursor

19. **Paragraph** is the text between one paragraph break and the next. A paragraph break is inserted by pressing the Enter key.
20. **Saving** This is to write the document's current state from RAM to a storage device.

21. **Proofreading** is reviewing a document to ensure its accuracy. Proof reading features include Spelling and Grammar Check (F7), Thesaurus, etc.

Features of a Word Processor

1. **Word Wrap** automatically breaks the text to the next line without pressing the enter key
2. **Text wrap** is a facility that allows text to surround embedded features such as pictures, tables, etc.
3. **Find** is a feature that allows the user to locate all occurrences of a particular character, word or phrase.
4. **Replace** allows the user to substitute existing characters, words or phrases with the new ones.
5. **Spell checker** checks spellings in the entire document once
6. **Autocorrect** corrects spellings of individual words as they are typed
7. **Grammar checker** reports grammatical errors and suggests ways to correct them. Grammatical errors are usually marked by a wavy green line
8. **Thesaurus** suggests alternative words with the same meaning for use in the document
9. **Mail Merge** is a feature used to create similar documents such as letters to be sent to several people
10. **Page numbering** numbers the pages automatically in a document
11. **Tables** allow users to organize information in form of rows and columns
12. **Columns** This arranges text into two or more columns
13. **Drop cap** formats the first letter in paragraph to be dropped across two or more lines
14. **Clipart** refers to pre-made images about various subjects used to illustrate concepts in documents
15. **Templates** establish the initial document layouts and formats for various document types
16. **Printing** refers to converting soft copy to hard copies
17. **Word Count** establishes the number of words, characters, paragraphs, etc. used in a document
18. **Footnotes** are used to comment on or provide specific reference for text in a document. It appears at the bottom of text on a page
19. **Endnotes** are used as references that provide additional information about a word or phrase within a document. It appears at the end of a page
20. **Insert** and **Delete** allows a user to add and remove portions of text while editing document
21. **Page orientation** is the layout in which a page is arranged for normal viewing. it can be:
    - **Portrait** is the layout of a page in which the height of a page is greater than the width

- **Landscape** is the layout of a page where the width is greater than the height

22. **Paragraph spacing** determines the amount of space between paragraphs
23. **Document views**. These include;
    - **Normal view** which shows formatting such as; line spacing, font, point size, italics, etc.
    - **Web layout view** enables user to view the document as it would appear in a browser**.**
    - **Print layout view** shows the document as it will look when printed.
    - **Reading layout** displays the screen for easy more comfortable reading of the document
    - **Outline view** displays the document in an outline form

24. **Blocking or highlighting text** refers to selecting text to make it ready for modification
25. **Sorting** is the arranging a list of text paragraphs, lines, words, etc.
26. **Superscript** is a feature that places text above another e.g. X^2
27. **Subscript** is a feature that places text below another e.g. X_2
28. **Borders and shadings** helps to enclose text or objects in a frame or boarders
29. **Page breaks** are is used to terminate a page prematurely
30. **Gutter margin** is a feature that adds extra space to the side or top margin to ensure text is not hidden by the binding.

31. **Page margins** are the blank spaces around the edges of the page.
32. **Print preview** is a feature in that enables users to view the document the way it would look when printed.
33. **Clip art gallery:** allows a user to insert drawings, diagrams, and photographs into a document.
34. **Mathematical formulae typesetting:** allows a user to typeset complex mathematical formulae within the program.
35. Indices of keywords and their page numbers;
36. Tables of contents with section titles and their page numbers;
37. Tables of figures with caption titles and their page numbers;
38. Cross-referencing with section or page numbers;
39. Footnote numbering;

Common Parts of a Word Processor

1. **Title bar** displays the task currently running. it also has the minimize, restore or minimize and close buttons
2. **Menu bar** has a group of commands that are used to manipulate the document
3. **Tool bars** has buttons for quick execution of frequently used commands
4. **Document window** is the working area where the document is created
5. **Status bar** displays information such as current insertion pointer position, progress, pages, edit mode, etc.

Advantages over ordinary typewriter

- Easy and fast to make changes to the document than in typewriting
- It is possible to proofread the document and correct mistakes before printing
- Have many features to create documents that look professional and visually appealing.
- Documents can normally be previewed before being printed.
- Documents can be saved for future use and editing.
- Convenient to create form letters and mailing labels.
- Can be used to carry out simple calculations in a document.
- Ability to work with drawings and objects.

- Word processors can save softcopies for future use **while** with a type writer; a document has to be retyped if needed again.
- With a word processor, it is possible to undo a mistake, **while** any error made with a type writer is impacted on the printout.
- A type writer prints one character at a time **while** a word processor prints many pages at a time.
- Easier to add graphics, drawings in a word processor than to draw with a type writer.
- The user can type continuously **while** user needs to advance the lever of a typewriter manually, at the end of every line.
- It is simpler to align text in a document **while** with a type writer; one has to manually align the text, which is very difficult.
- A word processor has Copy, cut and Paste features and text can be copied to and pasted from the clipboard **while** a type writer has no clipboard.
- A word processor can work on many pages at a go by inserting pages numbers, footers, headers, watermarks, etc. **while** a type writer works on one page at a time.
- A type writer makes a lot of noise during its operation as **compared** to a word processor

Disadvantages of using electronic word processors

- It takes time to learn how to use the effectively.
- Not faster compared to pen and faster
- You need access to a computer with installed word processor.
- Very expensive to access compared to pen and paper.
- It is not easy to read long documents on the computer screen.
- Sometimes the printer may print not the exact copy on the screen.

- Word processors cannot be used without electricity.
- Word processors Use is Expensive due to the cost of computers.
- They have led to Unemployment of typists because one person using a word processor can do a lot of work in a short time, which would be done by many using type writers.

- Many people are computer illiterate, and cannot use the program.
- Computers have Viruses, which lead to loss of data in soft copies.
- Using word processors on light emitting computer monitors for long leads to eye disorders, which isn't the case with type writers
- Word processors require additional hard ware like printers in order to obtain hard copies yet with typewriters, whatever is typed is permanent and instantly available as a hard copy: there is no delay for printing or risk of unintended file deletion.

Commonly used Word Processing keyboard shortcuts

The following among many others are some of the common word processing keyboard shortcuts that provide quick access to the usage of it.

Ctrl-Shift-<or>	Increase/ Reduce Font	Ctrl-O	Open a document
Ctrl-Enter	Breaks the page	Ctrl-P	Print
Ctrl-F	Find	Ctrl-R	Align—Right
Ctrl-F10	Maximize window	Ctrl-S	Save
Ctrl-F4	Close	Ctrl-Shift-C	Copy formatting
Ctrl-F5	restores a window	Ctrl-Shift-D	Double Underline
Ctrl-H	Replace	Ctrl-Shift-W	Underline words only
Ctrl-	Italics	Ctrl-U	Underline
Ctrl-J	Justify—Full	Ctrl-V	Paste
Ctrl-K	Hyperlink	Ctrl-W	Close
Ctrl-L	Align—Left	Ctrl-X	Cut
Ctrl-N	New document	Ctrl-A	selects entire text
		Ctrl-B	bolds selected text
		Ctrl-C	copies selected text
		Ctrl-D	
		Ctrl-Y	Redoes an action

5

COMPUTER HARDWARE

Computer hardware refers to the physical or tangible components or parts of a computer that you can touch, see or pickup.

Computer hardware components are categorized basing on their uses into four categories: **input, processing, output** or **storage** devices

INPUT DEVICES

An **input device** is any hardware component that aids users to enter data and instructions into a computer in a form that it can use.

Different types of data are entered into a computer using a special input device thus input devices can be grouped into the following:

- Text input devices
- Pointing devices
- Imaging devices
- Gaming devices and controllers
- Audio and voice input devices
- Biometric input devices and
- Other specialized input devices

a) Text input devices

Text input devices are those used to enter data and instructions in form of characters, numbers and symbols. The common text input device is the computer keyboard.

The computer keyboard

It has keys that users press to enter data and instructions into a computer. It is the primary input device for most computers. A standard model has between 102 – 105 keys.

Keyboard exists in different forms and types such as on-screen, wireless, corded, virtual, ergonomic, mini keyboards ad keypads.

Advantages of using keyboards

- They are common, commonly supplied with computers
- Entering data and commands with a keyboard is faster
- Keyboards are more reliable
- They are relatively cheap

Demerits of keyboard

- It takes a lot of time to practice in order to type quickly
- Keys can easily become faulty due to dust.
- Constant use of keyboards may cause finger injuries

b) Pointing devices

A **pointing device** is an input device that allows a user to move a pointer and make selections on the computer screen. Common pointing devices are described below:

The mouse

It is a hand held pointing device that aids the user to point to and make select item on the computer screen. Mice exist in different forms and types i.e. optical, laser, mechanical, optical mechanical and air mouse.

A *Mechanical mouse* uses sensors that detect the direction of a rubber or metallic ball on its underside that can roll in all directions.

An *optical mouse* uses devices that emit light to detect the mouse's movement. It is much more expensive than a mechanical modal.

A *laser mouse* uses a laser to detect the movement of the pointer

An *air mouse* is a newer model that allows the user to control objects, control media players or slide shows by moving it in predetermined directions in the air. For example raising the mouse might increase the volume of a media player.

A *wireless mouse* runs on a battery. When the user moves the mouse, it sends an infrared beam to a sensor which moves the pointer to.

Advantages of using a mouse

- It moves the pointer faster than using keystrokes
- A mouse is user-friendly for computer beginners.
- It is easy, convenient to use with a graphical user interface.

Disadvantages of using a mouse include

- It is not easy and convenient to input text
- Issuing commands using a mouse is slower
- It needs some practice to use it properly
- A mouse is not accurate enough for drawings
- A mouse usually requires a flat surface to operate
- A mouse needs more desk space to operate
- Requires moving hand from keyboard to mouse and back
- Repeated motion can lead to **carpal tunnel syndrome**

Common terminology associated with the use of a mouse

1. **Clicking**: pressing and releasing the left hand button of the mouse once.
2. **Right clicking**: pressing and releasing the right mouse button once
3. **Double clicking**: pressing the left button in quick succession
4. **Dragging**: pointing at an item and then hold down the left button as you move the mouse.
5. **Scrolling**: navigating the window page up or down by moving the wheel like button.
6. **Dropping:** This refers to the release of the left button mouse after dragging an item.

Trackball

A trackball is a stationary pointing device with a ball on it top or side, that is rotated with a thumb or finger. It works like the mouse except that it remains stationary as the user roll the ball.

Touchpad

It is a small flat rectangular pointing device sensitive to pressure and motion. The user slides a finger on it to use it. This is the best substitute of a mouse and it is common on notebook or laptop computers.

Touch-sensitive pads

Works more like a touch screen but enable users to scroll through and play music. It contains keys or wheels operated with the finger or thumb.

Light pen

Light pen- is a light-sensitive device that is used with only CRT monitors. It allows the user to point to displayed objects, or draw on the screen, in a similar way to a touch screen but with greater positional accuracy.

Touch screens

A touch screen is a touch-sensitive input and display device. Users can interact with these devices by touching the surface of the screen it is common on smartphones, laptops, terminals, etc.

Track point

Also called a **pointing stick** – it is a pressure sensitive pointing device shaped like a pencil eraser, positioned between the G, H, and B keys on a keyboard. To move the pointer, the stick is pushed in the desired pointer direction.

Mouse

Track ball

Touchpad

Pointing stick

Touch screen

c) Pen input devices

Stylus pen

It is a small metal or plastic ink pen – like device that uses pressure instead of ink. It writes and draws on a flat device called the *Graphics tablet.*

Digital pen

Is slightly larger than a stylus and has more functionality such as an electronic eraser and programmable buttons. It also writes and draws on a Graphics tablet.

A graphics tablet

It is a flat, rectangular, electronic plastic board that users can use with a stylus or digital pen to write on or sketch from.

Stylus pen

Digital pen

Graphics tablet

d) Gaming devices or Game controllers

These are devices specifically designed to be used for playing computer and video games. They include the following:

Gaming keyboard

Gaming keyboards include programmable keys so that users can customize it to be used in a computer game. Some have small displays that show game statistics, such as time to targets remaining.

Gaming wheels

A gaming wheel is a steering wheel-like device that users turn to simulate driving a vehicle using programs on a computer. Most wheels have foot pedals for acceleration and braking actions.

Joystick

It is a handheld vertical lever mounted on a base. A user moves the lever in different directions and presses the buttons to control actions of a stimulated player or vehicle.

Gamepad

A gamepad controls the movement and actions of players or objects in video games or computer games.

Light gun
A light gun is used to shoot targets and moving objects after the user pull the trigger on the device.

Dance pad
A dance pad is a flat electronic device divided into panels that users press with their feet in response to instructions from a music video game.

Motion sensing game controllers
These allow the user to guide onscreen elements by moving a handheld input device in predetermined directions through the air. Examples include the power glove, play station movie gadgets, balance boards, golf clubs, baseball bats, music instruments, among others.

e) Voice recognition equipment

It converts spoken words to text. Computers with speech recognition are programmed to recognize a vocabulary of words. The common VRE is a microphone.

Advantages of using voice input devices

- No typing of data is necessary.
- Voice recognition can be used by people whose hands are disabled.
- Dictating text is faster than typing.
- Voice recognition systems are also ideal for the blind

Demerits of text input by speech recognition

- Error rate is high, depending on user's accent.
- Difficult to distinguish homophones like see and sea
- Speech recognition does cannot work in noisy environment
- The voice recognition software must be trained to recognize more words.
- Requires the user to speak in a writing style, i.e. Even pronouncing the marks such as comma.

f) Audio input devices

Audio input devices enter data into a computer in form of sound effects, music, and speech. The common audio input devices include MIDIs such as electronic keyboards, pianos, guitars, electronic drums, etc., Microphones, Tape recorders, Radio and TV receivers

g) Video input devices

These input data in form of full motion pictures and images and storing them on computer memory. Common video input devices are digital video cameras, web cameras – cameras that capture videos that display on webpage, camcorders, etc.

h) Scanning and reading devices

These devices capture data directly from source documents such as credit cards, cheques, forms, invoices, adverts, brochures, photos, etc. They include the following examples:

1. Optical readers

These are devices that use light to read characters, marks, codes, then converts them into digital data that the computer can process. These are *Optical Mark Recognition readers* and *Optical Character Recognition readers*

- **Optical Character Recognition (OMR) reader** reads type-written; computer- printed, or hand written characters from ordinary documents to a form a computer can process.

- **Optical Mark Recognition (OMR) device** read hand-drawn marks such as small circles or rectangles on preprinted forms.

  A person places these marks on a form, such as a test, survey, or questionnaire, answer sheet.

2. Barcode readers or Barcode scanners

It is an optical reader that uses laser beams to read barcodes that are printed on items usually in super markets.
A *bar code* is an identification code that consists of a set of vertical lines and spaces of different widths and other images. Barcodes represent some data that identifies the item such as price and the manufacturer.

OCR Reader

OMR Reader

MICR Reader

Barcode reader

Barcode

RFID reader

Magstrip reader

Handheld scanner

3. Magnetic Ink Character Reader (MICR)

It is used to read text printed with magnetized ink and converts it into a form that the computer can process. They are mainly used in banks to process cheques. A check is inserted into a MICR reader, which sends the check information to a computer for processing.

4. Radio Frequency Identification (RFID) readers

(RFID) is a technology that uses radio waves to transfer data from an electronic tag, attached to or in an object, through a reader to identify and track the object. RFID readers can work over a long distance.

An RFID tag can be affixed to cars, computer equipment, books, mobile phones, and person.

5. Magnetic strip card reader

It reads magnetic strips on Credit cards, bank ATM cards, SIM cards, and other similar cards. Exposure to a magnet or magnetic field can erase the information and contents of a card's magnetic strip.

i) Imaging devices

These are devices that input images such as still photos, motion pictures, graphics, video etc. into the computer for processing.

They include the following:

Image scanner

A scanner is a light-sensing input device that converts hardcopy documents, drawings, or pictures to an electronic version (softcopy), which can then be stored on a disk and processed.

Common types of scanners

- A **flatbed scanner** works like a copy machine except that it creates a file of the document rather than a paper copy.
- A **sheet feed scanner** has motorized rollers that can feed the source document across the scanning head during the scanning process.
- A **handheld scanner** is manually passed over the image to be scanned.

Digital camera

A digital camera allows users to take pictures and store them digitally instead of storing them on a traditional film. Digital cameras are replacing film ones that store images on micro films.

Flatbed scanner *Handheld scanner* *Digital camera* *Web camera*

j. Biometric input devices

A *biometric device* identifies and analyzes a human biological characteristic and translates it into a digital code that is stored or compared with a digital code stored in the computer. They include:

- **A Fingerprint scanner** - captures curves and indentations of a fingerprint. Some grocery and retail stores now use fingerprint readers as a means of payment, where the customer's fingerprint is linked to an account or credit card.

- **Face recognition systems** - captures a live face image and compares it with a stored image to determine if the person is a legitimate user. Some buildings use face-recognition systems to secure access to rooms.

- **Hand geometry system** - measures the shape and size of a person's hand using a hand geometry system. Some large companies use this system as time and attendance devices or as security devices. Day-care centers use this system to verify parents who pick up their children.

- **A signature verification system -** recognizes the shape of your handwritten signature, as well as the pressure exerted and the motion used to write the signature. Signature verification system uses a specialized pen and tablet.

- **Iris recognition system** - reads patterns in the iris of the eye. These patterns are as unique as a fingerprint. Iris recognition systems are used by government security organizations, the military and financial institutions that deal with highly sensitive data.

- Retinal scanners – scan patterns of the tiny blood vessels in the back of the retina in the eye.

Fingerprint scanner

Face recognition system

Hand geometry system

Signature verification system

j) Terminals

These are computer devices that allow users to send data to or receive information from a host computer. These include:

(i) **Electronic Point Of Sale (EPOS)** – a machine from where customers can pay for goods or services from. It records purchases, processes credit or debit cards and updates inventory. They are commonly used in super markets and large shopping halls.

(ii) **Automatic Teller Machines (ATM)** – a self-service machine from where bank customers can withdraw cash, deposit money, transfer funds, or inquire about their account balances. The user inserts a

bank card into the machine. The machine prints a receipt when transactions are over.

Automatic teller machine (ATM)

Electronic point of sale (EPOS)

k) Other specialized input devices

There are many other special input devices that are used for doing special customized tasks such as:

- **Remote controllers -** devices that emit a beam of infrared light, which carries data signals, commonly used with TVs and modern laptops.

- **Sensors -** Various sensors can be used to measure heat, light, pressure, acidity, oxygen concentration, water flow, metals, alcohol, etc.

THE SYSTEM UNIT AND PROCESSING DEVICES

The **system unit** is a case that contains electronic components of the computer that process and store data. It protects the internal components of a computer and houses **ports** from where external **(peripheral)** devices connect to the computer system.

In summary, the system unit
- Houses internal components of a computer
- Gives shape and appearance to the computer.
- Protects the internal components against damage
- Keeps the motherboard where internal components attach

Internal devices include the CPU or processor chip, memory, cooling and power supply system, expansion (adapter) cards and slots, buses, etc. All these attach to the **Motherboard** (system board).


System unit


RAN Chip


Motherboard


The microprocessor

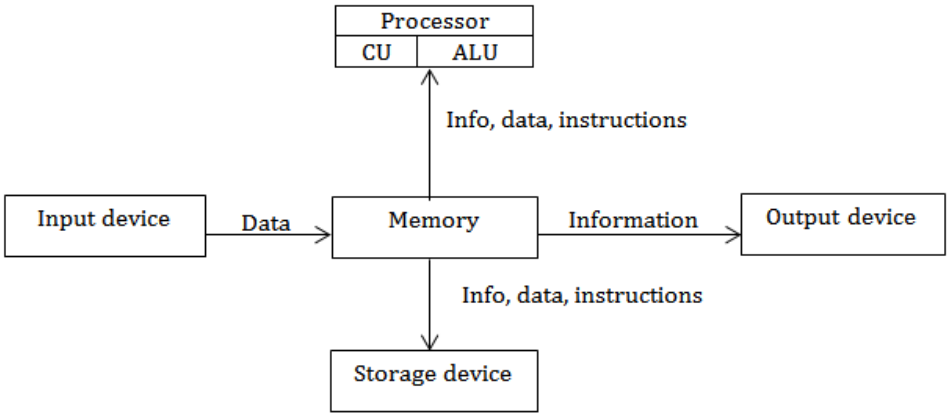

Internal hard disc

The **Motherboard** provides a path through which the processor communicates with internal and peripheral devices.

1. The Central Processing Unit – CPU

Also processor or microprocessor interprets and carries out the basic instructions that operate and manage computer operations. It is referred to as the 'brain' of the computer

The processor has three main components: Arithmetic and logic unit, control unit. System clock and registers that together, form the processing unit.



a) The control unit (CU)

The control unit directs and coordinates most of the operations in the computer. It interprets instructions from programs and then initiates action to carry out the instruction.

b) Arithmetic and Logic Unit (ALU)

The ALU performs the arithmetic, comparison, and logical operations in a computer. It performs the execution step of a machine cycle.

Arithmetic operations include addition, subtraction, multiplication, and division. While **logical operations** work with conditions and logical operators such as and, or, and not.

The machine cycle

For every instruction processed, the processing unit repeats a set of four basic steps called the **machine cycle**. The steps are: fetching, decoding, executing and storing.

(i) **Fetching -** The instruction to be executed is obtained from memory.
(ii) **Decoding -** The instruction is translated into commands the computer understand and execute
(iii) **Executing -** The commands are carried out
(iv) **Storing -** The results are stored in registers or memory

c) Registers

Registers are high-speed storage areas that temporarily hold instructions and data during processing. They work under the direction of the control unit to accept, hold, and transfer instruction or data at high speed.

Types of registers

- **Instruction register -** contains the instruction being executed**.**
- **Address register -** keeps track of where a given instruction or piece of data is stored in memory**.**
- **Storage register -** temporarily holds data from or about to be sent to memory.
- **The accumulator -** collects the result of computations.
- **General-purpose register -** used for several functions, as assigned by the CU.

d) The system clock

It is a small chip the CPU uses to control the timing of all computer operations. It generates electronic pulse or ticks at a fixed rate, which set the operating pace of components in the system unit.

Each tick is called a clock cycle, which affects machine cycle time. The faster the clock, the more instructions the CPU can execute per second.

Clock speed

This refers to the speed at which a processor executes instructions, measured in **Hertz**. A Hertz is one cycle or tick per second.

2. The power supply unit

The PSU converts the wall outlet ac power of 110 to 240V into dc power of 0.5 to 12 volts. a fan is built into the PSU to keep it cool. Processors generate heat, which could burn them up.

A heat sink is a small ceramic or metal component with fins on its surface that absorbs and disperses heat produced by electrical components such as a processor.

3. Buses

A **bus** is an electrical path that enables data flow between various system components. Buses allow various internal devices, peripherals to communicate with the processor.

All buses consist of two parts:.

- The **data bus** which transfers actual data bits and
- The **address bus** which transfers information about where the data should go in memory

4. Expansion slots and adapter cards

An **expansion slot** is a socket on the motherboard that can hold an adapter card.

An **adapter card** - also called expansion card, is a circuit board that increases the capabilities of the system, provides connections to peripherals.

A **peripheral device** is one that can be connected to and disconnected from a computer externally. When removed, the computer may keep operating such as mouse, keyboard.

Most peripheral are **plug and play**, work automatically with a computer when connected without physical configuration.

Some common adaptor cards are:

- **Sound card** – allows connection of sound input and output through external speakers microphones

- **Video graphics card –** connect display devices such as the monitor, projector
- **USB card –** connects to all USB devices such as external discs, keyboards, etc.
- **Disc controller –** connects disc drives for floppy, CD, DVD, blue ray discs.
- **Cable card –** allows viewing of digital cable TV channels
- **MIDI –** connects musical instruments
- **Modem –** connects a computer to a network through telephone lines

5. **Ports**

A port is the point at which a peripheral attaches to the system unit. Peripheral can send data to or receive information from the computer thru ports.

A peripheral device such as a keyboard, monitor, printer, mouse, digital camera, and microphone, often attaches by a cable to a port on the system unit using a connector.

Common ports on a computer

1. **A serial port** - connects a device to the system unit by transmitting data one bit at a time, usually used to connect devices that do not require fast data transmission rates, such as a mouse or keyboard.

2. **Personal system PS/2 port** - also *mouse port* connects a computer mouse or keyboard. Most computers come with two PS/2 ports.

3. **Parallel ports** - transmits several bits of data simultaneously. These ports provide the interface for devices such as high-speed printers.

4. **USB (Universal Serial Bus)** port - used in high-speed device interfaces. Most common today, can connect up to more than 127 devices.

5. **Bluetooth ports** - use radio waves to transmit data between two devices, without using cables, wireless.

6. **Video Graphics Array (VGA)** - used to connect a monitor or a data projector..

7. **Audio interface** - used to connect speakers and microphone.

RAM chips fitted in expansion slots

A port and connector

Ports attach to expansion card

8. **Fire wire** - has the same features as the USB but transmits data faster than USB. It is mostly used for streaming video from a digital video camera.

9. **Infrared** - also referred to as infrared data association (IRDA) is a wireless interface that uses infrared to connect to infrared-enabled devices.

Connectors

A connector joins a cable to a port. Most connectors are available in one of two genders: male and female.

- **Male connectors** have one or more exposed pins.
- **Female connectors** have matching holes to accept the pins on a male connector.

COMPUTER MEMORY (PRIMARY STORAGE)

Computer memory refers to the unit of the computer that stores data and instructions to be processed. For the CPU to process data, the data must first be copied into memory. It is the working storage area for instructions, data and information.

Memory is also known as *Primary* or *Internal Storage*.

Types of memory

The system unit contains two types of memory: volatile and non-volatile. The **volatile memory** loses its contents when the computer turns off, while contents of **nonvolatile memory** are not lost when power turns off.

RAM is the most common type of volatile memory and non-volatile memory chips include **ROM**, flash memory, and CMOS.

a) Random Access Memory (RAM)

RAM - also referred to the **Main memory** is the memory chips mounted on the motherboard that can be read or written to by the processor.

When the computer is turned on, system files are loaded from a storage device such as hard disk into RAM and remain there as long as the computer is running.

As additional programs and data are requested, they are read from storage into RAM for the processor. A computer only can process data that is in memory. **The more RAM a computer has, the faster the computer will respond.** RAM size in computers today ranges from 128MB, 512MB, and 1 GB, 64 GB to 164 GB.

Basic types of ram

- **Dynamic RAM (DRAM)** - must be refreshed (or recharged) constantly by the CPU

- **Static RAM (SRAM)** - is faster and more reliable than any form of dram. The term static refers to the fact that it does not have to be re-energized as often as dram.

- **Magneto resistive RAM (MRAM) -** stores data using magnetic charges instead of electrical charges. It is more powerful, consumes less power, cheaper and the fastest

- **Virtual RAM (VRAM) -** modern operating systems can use spare storage space on the hard disk as if it is working memory and this is referred to as virtual memory

b) Read-Only Memory (ROM)

ROM refers to memory chips that store permanent data and programs. Items stored in rom chips cannot be changed, hence the name read-only. It is nonvolatile. The contents of ROM often are recorded when the chip is manufactured.

Rom chips that contain permanently written data, instructions, or information are called **firmware**. Firmware can be read and used, but cannot be changed by user.

Basic types of ROM

a) Programmable Read-Only Memory (PROM) is a blank rom chip on which you can permanently place data and programs. Once data and instructions are programmed into PROM chip, it functions like a regular ROM and cannot be erased or changed.

b) Electrically Erasable Programmable Read-Only Memory (EEPROM) chip, allows a programmer to erase the microcode with an electric signal.

Differences between RAM and rom

RAM	**ROM**
a) Volatile, temporally	**a)** nonvolatile, permanent
b) Contents lost on power loss	**b)** Contents kept when power loss
c) Read and write	**c)** Read only
d) Can be increased	**d)** Cannot t be increased
e) Not installed at factory	**e)** Installed at factory

Memory cache

A cache is a relatively small block of very fast memory designed to speed up the internal transfer of data and software instructions. Cache speeds up processing time because it stores frequently used instructions and data.

Flash memory

Flash memory is a chip also that keeps its contents when the power shuts off. It can be erased electronically and reprogrammed. Most computers use flash memory to hold their startup instructions because it allows the computer easily to update its contents.

Complementary Metal-Oxide Semiconductor (CMOS)

CMOS chips use battery power to keep information even when the computer is off. Battery-backed CMOS memory chips, for example, can keep the calendar, date, and time current even when the computer is off.

SECONDARY STORAGE DEVICES

Secondary storage devices refer to the hardware devices that keep data and information permanent in the computer. They are non-volatile devices.

Categories of secondary storage media

There is a wide variety of storage devices in the following categories.

- Magnetic storage media

- Optical storage media
- Solid-state storage devices

a) Magnetic storage media

Magnetic storage devices store data using a combination of magnetic fields and binary data. They represent data as magnetic spots on tapes or discs. A magnetized spot represents a 1-bit and the absence of such a spot representing a 0-bit.

Common examples of magnetic media include: Magnetic tape, Floppy disc, Zip and jazz disc, Hard disc drive (HDD)

1. magnetic tape

Magnetic tape is a magnetically coated ribbon of plastic capable of storing large amounts of data and information at a low cost.

2. The hard disk

A hard disk is a principal mass storage medium in a computer system that stores data magnetically. It is made of stronger thick non-flexible disk material coated with magnetic materials and fixed permanently together with its drive mechanism inside the computer. Data is stored magnetically. Spinning at the required speed all the time it is very much faster to access than a floppy disk or CD-ROM (faster than 1 MB per second).
They can hold thousands of megabytes (gigabytes) of data. A hard disk is used for storing all programs and work files for very fast access by the computer.

Characteristics of hard disks

- They store mass volumes of programs and data thus increases the productivity of a computer
- They are faster in loading or retrieving data and programs than other forms of secondary storage.

1. Floppy disk (diskette)

A floppy disk, or diskette, is a portable, inexpensive storage medium that consists of a thin circular, flexible plastic disk with a magnetic costing enclosed in a square-shaped plastic shell.
A standard floppy disk is 3.5-inches wide and has storage capacities up to 1.44 mb. A floppy disk drive is a device that can read from and write to a floppy disk. Before you can write on a new disk, it must be formatted.

Formatting is the process of preparing a disk for reading and writing by organizing the disk into storage locations called tracks and sectors. It involves erasing and deleting all the data on the storage media

Care for diskettes

- Keep diskettes away from magnet fields, such as near wire telephones, loud speakers, and other appliances, which contain magnets.
- Do not keep heavy objects on top of the diskettes.
- Do not fold or bend diskettes.
- While labeling or writing on the diskettes use felt tip pen, not pencil or ballpoint pen.
- Do not expose the disk to excessive heat or light.
- Do not pull out the diskette from its drive when the drive light is still on.
- Do not use alcohol thinners, to clean the disk surface.
- Do not touch the disk surface.
- Do not bang, drop etc.
- Do not splash liquids e.g. water etc.
- Keep out of moisture

Advantages of floppy disks

- Floppy diskettes are portable
- Floppy diskettes are cheap
- Random data access on a diskette is possible
- A floppy diskette can be write- protected from being changed.

Disadvantages of floppy disks

- Floppy diskettes are not reliable – they need to be handled with a lot of care, else risk losing data.
- Floppy diskettes are not durable.
- Data access time is relatively slow.
- They have limited storage capacity (only 1.44mb)

2. Zip drive

The zip drive is a medium-capacity removable disk storage system with capacities of 100 mb to 750 mb that was introduced by iomega in late 1994. However it was never popular enough. Zip drives fell out of favor for mass portable storage during the early 2000s due to emergence of much better usb flash drives cds, and dvds.

3. The jazz drive

Similar the zip drive, the jazz drive was a removable disk storage system, introduced by the iomega company in 1995. The jazz disks were originally released with a 1 gb capacity. The rising popularity and decreasing price of cds and dvds greatly hurt the success of the jazz drive and the jazz line was ultimately discontinued in 2002.

4. Optical storage media

Optical storage refers to recording of data by making marks in a pattern that can be read back with the aid of light, usually a beam of laser light.
The reflected light is converted into a series of bits that the computer can process. An optical disc is a flat, round, portable storage medium made of metal, plastic, and lacquer that is written and read by a laser. Optical discs used in personal computers are 4.75 inches in diameter. Smaller computers and devices use mini discs that have a diameter of 3 inches or less.

Care for optical disks

The following should be done for the safety of data on optical disks:

- Do not expose the disc to excessive heat or sunlight
- Do not eat, smoke or drink near a disc.
- Do not stack disks.
- Do not touch the underside of the disk.
- Always store the disc in a jewel box when not in use
- Always hold a disc by its edges.
- Do not drop the disk to the ground.
- Don't bend the disk.

a) A compact disc (cd)

A compact disc (cd) is a flat, round, portable, storage medium that is usually 4.75 inches in diameter and less than one-twentieth of an inch thick.
Compact discs store items by using microscopic pits and land that are in the middle layer of the disc. A compact disc stores items in a single track, which is also divided into evenly sized sectors, that spirals from the center of the disc to the edge of the disc.

b) Picture cd

A picture cd is a compact disc that only contains digital photographic images saved in the jpg file format. You can purchase picture cds that already contain pictures. A picture cd is a multisession disc, which means you can write additional data to the disc at a later time.

c) Cd-r (compact disc-recordable)

Cd-r (compact disc-recordable) is a technology that allows you to write on a compact disc using your own computer's cd-r drive.

Once you have recorded the cd-r, you can read from it as many times as you desire. A cd-r is a multisession optical disc which allows you to write on part of the disc at one time and another part at a later time. However, you cannot erase the disc's contents.

d) Cd-rw (compact disc-rewritable)

A cd-rw (compact disc-rewritable) is an erasable multisession disc that you can write on multiple times. Reliability of the disc tends to drop, however, with each successive rewrite. To write on a cd-rw, you must have a cd-rw drive and cd-rw software. A cd-rw drive has a lower read and write speed as compared to cd-rs.

e) Magneto-optical (mo) disk

This is a hybrid disk, which combines the best features of magnetic and optical disk technologies. It has the erase and rewrite capabilities of magnetic disks, but it also has the very high-volume density capabilities of optical disks. Mo disks are not popular because they are too expensive, and not as reliable as magnetic media.

f) Dvd-rom

A dvd-rom (digital video disc-rom) is an extremely high capacity compact disc capable of storing from 4.7 gb to 17 gb. A dvd-rom drive or dvd player is required to read a dvd-rom. Although the size and shape of a dvd-rom and a cd-rom are similar, a dvd-rom uses one of the following three storage techniques to increase its storage capacity

The first technique involves making the disc denser by packing the pits closer together. A second technique involves using two layers of pits, which doubles the capacity of the disc. Finally, some dvd-roms are double-sided, which means that they can be removed and turned over to read the other side.

Advantages & disadvantages of cd

Advantages of compact disc over hard disk include

- A compact disc is more portable than a hard disk.
- Less prone to viruses than any other medium

Advantages of compact disc over floppy disk include

- The storage capacity of a compact disc is very much larger than that of a floppy disk.
- The average access time of a compact disc is faster than that of a floppy disk.

Disadvantages of compact disc include

- Some kinds of compact discs are read only (cd-rom and dvd-rom).
- The average access time of a compact disc is slower than that of a hard disk.

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g) High capacity dvd formats

A blu-ray discs-rom (bd-rom) has storage capacities of up to 300 gb. The hd (high-density) dvd-rom has storage capacities up to 60 gb. A mini-dvd that has grown in popularity is the umd (universal media disc), which can store up to 1.8 gb of games, movies, or music.

5. Solid-state storage media (sss)

Solid state storage (sss)/flash memory: is a type of computer storage media that is made from silicon microchips. Sss stores data electronically instead of magnetically. Flash memory stores the binary data of zeros and ones, but it does so with electrons that shuttle through the device's circuitry instead of magnetic poles on a disk. Because electrons store the data, the devices have no moving mechanical parts. This allows the drives to consume less power than traditional magnetic drives and to retrieve data faster.

a) Usb flash drive

A usb flash drive is a flash memory storage device that plugs in a usb port on a computer. Usb flash drives are convenient for mobile users because they are small and lightweight enough to be transported in a pocket. Current usb flash drives have data storage capacities ranging from 256 mb to 64 gb. Usb flash drives have become the mobile user's primary portable storage device, making the floppy disk nearly outdated.

b) Smart card

Smart card: contains a processing microchip to provide it with intelligence as well as memory it is really a tiny computer, eg. The SIM card used in a mobile phone identifies you through a pin number, identifies and connects to your service provider and provides a menu of options, as well as storing phone numbers and phone settings. A **smart card**, which is similar in size to a credit card or ATM card, stores data on a thin microprocessor embedded in the card. An **intelligent smart card** contains a CPU and has input, process, output and storage capabilities.

Applications of smart cards include

- Storing a prepaid dollar amount (e.g., a prepaid telephone calling card).
- Storing patient records and other health-care information.
- Tracking information of customers and employees.

c) Memory card/memory stick

Flash memory cards are a type of solid-state media, which means they consist entirely of electronic components and contain no moving parts. Common types of flash memory cards include; compactflash (cf), smartmedia, miscrosd, minisd, xd, picture card, etc. They are commonly used in electronic devices

such as digital cameras and mobile phones. They are tiny, re-recordable, and able to retain data without power. Depending on the device, manufacturers claim these storage media can last from 10 to 100 years.

Other types of storage media

a) Punched cards

A punched card, punch card, ibm card, or hollerith card is a piece of stiff paper that contains digital information represented by the presence or absence of holes in predefined positions. They were used through the 20th century in unit record machines for input, processing, and data storage. Early digital computers used punched cards, often prepared using keypunch machines, as the primary medium for input and storage of both computer programs and data.

b) Photographic film

Photographic film is a sheet of plastic such as polyester coated with a light sensitive emulsion that is used to record and store photographs. Normal film is shipped in small canisters (boxes) that protect it from the light. When exposed to light, it forms an invisible image. Chemical processes can then be applied to the film to create a visible image, in a process called film developing. A normal photographic film can hold up to 40 pictures.

c) Microfilm and microfiche

These are media used to store microscopic images of documents on roll or sheet film. The images are recorded onto the film using a device called a computer output microfilm recorder. The stored images are so small they can be read only with a microfilm or microfiche reader. Microfilm and microfiche have the longest life of any storage medium. Libraries use these media to store back issues of newspapers, magazines, and genealogy records.

d) Data logger

A remote input/output device, which stores data received from sensors that can then be input into a computer at another time or place. It can be left alone to collect data over a long period of time and in hostile places, such as on a satellite, at the bottom of the ocean or at the South Pole.

Common terms related to storage devices.

1. **A storage medium** is the physical material on which a computer keeps data. There is a variety of storage media available.
2. **Capacity** is the number of bytes (characters) a storage medium can hold.
3. **A storage device** reads and writes data to and from a storage medium.
4. **Reading** is the process in which a storage device transfers data, from a storage medium into memory.

5. **Writing** is the process in which a storage device transfers data from memory to a storage medium (saving).
6. **Access time**, is a measure of the amount of time it takes a storage device to locate an item on a storage medium.
7. **Transfer rate** is the speed with which data, instructions, and information move to and from a device. Transfer rates for storage are stated in kbps (kilobytes per second).

Units of Measuring Computer Storage Capacity

The smallest unit of measuring computer memory is a **binary digit** (bit). Binary digits are the numbers 1 and 0 which can be represented in a computer by switching voltage on and off.

Eight little bits make one byte. The storage capacity of computers (RAM and rom) and that of auxiliary storage units like disks are generally given in bytes. One byte stores approximately one character.

OUTPUT DEVICES

An **output device** is any hardware component that conveys information to the user. Different forms of information are given out to the user by aid of different special devices thus the following categories:

- Display devices
- Printing devices
- Audio output devices
- Other output devices

Display devices

Display devices are also referred to as the visual display unit (VDU)

A **display device** is an output device that visually conveys text, graphics, and video information often referred to as **softcopy**.

Commonly used display devices include:

- monitor
- Projector
- Headgear
- LED display

Monitors

Monitors display information in a visual form. The common types of monitors associated with computers are Liquid Crystal Display (LCD), Cathode Ray Tube (CRT) and Plasma monitors. LCDs and Plasma monitors are usually referred to as *flat panel display* units.

An LCD monitor

A CRT monitor

A Plasma monitor

Liquid Crystal Display (LCD)
It is a lightweight display device with a shallow depth and flat screen that typically uses a liquid crystal display technology to produce images.

Plasma Monitors
It is a lightweight display device with a shallow depth and flat screen that typically uses a gas plasma technology with a gas layer between to glasses to display information. They are more expensive than LCDs.

Flat panel display devices are common on laptops, mobile devices, desktops, etc. Many are widescreen, i.e. much wider than they are tall. Screens are measured diagonally from one corner to the other. Common sizes are 17", 19", 20", 22", 24" and 27", 45" and 65 inch screens

Advantages of flat panel display monitors

- They consume less electrical energy.
- They are portable in size, light, thin,
- They produce sharp and flicker-free images
- They are available in various sizes for selection
- Produce very bright images.

- The screens are perfectly flat.
- Produce little radiation energy that could affect eyes

Disadvantages of flat panel display monitors

- They are very expensive
- They have a limited viewing angle
- Have difficulty producing black and very dark grays.
- The bright end of the LCD intensity scale is easily overloaded.

- The internal gamma and gray-scale of an LCD is very irregular.
- Can have many weak or stuck pixels which are permanently on or off.
- LCDs have fixed resolution and aspect ratio

Factors the determine the quality of an LCD monitor

- Resolution – the number of horizontal and vertical pixels in a display. The higher the resolution, the smoother, sharper and clearer the image.
- Response time – the time in milliseconds it takes a pixel to turn on or off
- Monitor brightness
- Dot pitch – the distance between pixels in a display device.
- Contrast ratio

CRT monitors

A CRT monitor is a desktop screen that contains a large sealed glass cathode-ray tube. Inside the CRT, an electron beam moves back and forth across the back of the screen. This causes dots on the front of the screen to glow, producing an image on the screen. Each dot consists of a red, a green, and a blue phosphor, which combine to make up a pixel. **A pixel** is a single point in an electronic image.

Advantages of CRT monitors

- They are less expensive.
- They operate at any resolution, geometry and aspect ratio without the need of rescaling the image.
- CRTs run at the highest pixel resolutions generally available.
- Produce a very dark black and the highest contrast generally available.
- Produce the very best color and gray scale.
- Have fast response times and no motion artifacts
- Can also be viewed from a wide angle.
- They are very durable/lasts long

Disadvantages of CRT monitors

- They consume a lot of electric energy.
- Affected by magnetic fields from other equipment including other CRTs
- Have a rounded spherical or cylindrical shape
- Emit electric, magnetic and electromagnetic fields.
- They are large, heavy, and bulky.
- All color CRTs produce annoying moiré patterns.
- They are subject to geometric distortion and screen regulation problems.

- Produce a lot of heat.

Data projectors

A data projector takes the image that displays output on a computer screen and projects it onto a large screen or wall so audience can see it clearly. Presence of excess light affects data projectors and so they perform well in dark rooms.

Head mounted display (HMD) or Headgear
A headgear is made up of two tiny display and sound systems that channel images and sound from the source to the eyes and ears to create a 3-D sound effect in the virtual world.

Light Emitting Diodes (LED) Displays
A LED display is a flat panel display, which uses light-emitting diodes as a video display. A led panel may be a small display, or a component of a larger display. They are typically used outdoors in store signs and billboards.

Data projector

Printers

A printer is an output device that produces text and graphics on a physical medium such as paper. Printed information (hard copy) is in a more permanent form than a soft copy on a display device.

Printers with different speeds, features, quality, and capabilities are available in a range of prices.

Types of printers
Printers can be grouped into two types:
- Impact printers
- Non-impact printers.

1. Impact printers

An impact printer forms characters and graphics on a piece of paper by striking a mechanism against an ink ribbon that physically contacts the paper. Impact printers are noisy because of this striking activity.

They are ideal for printing multipart forms because the easily print through many layers of paper. Large businesses use impact printers because these printers can withstand dusty environments, vibrations, and extreme temperatures. Commonly used types of impact printers include daisy wheel, dot-matrix, braille and line printers.

Characteristics (features) of impact printers

- Very low consumable costs
- They are very noisy
- Useful for bulk printing due to low cost
- There is physical contact between the papers to produce an image.
- They are relatively very slow.
- They do not print transparencies
- Multiple carbon copies may be printed at once.
- Print quality is relatively low.

a) Daisywheel printer

In these printers, characters are arranged on the ends of the spokes of a wheel. The wheel (usually made of plastic) is rotated to select the character to print and then an electrically operated hammer bends the selected spoke forward slightly, squeezing in an ink ribbon between the character and the paper, as in a typewriter.

b) Dot-matrix printer

This produces printed images when tiny wire pins on a print head mechanism strike an inked ribbon like in a type writer. When the ribbon presses against the paper, it creates dots that form characters and graphics.

Most dot-matrix printers use continuous-form paper, in which thousands of sheets of paper are connected together end to end. The papers have holes along the sides to help feed the paper through the printer. Dot matrix printers provide cheap but low quality printing.

Advantages of dot matrix printers

- They are versatile
- Print letters in italics or bold
- Relatively inexpensive
- Used to print carbon copies.

Disadvantages of dot matrix printers

- Very noisy
- Slow speed
- Space consuming

c) Drum printer

An old line printer technology that used formed characters around a cylindrical drum as its printing mechanism. When the desired character for the selected position rotated around to the hammer line, the hummer hit the paper from behind and pushed it into the ribbon onto the character.

d) Braille printers

A braille printer, commonly known as a braille embosser, is an impact printer that renders text as tangible dot cells which are felt and read by the blind.
Using braille translation software, a document can be embossed with relative ease and efficiency. They need special braille paper which is thicker and more expensive than normal paper. Once a copy produced, printing further copies is often quicker by means of a device called a "thermoform", which produces copies on soft plastic

e) Line printers

A line printer is a high-speed impact printer that prints an entire line at a time. The speed of a line printer is measured by the number of lines per minute (LPM) it can print.

Some line printers print as many as 3,000 LPM. Mainframes, servers, or networked applications, such as manufacturing, distribution, or shipping, often use line printers.

2. Non-impact printers

A nonimpact printer forms characters and graphics on a piece of paper without actually striking the paper. Some spray ink, while others use

heat or pressure to create images. Commonly used nonimpact printers are ink-jet printers, laser printers, thermal printers, plotters, and mobile printers.

Advantages of non-impact –printers

- They print high quality images
- They are very speedy
- The printer does not make contact with the paper
- They print on most types of paper
- They can also print on transparencies.
- They do not make noise when printing.

a) Ink-jet printer

An ink-jet printer forms characters and graphics by spraying tiny drops of liquid ink onto a piece of paper. Ink-jet printers produce text and graphics in both black-and-white and color on a variety of paper types & sizes.

The print head mechanism in an ink-jet printer contains ink-filled print cartridges. Each cartridge has very many small ink holes, or nozzles. The ink propels through a combination of the holes to form a character or image on the paper.

The quality of inkjet printers depends on **resolution** – number of dots of ink per ink. Their printing speed is measured in **pages per minute**.

b) Laser printer

A laser printer is a high-speed, high quality non-impact printer. Operating in a manner similar to a copy machine, a laser printer creates images using a laser beam and powdered ink, called **toner**, which is packaged in a cartridge.

When printing a document, laser printers process and store the entire page before they actually print it. For this reason, laser printers sometimes are called **page printers**. Storing a page before printing requires the laser printer to have a certain amount of **inbuilt memory**.

c) Thermal printers

A thermal printer generates images by pushing electrically heated pins against a coated heat-sensitive paper. The coating turns black in the areas where it is heated, producing an image.

Basic thermal printers are cheap, but the print quality is low and the images tend to fade over time. Thermal printing technology is, however, ideal for use in small devices e.g. ATM receipt printers.

d) Plotters

Plotters are sophisticated printers used to produce large, high-quality, vector graphic drawings such as blueprints, maps, posters, circuit diagrams and signs.

These printers are usually very costly, and are used in specialized fields such as engineering, and graphic art. They use ink-jet printer technology, on a much larger scale, to print professional quality displays.

e) Large format printers

They are printers that create photo-realistic-quality color prints using inkjet technology. They are commonly used by graphic artists to produce high performance signs, posters, etc.

f) Mobile printers

A mobile printer is a small, lightweight, battery powered printer that allows a mobile user to print from a notebook computer, tablet pc, pda, smart phone or other personal mobile device while traveling. They fit easily in a briefcase alongside a notebook computer. Mobile printers mainly use ink-jet, thermal, wax-transfer, or dye-sublimation technology.

g) Photo printers

These are color printers that produce pictures. Most of these use an inkjet technology.

h) Multifunction peripheral (MFP)

A multifunction peripheral is a device that performs a variety of functions that would otherwise be carried out by separate peripheral devices.

As a rule, a multifunction peripheral includes at least two of printer, scanner, photocopier, fax machine.

Merits and demerits of MFPs

Advantages of a multifunction device are that

- It takes up less office space.
- It is significantly less expensive than if you purchased each device separately.
- The major disadvantage of the machine is that if it breaks down you lose all functions.

Factors to consider choosing a printer to buy

- The cost of the printer and its supplies, servicing
- The printing speed of the printer in pages per minute
- The type of printer – color on non-color
- The type and cost of paper it uses
- The nonuser of papers the printers tray can hold
- Compatibility with the computers ports and software
- Connectivity to a computer network
- Connection means – wireless or corded
- Ease of access of printer drivers and support help from the manufacturer

Terms associated with printers

1. **Toner** is a powder used in laser printers and photocopiers to form the printed text and images on the paper.

2. **DPI** (Dots per inch) is a measure of the number of individual dots printed in a line within the span of 1 inch (2.54 cm). The dpi value correlates with image resolution.

3. **Hard copy** is a printed permanent form of information

4. **Ink cartridge** is a container for the liquid ink that is deposited onto during printing of characters on a paper. Used mainly by inkjet printers.

5. **Toner cartridge** is a container for the liquid ink that is deposited onto during printing of characters on a paper. Used mainly by laser printers.

6. **Page orientation** is the way in which a rectangular page is focused on for normal viewing. The two most common types of orientation are portrait and landscape.

   A page in portrait orientation is taller than it is wide, with information printed across the shorter width of the paper.

   A page in landscape orientation is wider than it is tall, with information printed across the widest part of the paper.

Audio output devices

Audio output devices are the components of the computer system that produce music, speech, or other sounds, such as beeps.

a) Computer speakers

Computer speakers typically have tone and volume controls, allowing users to adjust settings. To boost the low bass sounds, surround sound speaker systems also include a woofer, with one or two center speakers and two or more satellite speakers that are positioned so that sound emits from all directions. Some computer speakers use wireless technology.

d) Pc internal speakers

Most personal computers have a small internal speakers that basically output beeps and low-quality sound.

e) Headphones and earphones

In a crowded computer laboratory environment, speakers might not be applicable. Instead, users can plug head-phones or earphones in a port on the sound card, in a speaker, or on the front of the system unit. With the headphone or earphone, only the individual wearing the headset hears the sound from the computer.

Other output devices

There are very many kinds of emerging output devices. Some are both input and output devices. Examples include: Fax machine, Machine tools.

A **fax machine** is a device that transmits and receives typed or hand written documents over telephone lines.

A **machine tool** is a machine for shaping metal or other rigid materials, usually by cutting, boring, grinding, or shearing. Through computer-aided

manufacturing, computers are used to control the output of machine tools and related machinery in the manufacturing of work pieces.

6

COMPUTER SOFTWARE

Computer software refers to the electronic instructions and procedures that command and control the operation of a computer. There are mainly two types of software: **System software** and **Application software**

System Software

System software refers to programs that manage, control and maintain the operation of a computer and all devices connected to it. It performs tasks related to the operation and performance of the computer system and avails resources to the user.

Categories of system software

System software is categorized into four**:** Operating system, Utility programs, Device drivers and Programming languages.

Operating System software (OS)

Operating system is a set of programs containing instructions that work together to coordinate all the computer activities. It performs daily activities of a computer and manages its resources.

Types of operating system

- Stand-alone operating system
- Network operating system
- Embedded operating system

Common examples of operating systems associated with computers are: Windows Operating System, Linux , Unix, Ubuntu Operating System, Macintosh(Mac), Chrome Operating System, Novell Operating System, Android For Mobile Phones, etc.

Function of operating system (OS)

- It helps in processor management, in multitasking and time sharing

- Configuring and controlling peripheral devices
- Installing of both system and application software
- Managing system and application programs
- Updating software automatically
- Booting the computer
- Monitoring system performance
- Administering system and network security
- It helps in file management
- Managing memory and storage devices
- Allocating system resources
- Establishing an Internet connection
- Providing the user interface between the user and computer
- Providing a platform for other programs to run
- Responsible for scheduling and coordinating computer jobs
- Spooling print jobs
- Establishing and controlling network connections
- Managing computer errors

Operating System User Interfaces

User interface refers to the visual part of a program or OS through which a user interacts with a computer or software. It determines how commands are given to the computer and how information is displayed on a computer.

There are two forms of operating user interfaces: **Command-line** user interface: and **Graphical** user interface.

Command-line user interface:

In a CLI, a user types commands using a keyboard or every command prompt. The set of commands a user uses to interact with the computer is called **command language**. Examples are DOS, UNIX, and LINUX.

A user is provided with a virtually empty screen with a blinking cursor where commands are keyed and the computer executes them by pressing the enter key.

Advantages of command user interface:

- Commands are executed faster.
- Consumes limited random access memory
- Cannot easily affected by viruses
- Ideal for programming and programmers
- Commands can be grouped together.

Disadvantages of command user interfaces

- Commands are not easily memorized
- Requires a lot of knowledge to master the commands
- Commands have to be typed correctly
- No graphics on the screen.
- A mouse cannot be used

Graphical User Interface (GUI)

In a GUI, a user uses menus and visual images such as icons, buttons and other graphical objects to issue commands. Common GUI operating systems are Windows, Ubuntu, etc.

Advantages of graphical user interface (GUI)

- It is user friendly because it is easy to learn and work with
- There is no need to type and memorize any command language.
- The interface is similar for any application.
- You are provided with a coloured screen with icons each representing a program.
- A mouse may be used.

Disadvantages of graphical user interface (GUI)

- Require much more memory and as well as the processor
- Require much more desk space to hold the files
- Difficult to automate for expert users
- Easily affected by viruses
- Not good for programmers.

Utility Software

It a type of system programs that allows a user to perform maintenance tasks related to nagging a computer, devices connected to it and software installed on it. They are designed to configure, analyze, optimize and maintain a computer in and good operation conditions.

Functions of common utilities

There are a variety of utility programs with specified functions as described below:

1. **File manager** – perform tasks such as displaying file lists on storage media, organizing files in folders, copying, renaming, deleting, moving and sorting files
2. **Search utility** - helps user to locate files on a computer based on a given criteria
3. **Uninstaller** – removes with its associated file from the file system
4. **Image viewer** – allows a user to display, copy and print an image
5. **Disc cleanup utility** – searches for and removes unnecessary files such as downloaded, temporary Internet, deleted files and unused files
6. **Disc defragmenter** – reorganizes files and unused space on a computer hard disc so that data access is more quick, programs run faster
7. **Backup utility** – allows users to copy or backup selected files or an entire hard disc to another storage medium or location
8. **Restore utility** – restores backed up files to their original form in the event of loss of the original copy
9. **Screen saver** – causes the computer screen to display a moving image or blank screen if no keyboard or mouse operation occurs for a specific time. Screensavers are used for security, entertainment, advertisement, etc.
10. **Personal firewall** – detects and protects a computer form unauthorized intrusions. It monitors transmissions to and from a computer
11. **Antivirus utility** – protects a computer by identifying and removing viruses found in memory, storage media, or on incoming files
12. **Spyware remover** –detects and removes spyware and related programs
13. **Adware remover** – a utility that detects and removes adware and related programs
14. **Internet filters** – remove or block certain infected or inappropriate from being received or displayed from the web.
15. **File compressing utility** – shrinks the size of files and folders for easy transfer
16. **Media players** – allows users to view images, animations, play music and videos files on a computer
17. **Disc burning** – writes computer files on optical storage media such as recordable or rewritable CD, DVD or Blue-ray disc.
18. **PC maintenance utility** – identifies and fixes operating system problems, detects and repairs disc problems and improves general system performance.
19. **System archives** - output a stream or a single file when provided with a directory/set of files.
20. **Disk checkers** - scan an operating hard drive for logical (file system) and physical errors
21. **Cryptographic utilities** - used to encrypt and decrypt streams of files.
22. **Sorting utilities** - help to organize data in a given order.
23. **Memory testers** - check for memory failures.

24. **Disk practitioners -** divide a drive into multiple logical drives, each with its own file system which can be mounted by the operating system to be treated as an individual drive.
25. **File synchronization utilities** - maintain consistency between two sources. They enable redundancy or making copies of data.
26. **System profilers** - provide detailed information about the software installed and hardware attached to the computer.
27. **Network utilities** - analyze a computer's network connectivity, configure network settings, check data transfer or log events.
28. **System restore utility**

Device Drivers

A device driver is small software that tells the operating system how to communicate with the device. Each peripheral device on a computer has its own specialized set of commands and thus requires its own specific driver. The operating system loads each device's driver when the computer boots up.

To communicate with the hardware devices, the operating system relies on device drivers. A device driver accepts instructions and then converts them into commands that the device understands.

Programming Languages

These refer to the languages used to write a computer instruction, software. A person who writes a computer program is called a **programmer**.

Functions of software programmer

- He writes a computer program
- He maintains a computer program
- He upgrades a computer

Types of programming languages

Programming languages are of two types

- Low level programming language
- High level programming language

Low level languages

This is a computer language written in machine code language, the language understood by a computer. It is also referred to as binary language because it consists of only two digits, 0s and 1s

Types of low-level languages

- Machine code language (first generation)
- Assembly language (second generation)

Assembly (low-level) languages

This is a language which consist of mnemonic symbols (English like words) used to represent the binary digits of 0s and 1s of machine language. Assembly languages are used to develop system software.

However computers can only understand machine language, thus assembler languages must be translated into machine language for execution.

Advantages of low level languages/machine code

- Machine codes are executed faster.
- They don't require either a compiler or interpreters except assembly
- They are suitable to developing operating systems.

Disadvantages of low level languages

- They are difficult to learn and understand.
- The instructions are expressed in binary form (0 and 1s)
- The programs are machine dependent hence difficult to be used by other machines of different family.

High level programming languages

This is a computer written in official language (known to man) but should be converted to machine code for a computer to understand.

High level languages consist of statements or sequences text including words, numbers and punctuation, much like written natural languages.

Advantages of high level languages

- They are machine independent and can be used by other computers.
- They are user friendly and problem oriented.

- They are easier to learn, write, correct and revise than assembler and machine languages.
- They can be used for development of application software.

Disadvantages of high level languages

- They require to be translated to machine code
- They are not executed faster.

Examples of high level languages

- COBOL
- PASCAL
- Python
- Java Script
- Java
- C
- Ruby
- C++
- C#(C-sharp)
- PERL
- FORTRAN
- PHP

Language Processors (Translators)

Language processors translate high level languages to low level (machine code) languages which the processor can understand. They are software designed to translate from high level language to low-level language.

Examples of language processors

- A **Compiler** is a program which translates a whole source code from high level language to low level language which can easily be understood by the computer.
- An **Interpreter** translates the source line by line while translating a high level language to low level language.
- The **Assembler** translates assembler instructions from assembly language to machine code language or the binary code.
- The **linkers** combine compiled programs and determine where the will be located in the memory.
- **Language editors** are applications or software used to write computer language codes. Some also compile. Common language editors, Notepad, Trouble c, Borland, Sublime text, Dev C, C++, Codeblocks, Notepad ++ etc.

Common terms used in programming

- **Source code** is an instruction written as text file by the programmer that must be translated by a compiler or interpreter or assembler into an object code before execution.

- Source code cannot be understood by the computer until it has been translated into machine code.
- **Execution** is the process by which a computer system performs the instructions of a computer program.
- **Object code** is a code in machine language that is ready for execution by the computer.
- **Bug** is a logical problem in the source code that stops the software from running give or to give wrong results
- **Debugging** is the process of detecting, checking and identifying problems and errors in the source code.

APPLICATION SOFTWARE

This is software that performs a specific and user function. Application software is installed on operating system. **Application software** consists of programs designed to perform specific tasks for end-users

Types of application software

Application software is categorized into two: *Off-shelf packages* and *Customized* programs, bespoke or tailor-made programs

Off – the - shelf packages

These are programs already written and ready to be run upon their purchase.

Main categories of off shelf packages

1. **Word processors** - programs that allow a user to perform word processing functions, they are document production applications e.g. MS word. A user can use a WP to create, edit, save, format and print letters, reports, and other documents.

2. **Spreadsheet software** – a program with which a user can organize data in rows and columns create graphs and can perform calculations e.g. MS excel.

3. **Presentation software** - an application with which a user can organize content on a slide for viewing by the audience e.g. MS Power point

4. **Database software** – an application with which one can store lots of data for future manipulation

5. **Desktop publishing software** – software, with which one can design publications like newspapers, wedding cards certificates etc.

6. **Imaging software** - application software with which users can edit, retouch a photograph and images

7. **Web browsing software** - software used for displaying and viewing webpages from the Internet or html documents on computers. Examples include, Mozilla firebox, Internet explorer, Safari, Opera, Netscape navigator, Chrome

8. **Web authoring software** – these are used by webmasters for building websites. Examples include: Microsoft FrontPage, Adobe Dreamweaver, Microsoft expression web, Antenna web design studio, Sublime text 3

9. **Media players for audio and video** – used for audio and video playback on computers. Examples include: Windows media player,, Nero ShowTime, Jet-audio, Power dvd, VLC media player, Virtual DJ, etc.

10. **Graphics software** - used by graphic designers to create and design artistic graphics and to manipulate visual images on a computer such as Logos, cartoons etc. Examples include Paint, Adobe photo shop, Corel draw, Adobe illustrator etc.

11. **Accounting software** - helps companies to record and report their financial transactions. With accounting soft-ware, you perform accounting activities related to the general ledger, accounts receivable, accounts payable, purchasing, invoicing, job costing, payroll functions, etc. Examples include quick books

12. **Audio and video editing software** - lets users produce studio quality soundtracks. Video editing software is used to modify video clips: you can reduce the length of a video clip, reorder a series of clips, or add special effects such as words that move horizontally across the screen etc. common audio and video editing software are:

    - Adobe premiere video editor
    - Ulead video editor
    - Adobe audition for –audio
    - Fruity loops studio-audio

13. **Images viewing software** - computer applications primarily used for previewing digital photographs on the computer screen. Many have basic features such as viewing thumbnails, slideshows, printing and simple editing such as cropping and resizing.

Examples of image viewers include: Microsoft office picture manager, Windows photo viewer, Picasa photo viewer, etc.

14. **Reference software** - provides valuable and thorough information for all individuals. Popular reference software includes encyclopedias, dictionaries, health/medical guides, and travel directories. Examples include: Encyclopaedia Britannica 2011 Ultimate Reference Dvd, Microsoft Student with Encarta Premium, etc.

15. **Note taking software** - enables users to enter typed text, handwritten comments, drawings, or sketches anywhere on a page and then save the page as part of a notebook .the software can convert handwritten comments to typed text or store the notes in handwritten form. Examples include Microsoft Office OneNote

16. **Text editors** - simple word processors that are generally used to type without any special formatting, mainly used to create small notes, memos and programs. Examples of common text editors are: Notepad, Notepad++, Sublime Text, Gedit etc.

17. **Gaming software** - programs developed as electronic game that involve human interaction with a user interface to generate visual feedback on a computer. Common computer games include Solitaire, Chess Titans, Racing, StarCraft, Need for Speed, GTA vice City, and Alien Shooter.

18. **Email software** - is a computer program used to access and manage a user's email account. Web applications that provide message management, composition, and reception functions are sometimes also commonly referred to as webmail. Common ones are Microsoft outlook, Pegasus mail, Mozilla's thunderbird, Kmail, evolution and Apple mail. Popular web-based email clients include: Gmail, yahoo Mail, mail.com, Lycos mail, and Hotmail.

Advantages of off-shelf packages

- They are relatively cheaper than bespoke packages.
- They are readily available for purchase.
- They are user friendly; many have a graphical user interface, sample manuals provided on purchase.
- The user does not face research and development costs or problems since the package is already in operation.
- The user faces limited risk since the user has an option to seek information from existing users about the package before making a decision to purchase.

Disadvantages of off-shelf packages

- They hardly full fill users' specific needs perfectly.
- They are standardized implying it may be hard to make adjustments.
- They may not be recommended where a particular company wants to gain competitive advantage over others.
- Where the package does too much compared to the company needs, the amount of extra space occupied in the hardware can lead to memory wastage.
- The package may also be limited to a particular operating system
- It may be easy to manufacture viruses that may tamper with such application programs.

Customized (Tailor-Made) Or Bespoke programs

These are tailor made programs constructed to meet specific user requirements. They are specifically designed to meet user requirements.

Merits of customized programs

- Ability to satisfy user's specific needs
- The company will be able to perform tasks with its software that its competitors cannot do with theirs thereby gaining a competitive advantage.
- They can easily be modified or upgraded.
- Ownership is to the company that ordered for the software.

Disadvantages of customized software

- Time taken to develop the package may be long yet requirements could be urgent.
- The cost of paying programmers makes them expensive. The organisation has to incur development and consultancy costs in this case.
- They are not flexible i.e. not meant to do various tasks.
- Expensive to maintain. When they breakdown programmers who are expensive have to be called in
- In-case of breakdown, the company may be brought to a standstill
- There is a greater probability of bugs in bespoke programs.
- They are not compatible with all computer types, designed for specific computer types.
- They may not run which means that the programmer has to design another one. This could even lead to more costs on the side of the user as well as causing delays

Shareware

Shareware is copyrighted software that is distributed at no cost for a trial period. To use a shareware beyond that period, you send payment to the developer. In some cases, a scaled-down version of the software is distributed free, and payment entitles the user to the fully functional product.

Copyrighted software

Copyrighted software refers to computer programs with restrictions regarding use, modification, and redistribution. You have to pay for copyrighted software and must not copy it without permission from the manufacturer. Copying copyrighted software without paying for it is clearly unethical and illegal.

Freeware

Freeware is copyrighted software provided at no cost by an individual or a company that retains all rights to the software. Therefore, other programmers cannot include freeware in applications they intend to sell.

Open-source

Open source software is software provided for use, modification, and redistribution. This software has no restrictions from the copyright holder. Open source software usually can be downloaded from the web at no cost.

Public-domain software

Public-domain software has been donated for public use and has no copyright restrictions. Anyone can copy or distribute public domain software to others at no cost.

Web-based software

Web-based software refers to programs hosted by a web site. Users access and interact with web-based software from any computer or device that is connected to the Internet. Many web sites allow free access to their programs; some charge a fee. Examples of web-based software include e-mail, Website builders, online games, travel and mapping software, etc.

Special purpose (specialized) software

This refers to computer programs developed and dedicated to particular jobs only. Programs that run on special purpose computers like ATMs are special purpose software.

Other examples of specialized software include:

- Business – transaction and sales management software.
- Science and engineering software etc.

General purpose

This refers to a wide a variety of application programs that perform many common tasks.
Varieties of general purpose application programs include word processing programs, spreadsheet programs, web browsers, graphics programs, etc.

Software suite

A software suite is a collection of several applications that are bundled together and sold or distributed as a single package. The software programs may have correlative features and functionality or they may be completely different from one another but share a similar theme.
When you install the suite, you install the entire collection of applications at once instead of installing each application individually. At a minimum, suites typically include the following software applications: word processing, spreadsheet, database, and presentation graphics,

Examples of software suites

- Microsoft office
- Libre office productivity suite.
- Open office.org
- Word perfect office x5
- Zoho
- Quickoffice & office suite
- Prooffice free 3.0
- Koffice
- Lotus smart suite
- Adobe master suite

Advantages of using software suites

- Costs significantly cheaper than buying each of the application package separately
- Easy to learn and use because applications within a suite usually use a similar interface and share common features such as clip art and toolbars.
- Easy installation because all the various applications can be installed at once.

Common terminologies used in software

1. **Software license -** This is a document that provides legally binding guidelines for the use and distribution of software.

2. **Software agreement -** This refers to the legal contact between licensor and /or author and the purchaser of a piece of software which establishes the purchaser's' rights.

3. **Software piracy** this is the illegal duplication of copyrighted software.

4. **Software bug** refers to an error in the programming code that does not permit it to function well.

5. **Beta software** is a type of software provided to people for testing purposes

6. **Software release** is the process of issuing/letting the software or application for publication, use and distribution.

7. **Software version** refers to variation of an earlier or original type with minor changes to the existing version or type. E.g. iTunes 12.0, iTunes 12.2.3

8. **Hot fix**: this is software that is designed to fix a bug or security hole in software program.

9. **Spy ware**: this is a software application that is designed to gather information about a person or organization without their knowledge that may send such information to another entity.

10. **Software patch**: this is software that is designed to modify, correct, and fix problems in software.
11. **Software update**: this is a software application that provides fixes for features that are not working as intended or adds minor software enhancements and compatibility.

12. **Software upgrade**: this is a process of replacing a product with a newer version of the same product.

13. **Firmware**: this is a permanent software that is programmed or embedded in a hardware usually read-only-memory by the manufacturer.

Qualities of a Good Software package

- Should be error free-operate without bugs
- Should provide help in case of user errors
- Should be compatible or machine independent
- Should not stop working no matter the errors made by the user-robust
- Should be easy to use, learn with simple user interface

- Should be easy to update, upgrade and maintain
- Should have user manuals and documentation
- Should be reliable, predictable, reliable and dependable.
- Should be capable of displaying error messages to the users
- Should be scalable-easy to change to meet user needs
- Should be interoperable-work with other software
- Should be accurate in retrieving results
- Should be portable-work on multiple operating systems
- Should be efficient to meet the users targets
- Should be readily available
- Should be authentic, genuine, licensed
- It provides the required functionality.
- It has a life-time (measured in years).
- It is accompanied by complete documentation.
- It can be easily customized, configured.

Factors to consider before obtaining a software program

- Correctness — does the software do what it is supposed to do (according to the design specs)?
- Robustness — how does the software respond to unexpected conditions (wrong input)?
- User-friendliness — is the software easy to use by users from the intended audience?
- Adaptability — how difficult is it to modify the software to adjust to an ever-changing world?
- Cost effectiveness

Characteristics of good software

- **Suitability**. This is the essential functionality characteristic and refers to the appropriateness (to specification) of the functions of the software.
- **Accurateness**. This refers to the correctness of the functions, an atm may provide a cash dispensing function but is the amount correct?
- **Interoperability**. A given software component or system does not typically function in isolation. It concerns the ability of a software component to interact with other components or systems.
- **Compliance**. Where appropriate certain industry (or government) laws and guidelines need to be complied with. This s addresses the compliant capability of software.
- **Security**. This relates to unauthorized access to the software functions.
- **Fault tolerance**. The ability of software to withstand (and recover) from component, or environmental, failure.

- **Understandability**. Determines the ease of which the systems functions can be understood, relates to user mental models in human computer interaction methods.
- **Learnability**. Learning effort for different users, i.e. Novice, expert, casual etc.
- **Maintainability**. Characterizes the amount of effort to change a system.
- **Stability**. Characterizes the sensitivity to change of a given system that is the negative impact that may be caused by system changes.
- **Replace ability**. Characterizes the plug and play aspect of software components, that is how easy is it to exchange a given software component within a specified environment.

7

INTRODUCTION TO SPREADSHEETS

Introduction to Spreadsheets

A spreadsheet is a grid of rows and columns that accepts entry of data, allows editing, formatting and manipulation of numeric data. Spreadsheets can also display data graphically with the help of charts and graphs.

Types of Spreadsheets

1. **Manual spreadsheets**. It is commonly used by keepers as a ledger book with many sheets of papers divided into rows and columns. Data is entered manually using a pen, pencil and manipulated manually using a calculator.
2. **Electronic spreadsheets**. It is prepared using a computer program and enables users to enter values in rows and columns, which are then, manipulated using automatic formulae and functions.

Common electronic spreadsheet programs are VisiCalc, Lotus 1-2-3, Microsoft Office Excel, Quattro Pro, Microsoft Works, Multiplan, View sheet, Lucid 3D, etc.

Advantages of Manual Spreadsheets

- They are easy and cheap to acquire
- They are easily portable
- They are suitable for draft or rough work
- They are not electronic, thus, can be used without electric power
- No skills are needed, hence, even a computer illiterate can use manual spreadsheets

Disadvantages of Manual Spreadsheets

- They require a lot of manual effort and time
- Many errors are bound to be made
- Rubbing out to correct errors makes the work untidy
- They do not have pre-existing tables as opposed to electronic spreadsheets
- They are very small in size
- They are not durable. They can easily wear and tear out
- They do not have automatic formulas that would otherwise quicken the work
- You cannot easily insert or delete extra columns and rows

Advantages of Electronic Spreadsheets

- They have pre-existing tables, thus, no need to draw gridlines
- They have in-built formulas and functions, enabling automation in calculations and work manipulations
- There are minimal errors and in case of any, they are easily corrected
- They have very large worksheets that can store a lot of work easily and for long
- Extra columns and rows can be inserted and deleted without any bad effect
- The work can be protected with passwords thus ensuring security
- Work can be enhanced to look very attractive with various formats to suit the user's needs
- The records can be sorted and filtered to get only those that you want
- They allow printing of multiple copies without re-creation

Disadvantages of Electronic Spreadsheets

1. They are expensive to buy and maintain
2. They are electronic, thus cannot be used without electricity
3. They require computer skills and continuous training
4. There is data loss due to virus attacks and system failure
5. There are privacy problems like unauthorized access over networks
6. Health related hazards as they are associated with use of computers

Features of Electronic Spreadsheet Software

1. **Workbook** - a collection of multiple worksheets in a single file
2. **Worksheet** - a single page of a workbook. It is an equivalent of a work area in Microsoft Word. A worksheet is made up of rows and columns which intersect to form cells.
3. **Columns** - vertical lines which run through the worksheet, labeled by letters; A, B, C …
4. **Rows** - horizontal lines across a worksheet, labeled by numbers; 1, 2, 3…
5. A **cell** - is an intersection of a column and a row. Each cell on the spread sheet has a cell address.
6. **Cell address** is a unique name of a cell, given by the column letter and row number, e.g. A1
7. **Range** - a group of adjacent cells defined as a single unit. A range address is a reference to a particular range.
8. **Value** - a numerical entry in a cell.
9. **Labels** - a text entry in a cell.
10. **Name box** - displays the address of the selected cell or cells
11. **Formula bar** - a bar at the top of the Excel window used to enter or edit values or formulas in cells or charts.

12. **Autofill** – a feature that allows a user to quickly fill cells with repetitive or sequential data such as chronological dates or numbers, and repeated text.
13. **Sorting data** - arranging records in ascending or descending order.
14. **Filtering data** - displaying of records that satisfy the set condition from the parent list.
15. **Graphs** - a pictorial representation of the base data on a worksheet.
16. **A chart** is a graphical representation of data. A chart may be 2-D or 3-D
17. **What-if analysis** - a process of changing values in cells to see how changes affect outcomes of formulas on the worksheet.
18. **Freezing panes** - where rows and columns are frozen such that they remain visible during scrolling long sheets

Uses or Applications of Spreadsheets

- Preparation of budgets
- Preparation of cash flow analysis
- Preparations of financial statements
- Processing basic business information, like, job costing, payment schedules, stock control, tax records
- Analysis of data from questionnaires
- Presentation of information in tabular form, graphical or charts forms
- Mathematical techniques and computation like trigonometry
- Statistical computations like standard deviations.
- Grading students

Common operators used in Microsoft excel

An Operator specifies the type of calculation to perform on the elements of a formula. They can be arithmetic, logical arithmetic (comparison), text concatenation, and reference.

1. **Arithmetic operators**
   These are used to perform basic mathematical calculations such as addition, subtraction, division or multiplication; combine numbers; and produce numeric results.

Arithmetic operator	Meaning	Example
+ (plus sign)	Addition	3+3
– (minus sign)	Subtraction	3–1
	Negation	–1
* (asterisk)	Multiplication	3*3
/ (forward slash)	Division	3/3
% (percent sign)	Percent	20%
^ (caret)	Exponentiation	3^2

2. Comparison Operators

These are used to compare two values, and the result is a logical value either TRUE or FALSE.

Comparison operator	Meaning	Example
= (equal sign)	Equal to	A1=B1
> (greater than sign)	Greater than	A1>B1
< (less than sign)	Less than	A1<B1
>= (greater than or equal to sign)	Greater than or equal to	A1>=B1
<= (less than or equal to sign)	Less than or equal to	A1<=B1
<> (not equal to sign)	Not equal to	A1<>B1

3. **Reference Operators** combine ranges of cells for calculations. Examples include;

Reference operator	Meaning	Example
: (colon)	Range operator, which produces one reference to all the Cells, between two references, including the two references	B5:B15
, (comma)	Union operator, which combines multiple references into one reference	SUM (B5:B15, D5:D15)
(Space)	Intersection operator, which produces one reference to cells common to the two references	B7:D7 C6:C8
& (ampersand)	Connects two values to produce one continuous text value	("North "&"wind")

4. Cell References

A Cell reference is an address given to a particular cell or group of cells on a worksheet. e.g. A2, B6, B3.

There are three types of cell references;

- **Relative cell reference**. Here, the address of a cell is based on the relative position of the cell that contains the formula and the cell referred to. If you copy the formula, the reference automatically adjusts. A relative cell reference takes the form: A1, B17, G20, and C2.
- **Absolute cell reference**. Here, the exact address of a cell is used in the formula, regardless of the position of the cell that contains the formula. An absolute cell reference takes the form: $A$1, $D$6, $B$3, $E$6.
- **Mixed cell reference**. This is a type that uses both relative and absolute cell references at once. It may use an absolute column

reference and a relative row reference or vice versa, e.g. $G17, B$14, D$2, $E2.

Formulas

Formulas are equations that perform calculations on values in your worksheet and return a value in a chosen cell, e.g. =A2+B2, = (A3+B3+C3+D3)/4, =A6*B4, =C4-D4, =E10/G10

5. Logical operators

Operator	Description
AND	Returns TRUE if all arguments are True and FALSE if any argument is false
FALSE	Returns the logical value FALSE
IF	Specifies a logical test to perform
IFERROR	Returns a value you specify if a formula evaluates to an error; otherwise, returns the result of the formula
NOT	Reverses the logic of its argument
OR	Returns TRUE if any argument is TRUE
TRUE	Returns the logical value TRUE

Error Alerts

Excel displays an error value in a cell when it cannot properly calculate the formula for that cell. Below are some common error values and their meanings.

Error message	Meaning
#####	Column is not wide enough, or a negative date or time is used.
#DIV/0!	A number is divided by zero
#N/A!	A value is not available to a function or formula
#NAME?	Microsoft Office Excel does not recognize text in a formula.
#NULL!	You specified an intersection of two areas that do not intersect
#NUM!	The numeric values used in a formula or function are invalid
#REF!	The cell reference is not valid, e.g. 6E instead of E6
#VALUE!	An argument or operand used is of wrong type

Functions

A function is a prewritten formula that takes a value or values, performs an operation, and returns a value or values in a chosen cell. Examples of functions in MS Office Excel include the following:

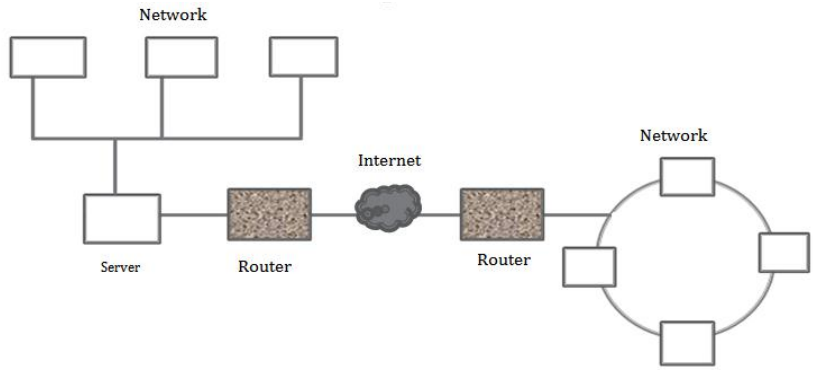
Function	Description	Example
SUM	Adds all the numbers in a range of cells	=SUM(B2:G2)
PRODUCT	Multiplies numbers given as arguments to return product	=PRODUCT(A2:D2)
MAX	Returns the largest value in a set of values	=MAX(D4:D10)
MIN	Returns the smallest number in a set of values	=MIN(A2:A12)
LARGE	Returns largest value in a data set, e.g. 5th largest value	=LARGE(B1:B9,5)
COUNT	Counts number of cells in a range that contains numbers	=COUNT(A1:E9)
COUNTIF	Counts number of cells in a range that meet given criteria	=COUNTIF(A1:C9,"<10")
COUNTBLANK	Counts number of empty cells in specified range of cells	=COUNTBLANK(A2:H8)
AVERAGE	Returns the average (arithmetic mean) of the arguments	=AVERAGE(B2:B15)
MEDIAN	Returns number in the middle of the set of given numbers	=MEDIAN(D4:D10)
MODE	Frequently occurring value in arrange of data.	=MODE(C2:C9)
RANK	Returns the size of a number relative to other values in a list of numbers.	=RANK(F3,$F$3:$F$11,0)
SQRT	Returns a positive square root	=SQRT(B5)
IF	Returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.	=IF(A2<50,"fail", "pass")
VLOOKUP	Searches for a value in the first column of a table array and returns a value in the same row from another column.	=VLOOKUP(***lookup_value,lookup_table, column***)
HLOOKUP	Searches for a value in the top row of a table array and returns a value in the same column from a row you specify in the table or array	=HLOOKUP(***lookup_value,lookup_table, column index***)

8

THE INTERNET AND WORLD WIDE WEB

The Internet

Internet is a global interconnection of computer networks linked together to communicate and share resources
Or
The Internet is a worldwide collection of networks linked together to share data, information and other resources. It is simply referred to as the network of networks. It is simply called the **Net**.



History of the Internet

In 1969 the U.S. Department of defence commissioned the Advanced Research Projects Agency Network (Arpanet). The purpose was to provide communication links between supercomputers located at various regional sites (universities and defence bases) within the United States.
It is this Arpanet that evolved into the Internet after computer networks were connected to it in different parts of the world. By1992, more than 1 million hosts existed on the Internet

Methods (ways) of connecting to the Internet

As technologies develop, bigger, better and faster Internet connections methods evolve. ISPs provide Internet connectivity through the following:

- Dial up (phone line) connection with dial up modems
- Broadband (cable or digital subscriber line (dsl)) or fibre
- Satellite connection
- Wireless broadcasts e.g. Wi-Fi Hotspots and Wi-Max.

Requirements for connecting to (access) the Internet

To access the net, the following elements is required

- Computer – PC, internet phone, handheld device
- Ethernet or wireless technologies.
- An Internet service provider
- Modem
- Communication line such as telephone line
- Internet software – internet protocol, web browser, email client or host
- Transmission medium

1. Internet service providers (ISPs)

It is a company that offers Internet services to end users. It takes care of the technical aspects of connecting to the Internet usually at a fee. In Uganda, common ISPs are Orange, MTN, Airtel, UTL, Smile etc.

Factors to consider when choosing an ISP

- Ability of the ISP to offer services in all areas.
- Speed or network performance
- Ease of use, should provide a simple to install software to help users get online
- The cost in relation to the time on connectivity and packages
- Availability of user support and customer care and service
- Ability to allow users try services before buying them
- Ability to provide promotional services to customers
- Performance matching the user expectation
- Availability of a security policy and assistance in filtering undesirable content
- Restrictions of use
- Reliability : how long the ISP has been in business
- Compatibility, the speed of their modems and software should match the speed of users'.

2. Protocol

It refers to a set of rules that govern how two computers send and receive data on a network. The internet uses Transmission Control Protocol/Internet Protocol - TCP/IP.

An **IP address** is a special number that is used to recognise a computer or network on the Internet. It enables data to be sent and received by it,

3. Web browsers

A web browser is application software that allows users to browse or surf the internet.
It is used to display webpages from the Internet. Common browsers include

Google Chrome, Mozilla Firefox, Internet explorer, Opera mini, Apple safari, Netscape navigator

4. **E-mail software**

   It is application software that allows a user to compose, receive and send electronic mails over the Net. Common examples are: MS outlook, Gmail, Hotmail, Eudora, Yahoo mail

Common Internet services

The net offers a variety of services which include the following in summary:

- The World Wide Web
- Emails and faxes
- Instant messaging
- Electronic commerce
- Electronic learning
- Newsgroups
- Searching the web – search engines
- Web conferencing
- Webinars (web seminars)
- Cloud computing
- Social networking
- Mailing lists
- Internet relay charts
- Internet telephony – voice over internet
- Web directories
- telnet and UseNet

1. **Telnet** – enables users use the resources of a computer by remotely logging to the distant computer which is called the host.

2. **Mailing list** – this is based on the email protocol. As an electronic mailing list. it is very convenient when somebody wants to send a message or newsletter, for example, too many people in one go.

3. **Internet relay chat (IRC)** – a live interactive discussion in which parties on the network exchange ideas and observation electronically. Chats are usually organized in what we call chat rooms.
4. **File transfer protocol** – the standard method for transferring files, whether downloading or uploading, to and from your computer with another computer on the Internet.

5. **Newsgroups** – worldwide discussion areas where notices can be posted for anyone to view. They are equivalent to a discussion group or an electronic bulletin board. There are newsgroups for every conceivable topic and more, e.g. educational technology.

6. **World Wide Web** – this refers to the global collection of websites consisting of linked electronic documents called webpages stored on Internet servers all over the world.

The www is the most exciting service that has revolutionized the Internet, people use this service to browse for information.

7. **Instant messaging:** a combination of real-time chat and e-mail by which short text messages are rapidly exchanged over the Internet, with messages appearing on recipient's display screen immediately upon arrival.

8. **Usenet**: a system of worldwide discussion groups
9. **Internet telephony or voice over ip**: real-time voice conversations transmitted between computers on the Internet.

10. **Web directory**: a listing of web sites and their urls, categorized by topic.
11. **Electronic commerce/e-commerce:** conducting commercial activities on the Internet.

12. **Social networking.** A type of service where users can seek others who share their interests, find out what's going on in their areas of concern, and share information with one another (e.g. Facebook, twitter).

13. **Cloud computing:** a service in which computer software, hardware and data are used remotely over the Internet, instead of acquiring and using them on a local computer.

14. **Search engines:** software programs that look through the web to locate sites matching a keyword entered by the user. Keyword: a string of letters or words that indicates the subject to be searched.

1. **Email communication**

An **Email** is a message transmitted over the internet. To compose, send or receive an email, email software and a user account are required. Creating an account using email software is called **Signing in**.

User ID and password
After signing in, a user is assigned a unique user ID and user password for login into the account.

A user ID - also called **Email address** is a unique name assigned to each individual user account or user. **A user password** is a combination of characters that authenticates the user to be a legitimate user of the account.

Format of an email address

An email address has two basic parts: the username and the internet domain separated by the @ symbol. It is usually in lowercase. The general format is *username@internet domain.*

For example in **montec@yahoo.com**

- **montec** is the username
- **@ (at)** symbol separates username from internet domain
- **Yahoo.com** is the internet domain or name of the email host on the net
- **Dot** separates different parts of the email
- **.com** identifies the domain type of organisation offering a particular service

In the US, most domains end with a domain type indicating the type of the site or geographical location such as the following:

- *com* for commercial institution
- *gov* for government institution
- *org* for non-profit organisation
- *mil* for military organisation
- *net* for network service provider
- *ac* for academic institution

Outside the US, a country code may be added to the domain name to indicate the country from where the host is located: such as:

- *uk* for unite kingdom
- *ug* for Uganda
- *ke* for Kenya
- *au* for Australia
- *jp* for japan, etc.

Parts of an email compose window

1. The header part has the following parts
   - **To:** where the email address of the recipient is entered
   - **From:** where the sender's address is typed or entered
   - **Subject:** contains a brief description of the message
   - **CC:** **Carbon Copy** – used to copy the email to other recipients, the main recipient sees who the email has been sent to
   - **BCC**: **Blind Carbon Copy** - copies the email to other recipients, the main recipient doesn't see who the email has been sent to
   - **Date**: indicates the data and time the message is sent
   - **Attachment**: a file attached to and sent with the email

2. **Body**: The body of a message contains text that is the actual content
3. **Message**: where the content is entered. It should be short and to the point
4. **Signature**: provides additional information about the sender such as full name, address and telephone contact

Other parts of an email window and related email vocabulary are:

- **Inbox** – stores all incoming emails
- **Outbox** - contains emails waiting to be sent
- **Sent** – contains mails that have already been sent
- **Drafts** – stores emails that being worked on, not yet ready to be sent
- **Deleted item** – holds deleted mails
- **Reply** – allows the user to reply to incoming mails
- **Forward** – helps user to send a received an email to someone else, after editing
- **Copy** or **cut** – copies or cuts an email
- **Delete** – deletes an email. These deleted messages are stored in the trash.
- **Address book** – where the names and addresses of common respondents are kept for easy and faster access
- **Sign up** – creating and account, registering user email account details
- **Login** or **Sign in** – opening or accessing an account using account details such as username and password
- **Logout** or **Sign out** – closing a user email account
- **Compose** or **New** – write a new message

Advantages of using e-mail as a means of communication

- Easy to use. Emails applications have user friendly features used to compose messages
- Email supports sending of attachments like documents, zipped files, etc.
- It is very fast in terms of speed: the e-mail is delivered instantly, anywhere across the globe.
- Easy to prioritize: since the mails have subject lines, it is easy to prioritize them and ignore unwanted mails.
- Email messages can be sent to many recipients at the same time
- Emails can also carry hyperlinks that lead to other webpages with just a click
- One can subscribe to news and other online services through email
- Email software have management features that help users to organize their messages in folders like inbox, sent, draft, etc.
- Easier for reference: when one needs to reply to a mail, there is a provision in the mailing system to attach the previous mails as references. This refreshes the recipient's knowledge, on what he is reading.
- Environment friendly: compared to postal mails which use paper and fuel to transport letters. Electronic mail saves a lot of trees from being axed. It also saves fuel needed in transportation.
- Email software has address book features that may be sorted in alphabetical order.
- Email software has a good degree of security features such as username and password before sign in

- Email applications have inbuilt english dictionary which safeguards the sender from incorrect spelling and grammar.
- Email is a relatively cheap means of communication since there is no printing or postage expenses involved.
- 24/7 any time access. At any time of the day or night, one can communicate with friends, relatives, professors and business associates.
- Messages remain permanent for future access from anywhere.
- Use of graphics such as colorful greeting cards and interesting pictures can be sent through e-mails.
- Advertising tool: many individuals and companies are using e-mails to advertise their products, services, etc.

Limitations of using email as means of communication.

- **Emails can spread viruses:** the recipient needs to scan the mails, as viruses are transmitted through them and have the potential to harm computer systems.
- **Spam and junk:** e-mails when used to send unsolicited messages and unwanted advertisements create nuisance called spam. Checking and deleting these unwanted mails can unnecessarily consume a lot of time, and it has become necessary to block or filter the unwanted e-mails by means of spam filters.
- **E-mail spoofing** is another common practice. Spoofing involves disguising as different sender by altering the e-mail headers or the addresses from which the mail is sent.
- **Hacking and email interception:** the act of unauthorized attempts to bypass the security mechanisms of an information system or network is termed as hacking. After the e-mail is sent and before it is received by the desired recipient, it "bounces" between servers located in different parts of the world. Hence, the e-mail can be intercepted by a professional hacker.
- **Misinterpretation:** one has to be careful while posting any kind of content through an e-mail. If typed in a hurry, the matter could be misinterpreted. Since the content posted via e-mails is considered informal, there is a chance of business documents going unnoticed. Thus, vital communications and especially those requiring signatures are not managed through e-mails
- **Crowded inbox:** over a period of time, the e-mail inbox may get crowded with mails. It becomes difficult for the user to manage such a huge chunk of mails.
- **Need to check the inbox regularly:** in order to be updated, one has to check his e-mail account regularly, which may be expensive in the long run.
- Email cannot be used without computers especially in remote areas without electricity.
- In case **one forgets his/her** password, signing in is not possible and this can lead to loss of information.
- Email may violate privacy in case someone else gets to know your user password since the other may check your mails.

2. The World Wide Web

WWW (simply the Web) is a worldwide collection of websites and servers that can be access over the Internet. A **website** is a collection of related web pages or resources on a web server.

The first page on a website is the **home page**. A **webpage** is a HTML document accessible to a web browser. Webpages are linked by **hyperlinks**.

A **web browser** (check previous notes) helps a user access the web.

Search engines
A **Search Engine** is a program that retrieves information from the web basing on the keywords from the user. Common search engines are: Google, Yahoo search, Wikipedia, Baidu, Bing search, Bing, Ask. Com

Browsing or surfing the web refers to exploring or navigating from one website to another. Every website is identified by a URL – **Uniform Resource Locator.**

A **URL** is a unique name that identifies a particular webpage on the web server. Ii can also mean an internet address of a particular webpage on the web.

A typical URL has two basic parts:
1. Protocol
2. Domain name

A **Protocol** is a standard or set of rules used by a computer to connect to the web to access resources. Common protocols are HTTP, FTP, etc.

A **domain name** is the name of the web server where the resources are located.
The general format of a URL is *protocol: //domain name*.

Consider the URL
http://www.Microsoft.com/learning/computer/tutorials.html

- **hhtp** is the protocol
- **www.Microsoft.com** is the domain name
- **learning** is the folder for the file
- **computer** is a subfolder for the file
- **tutorials.html** is the name of file or webpage

Some tines, more 2 codes are including on the domain name to identify the type of organization and country where it is located such as in http://www,mtn.co.ug. In this case, **co.ug** is called the **top level domain**.

Note: Search entries are called **keywords** and search results are called **hits**.

Some common searching techniques on the web

1. Use "quotation marks" to search as a phrase and keep the words linked together.
2. + and – can be used to include or exclude a word
3. Boolean syntax: enter words and connect with Boolean operators: and, or, not
   - And will include sites where both words are found. Uses: joining different topics eg (ie. "Global warming" and California).
   - Or - requires at least one of the terms is found uses: join similar or synonymous topics (i.e. "global warming" or "greenhouse effect")
   - Not – searches for the first term and excludes sites that have the second term uses: join similar or synonymous topics (i.e. Washington not school)

Other syntax:

- **The wildcard operator (*):** Google calls it the fill in the blank operator. For example, amusement *
- **Site search:** many web sites have their own site search feature, but you may use a search engine to get results from one website example: site:www.newvision.co.ug ICT in schools.
- **Related sites:** for example, related:www.youtube.com can be used to find sites similar to YouTube.

Types of websites

1. Web portal : an Internet-based website that can perform many electronic functions and provide the user with quick access to a variety of information and services. Eg. Uneb results portal

2. Content aggregator: combines information such as news and entertainment, sports scores, weather forecasts, photographs and video from a variety of sources and makes the combined content available to its customers e.g web-based feed readers like rss feeds, delicious.com, etc.

3. A wiki: a website that allows collaborative editing of its content and structure by its users. E.g. Wikipedia

4. A blog: a **blog** is a website in which journal entries are posted on a regular basis. A person who posts entries is called a **blogger**

Blog posts are typically displayed in reverse chronological order (the most recent post appears first).a majority are interactive, allowing visitors to leave comments.

Difference between a blog site and wiki site

Blog	**Wiki**
Blog usually has a single author	A wiki usually has many authors

Blog is usually in reverse chronological structure	A wiki has a structure determined by content and users
Blog is usually personal/someone's opinion	A wiki is usually objective
The public can't edit someone's blog, can only add comments to a blog.	A wiki can be edited by the public users.

4. Media sharing website

Media sharing sites allow you to upload your photos, videos and audio to a website that can be accessed from anywhere in the world. E.g youtube.com, dailymotion.com, blip.tv, slideshare.net, archive.org, podbean.com, and many, many others

5. Social networking website

An online service, platform, or site that focuses on building social relations among people who share interests by posting information, comments, messages, images, etc.

A type of website where users can seek others who share their interests, find out what's going on in their areas of concern, and share information with one another

Examples social networking sites include

- Facebook
- Twitter
- Google plus,
- Linkedn
- Whatsapp
- Instagram
- Youtube
- Pinterest
- Skype

Advantages of social networking websites

- **Staying connected:** the main purpose of social media is to be able to stay connected to friends and families the main purpose of social media is to be able to stay connected to friends and families
- **Finding people with common interests:** social networking is also a great way to meet peers.
- **Invaluable promotional tool:** companies, artists, etc. use social media for advertising to the masses
- **Information spreads incredibly fast**
  breaking news and other important information can spread like wildfire on social media sites.
- **Helps to catch and convict criminals: the police uses social media** to persecute criminals.

Disadvantages of social networking websites

- **Perpetuates false and unreliable information:** anyone can post any unverified rumours which cause panic and severe misinformation in society.
- **Causing major relationship problems:** online social interactions have cause many breakups.
- **Cyber bullying:** a new trend of cyber bullying is wreaking havoc all across the world. This is especially true with young kids publicly harassing one another, and posting mean or slanderous things which are broadcasted to the entire cyber world.
- **Used to profile and discriminate in the job world:** employers are using social media to pre-screen their applicants.
- **The addiction is real:** one of the biggest problems with the social media craze is that people are becoming more and more addicted to using it. It is the number one time waster at work, in school, and at home.
- **Privacy violation:** social networks may violate privacy in case someone else gets to know your user password.
- **Misinterpretation**: one has to be careful while posting any kind of information on social networks. If typed in a hurry, the matter could be misinterpreted

- **Evaluating the reliability of information found on a website**
- **Check the last part of the url.** The top level domain can help to identify reliability (for example .gov, .ac, .ed, .sch are usually fairly reliable, while.org, .co, .com are less reliable).
- **See if responsible bodies have endorsed the site** e.g. Uneb. If site is endorsed by reliable/reputable people/organizations it can be accepted as being reliable.
- **Checking the author's credentials**. If the author's credentials are good it is likely to be reliable.
- **Can compare information from sites to see if it is reliable**. If information is comparable to information from reliable/ authenticated/text books it is likely to be reliable.
- **Check the date of the last update.** If the date of the last update was a long time ago it is likely to be unreliable.
- **Are any advertisements present?** If site has excessive advertising it could be unreliable. If the advertising is related only to its own products it could be unreliable. If it has testimonials it is likely to be reliable.

Cloud computing

Cloud computing is Internet-based computing, whereby shared resources e.g hardware, software and information are provided to other devices on-demand. In simple terms, cloud computing is using the Internet to access someone else's software running on someone else's hardware in someone else's data center. Cloud computing operates on a similar principle as web-based email clients, allowing users to access all of the features and files of the system without having to keep the bulk of that system on their own computers. In fact, most

people already use a variety of cloud computing services without even realizing it such as gmail, google drive, google docs, etc.
The online software services 'on the cloud' have long been referred to as software as a service (saas) and the hardware as infrastructure as a service (iaas).

Advantages of cloud computing

- **Lower computer costs**:
  - You do not need a high-powered and high-priced computer to run cloud computing's web-based applications.
  - Since applications run in the cloud, not on the desktop pc, your desktop pc does not need the processing power or hard disk space demanded by traditional desktop software.
- **Improved performance**: with few large programs hogging your computer's memory, you will see better performance from your pc.
- **Reduced software costs**:
  - Instead of purchasing expensive software applications, you can get most of what you need cheaply, e.g most cloud computing applications today, such as the google docs suite better than paying for similar commercial software.
- **Better security**: by using encryption, information on the cloud is less accessible by hackers or anyone not authorized to view the data. As an added security measure, with most cloud-based services, different security settings can be set based on the user.

- **Instant software updates**:
  - Another advantage to cloud computing is that you are no longer faced with choosing between obsolete software and high upgrade costs.
  - When the application is web-based, updates happen automatically.
- **Improved document format compatibility**
  - You do not have to worry about the documents you create on your machine being compatible with other users' applications.

- **Unlimited storage capacity**: cloud computing offers virtually limitless storage on servers in powerful datacenters.
- **Increased data reliability/ safety**: unlike desktop computing, in which if a hard disk crashes and destroy all your valuable data, a computer crashing in the cloud should not affect the storage of your data.
- **Universal document access**: that is not a problem with cloud computing, because you can access it whenever you have a computer and an Internet connection.
- **Easier group collaboration**: multiple users can collaborate easily on documents and projects
- **Device independence**: even to a portable device, and your applications and documents are still available.

Disadvantages of cloud computing

- Requires a constant Internet connection: cloud computing is impossible if you cannot connect to the Internet. A dead Internet connection means no work.
- Does not work well with low-speed connections: web-based applications require a lot of bandwidth to download, as do large documents
- Features might be limited: many web-based applications simply are not as full-featured as their desktop-based applications. For example, you can do a lot more with Microsoft PowerPoint than with Google presentation's web-based offering.

Disadvantages of cloud computing

- **Can be slow-**even with a fast connection, web-based applications can sometimes be slower than accessing a similar softwareon your desktop pc. Everything about the program, from the interface to the current document, has to be sent back and forth from your computer to the computers in the cloud.
- **Stored data might not be secure**: with cloud computing, all your data is stored on the cloud. Any unauthorized users gaining access to your password may access confidential data.
- **Migration issues**: each cloud system uses different protocols and different apis, so your normal applications will have to be adapted to execute on these platforms.

Factors affecting the speed of an Internet connection:

- Computer processor speed
- Distance the data travels
- Traffic, number of users on the network
- Malware, spyware and viruses.
- Modem speed.
- Natural conditions
- Positioning of wireless access points
- Memory available.
- Computer Internet settings
- Technological circumstances such as loose connections of cables or maintenance works being done by the ISP.
- Cookies: over time, cookie files saved by websites in browser can compromise the speed.

Implications of the Internet (advantages/disadvantages)

- **Interactive communication**; Internet offers several communication tools such as emails, chatting, instant messaging, audio and video conferencing, online telephone calls etc.

- **Resource sharing**; data, information, software programs can be shared over the Internet.
- **Research**; Internet helps in conducting research using books online, encyclopaedia, audio and video tutorial to answer research questions.
- **Entertainment tools for leisure**; through on-line games, online chats, multimedia (audio, video) etc.
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Disadvantages of using the Internet

- Computer viruses can be spread over the Internet.
- Internet provides access to unsuitable material such as pornography, the biggest threat to healthy mental life.
- Theft of personal information: if you use the Internet, you may be facing grave danger as your personal information such as name, address, credit card number etc. Can be accessed by hackers or thieves.
- Spamming: spamming refers to sending unwanted e-mails in bulk, which provide no purpose and needlessly obstruct the entire system.
- Some people get addicted to the Internet, causing problems with their social interactions of friends and loved ones.
- The initial cost of connecting to the Internet is high. E.g. Buying computers.
- Many people are computer illiterate and so cannot use Internet, hence miss.
- There is a lot of wrong information on the Internet. Anyone can post anything, and much of it is garbage/ inaccurate.

Netiquette

- Netiquette: rules of behaviour when using the Internet "netiquette" refers to Internet etiquette. This simply means the use of good manners in online communication such as e-mail, forums, blogs, and social networking sites.
- It is important to use netiquette and communicate to people online in the same manner you would communicate physically.

Netiquette guidelines:

- **Be clear:** make sure the subject line (e-mail) or title (web page) reflects your content
- **Use appropriate language:** avoid sending abusive and emotional messages.
- Don't use all capital letters--it's equal to shouting or screaming

- **Be brief:** if your message is short, people will be more likely to read it
- **Make a good impression:** your words and content represent you; review/edit your words and images before sending.
- **Don't forward e-mail messages you receive** without permission of the original sender.
- **Obey copyright laws:** don't use others' images, content or use web site content without permission.
- **Do not send spam:** spamming is posting or e-mailing unsolicited e-mail, often advertising messages, to a wide audience (another way of thinking of it is electronic junk mail).
- **Don't respond to "flames" or personal attacks**
- Always keep messages brief and use proper grammar and spellings.
- Never read someone's private mail.
- Don't click on hyperlinks to unknown sites, especially on adverts and popups.
- Don't download attachments from unknown sources.
- Avoid impersonation.
- Adhere to the same standards of behaviour online that you follow in real life.
- Respect other people's time and bandwidth.
- Make yourself look good online.
- Respect other people's privacy.
- Logout or log off your account after use.
- Post only acceptable information that has no harm to the public.
- Remember you are not anonymous. What you write in an e-mail and web site can be traced back to you.
- Know where you are in cyber space.

9

ELECTRONIC DATABASES

Introduction to Database Managing Systems

A **Database Management system (DBMS)** refers an application program that lets users add, view, and work with the data in a database

A **database** is a collection of related data organized in a way that allows access, retrieval, use, updating, manipulation and maintenance.

Examples of databases

- Telephone books (directories)
- Customer address books
- Employee information forms
- Dictionaries
- Student registers
- Television guides etc.

Examples of Database Management System software

- Microsoft Office Access
- My Structured Query Language(SQL)
- My SQL Server
- Oracle
- Postgress
- Sqlite
- Amazon simple DB
- File Maker
- Informix
- ADABAS
- Teradata
- Microsoft SQL server
- IBM DB2
- Bento
- Borland Database Engine
- Dbase
- Foxpro
- Paradox

Functions of the Database Management Systems

- Enables one to create summary reports
- It provides an interface for a user to enter data
- Enables the use to create forms
- Allows easy access and retrieval of data
- Allows querying/filtering of some data

Categories of databases

A database can also be categorized as
- Paper/manual database or a

- computerized (electronic) database

An example of a paper database is a **personal address book** on the other hand; an **electronic inventory tracking system** is one example of computerized database

Common types of databases

- **A flat file** database is made up of only one table. It is easy to setup and use
- **A relational database** can take information from two or more tables, combines them into a new table or report using a key field.

Characteristics of databases

- The data is arranged in columns(fields) and rows(records)
- Each column has similar data items
- Each row contains information belonging to a single individual

Areas where a database can be used/applied

- **Report card generation:** a database can be used by schools to generate report cards and necessary academic summaries.
- **POS (Point of Sale**): in a supermarket, a database is used to design and automate a point of sale interface to manage money coming in, stock movement, e.t.c. E.g. Standard Supermarket in Kampala.
- **Banks**: a big database is used to manage details about a customer's transaction with the bank.
- **Electoral commission**: it manages a database archive for all eligible voters in a given country.
- **Data warehouses:** information bureau use a database to manage and distribute information to users for example information about air travel by various air companies.
- **Stores:** a database keeps consistent and reliable data. Very big stores used databases to store, manage and automate store records.

Advantages of using electronic database system

- It is easy to enter and retrieve data in a short period of time.
- Data is frequently updated after each single entry.
- An electronic database can store data for a very long period of time in an archive.
- An electronic database is flexible since it can be redesigned, to hold thousands of data.
- An electronic database can be used by many people at the same time.

- A database can be used by many people at the same time.
- Data is frequently updated after each single entry.
- Data is automatically saved as soon as data is entered into a database.

- Data can be retrieved in different formats e.g query, forms, reports, e.t.c

- Data can be retrieved in different formats e.g. Query, forms, reports, etc.
- An electronic database stores data that is consistent and reliable since at each stage, it is checked for consistency and reliability.

Disadvantages of electronic database system

- They are also difficult and time consuming to develop
- They are expensive to set up as they may require sophisticated programs and hardware.
- Data in a database may be more susceptible to sabotage, theft or destruction.
- It requires much time for training to be effective in using an electronic database
- They are very expensive to maintain and require initial cost
- They are very complicated and complex to us.
- They need technical requirements and knowledge.
- Require extra cost of hardware and software
- They consist of data failure.
- Consumes a lot of space on the hard drives
- Requires a lot of system currency and updating

Common terms in (or features) database management systems

1. **Field-**A field is a column in a table that contains a specific piece of information within a record.
2. **Record** A record is a row in a table that contains information about a given person, product, or event.
3. **Validation rule**-Is a method used to check that data falls within the appropriate range or parameter defined by the database user.
4. **Primary Key** Is a field that uniquely identifies a record in a table. Before saving a table, you should insert a primary key.
5. **Foreign key:** A key used in one table to represent the value of a primary key in a related table.
6. **Field name**- Database feature assigned to each field to identify the different fields
7. **Field properties**-Determine how data is handled, stored and manipulated -Further define data types and formats like field size, default values
8. **Data type**-Specify the kind of data a field can contain and how the field is used.
9. **Queries**-These allows you to filter and extract specified data from tables in the databases
10. **Relationships**: These are mainly used in relation to relational databases. Relationships allow relating tables with similar records and fields. One to one, One to Many, many to many relationships can

be created.
11. **Forms** allow you to enter or view data stored in your tables
12. **Reports** allow you to print data based on queries/tables that you have created

1. **Data entry**: the process of getting information into a database, usually done by people
2. **Objects**: these are the components that makeup a database. Examples of database objects include, tables, forms, queries, reports, modules, macros
3. **An entity:** is a person, place, thing, activity, or event for which data is collected
4. **A field:** is a single piece of information from a record. In a database table every column represents a field
5. **A record:** is a row on a datasheet and is a set of values defined by fields
6. **Field name (field labels):** is a title of a particular column in a database table e.g. Titles like **id no, name, sex, district, allowance**.
5. **Field length**: is the maximum number of characters that can be stored for data in a
Particular field.
6. **Data type (field type):** is an attribute which determines the kind of data which users can store in a field
7. **Data redundancy**: is the repeating of data in more than one file.
8. **Query:** is a database object used to request for specific type of data from a database table or combination of tables.
9. **Form:** is a database object that allows you to enter or view data stored in your tables.
10. **Report:** is a formatted screen display or printout of the contents of one or more tables in a database.
11. **Design view**: this provides the tools for creating fields in a table and other objects.
12. **Datasheet view**: allows one to update, edit and delete information from a table.
13. **Attribute**: a part of the description of an entity. The entity itself is described by one or more attributes e.g. The attributes for student can be name, address, telephone, etc.
14. Primary key (key field): is a field in a data file that uniquely identifies each record. It is also used to connect two or more tables in a database

Characteristics of a primary key

It uniquely identifies each record ie cannot have repeated values
It is never empty or null

15. **Foreign key:** is a primary key of one table that also appears in another table
16. Data integrity: is the degree to which the data in any file is accurate and up-to date.
17. **A string** is a data type used to represent text rather than numbers. It is comprised of a set of characters that can also contain spaces and

numbers.

18. Wild cards: is a special character that represents one or more other characters. Wild card characters may be used to represent a letter or letters in a word. Wild cards can be used in access queries to look for specific information

Wildcard	Description	Example
*	Matches any number of characters. You can use the asterisk (*) anywhere in a character string.	**Wh*** finds what, white, and why, bu not awhile or wat
?	Matches any single alphabetic character.	**B?Ll** finds ball, bel and bill.
[ ]	Matches any single character within the brackets.	**B[ae]ll** finds ball a bell, but not bill.
!	Matches any character not in the brackets.	**B[!Ae]ll** finds bill and bull, but not b or bell.
-	Matches any one of a range of characters. You must specify the range in ascending order (a to z, not z to a).	**B[a-c]d** finds bad, bbd, and bcd.
#	Matches any single numeric character.	**1#3** finds 103, 11 and 123.

19. Data normalization

The process of applying the normalization rules to your database design is called normalizing the database, or just normalization.

When do we use normalization rules?

When you want ensure that you have divided your information items into the appropriate tables i.e. When you want to see if your tables are structured correctly.

You apply the rules in succession, at each step ensuring that your design arrives at one of what is known as the "normal forms." five normal forms are widely accepted ie

The first normal form
Second normal form
Third normal form
Fourth normal form
Fifth normal forms

Database objects

These are the basic components that make up a database and they include:

Tables
Queries
Forms
Reports
Macros

Modules etc

Macros (mini programs):
These are tools used to automate the way one uses his database. Macros can be used to instruct the computer to print specific reports at a given time.
Macros in access can be thought of as a simplified programming language which you can use to add functionality to your database. For example, you can attach a macro to a command button on a form so that the macro runs whenever the button is clicked. Macros contain actions that perform tasks, such as opening a report, running a query, or closing the database. Most database operations that you do manually can be automated by using macros, so they can be great time-saving devices.

Modules:

A module is a collection of declarations, statements, and procedures that are stored together as a unit.
Modules, like macros, are objects you can use to add functionality to your database. Whereas you create macros in access by choosing from a list of macro actions, you write modules in the v**isual basic for applications (VBA).**

Visual basic for applications (VBA): is a macro-language version of **Microsoft visual basic** that is used to Microsoft windows-based applications and is included with several Microsoft programs.

Database tables

Characteristics of a good database table

- It should have a primary key
- It should have the required fields
- It should have required data types and formats

Data types in Microsoft access

Data type	**Stores**	**Size**
Text	**Alphanumeric characters** Use for text, or text and numbers that are not used in calculations (for example, a product id).	Up to 255 characters.
Memo	**Alphanumeric characters (longer than 255 characters in length) or text with rich text formatting.**	Up to 1 gigabyte of characters, or 2 gigabyt of storage (2 bytes per character), of which yo can display 65,535

		characters in a control.
Number	**Numeric values (integers or fractional values).** Used for storing numbers to be used in calculations, except for monetary values (use the currency for data type for monetary values).	1, 2, 4, or 8 bytes, or 16 bytes when used for replication id.
Date/time	**Dates and times.** Used for storing date/time values. Note that each value stored includes both a date component and a time component.	8 bytes.
Currency	Used for storing monetary values (currency).	8 bytes.
Autonumber	A unique numeric value that office access automatically inserts when a record is added. Use for generating unique values that can be used as a primary key. Note that autonumber fields can be incremented sequentially.	4 bytes or 16 bytes when used for replication id.
Yes/no	**Boolean values.** Use for true/false fields that can hold one of two possible values: yes/no or true/false, for example.	1 bit (8 bits = 1 byte).
Ole(object linking and embedding) object	**Ole objects or other binary data.** Use for storing ole objects from other Microsoft windows applications.	Up to 1 gigabyte.
Attachment	**Pictures, images, binary files, office files.** This is the preferred data type for storing digital images and any type of binary file. **Note** Field name should be written as a caption	For compressed attachments, 2 gigabytes. For uncompressed attachments, approximately 700k, depending on the degree to which the attachment can be compressed.
Hyperlink	Hyperlinks. Use for storing hyperlinks to provide single-click access to web pages through a url (uniform resource locator) or files through a name in unc	Up to 1 gigabyte of characters, or 2 gigabytes of storage (2 bytes per character), of which you can display 65,535 characters in a control.

	(universal naming convention) format. You can also link to access objects stored in a database.	
Lookup wizard	Not actually a data type; instead, this invokes the lookup wizard. Use to start the lookup wizard so you can create a field that uses a combo box to look up a value in another table, query or list of values.	Table or query based: the size of the bound column. Value based: the size of the text field used to store the value.

Note

- For phone numbers, part numbers, and other numbers you don't intend to use for mathematical calculations, you should select the text data type, not the number data type.
- For the text and number data types, you can specify the field size or data type more specifically by setting a value in the field size property box.

Field properties

Use this field property	To
Fieldsize	Set the maximum size for data stored as a text, number, or autonumber data type.
Format	Customize the way the field appears when displayed or printed.
Decimalplaces	Specify the number of decimal places to use wh displaying numbers.
Newvalues	Set whether an autonumber field is incremente or assigned a random value.
Inputmask	Display editing characters to guide data entry.
Caption	Set the text displayed by default in labels for forms, reports, and queries.
Defaultvalue	Automatically assign a default value to a field when new records are added.
Validationrule	Supply an expression that must be true whenev you add or change the value in this field.
Validationtext	Enter text that appears when a value violates th validationrule expression.
Required	Require that data be entered in a field.
Allowzerolength	Allow entry (by setting to yes) of a zero-length string ("") in a text or memo field.
Indexed	Speed up access to data in this field by creating

	and using an index.
Unicodecompression	Compress text stored in this field when a large amount of text is stored (> 4,096 characters)
Imemode	Control conversion of characters in an asian version of windows.
Imesentencemode	Control conversion of characters in an asian version of windows.
Smarttags	Attach a smart tag to this field.
Appendonly	Allow versioning (by setting to yes) of a memo field.
Textformat	Choose rich text to store text as html and allow rich formatting. Choose plain text to store only text.
Textalign	Specify the default alignment of text within a control.
Precision	Specify the total number of digits allowed, including those both to the right and the left of the decimal point.
Scale	Specify the maximum number of digits that can be stored to the right of the decimal separator.

If you want more space to enter or edit a property setting in the property box, press shift+f2 to display the **zoom** box. If you are entering an input mask or validation expression and would like help

in building it, click next to the property box to display the appropriate builder

Understanding input masks

An input mask is a set of literal characters and mask characters that control what you can and cannot enter in a field. For example, an input mask can require users to enter dates or telephone numbers that follow the conventions for a specific country/region

When and where to use an input mask

- You use an input mask whenever you want users to enter data in a specific way. For example, if you want users to enter phone numbers in the british format or german format, use an input mask.
- By default, you can apply input masks to table fields that are set to
    - The text,
    - Number (except replicationid),
    - Currency, and
    - Date/time data types.
- You can also apply input masks to form controls, such as text boxes, that you bind to table fields that are set to those data types.

How to use input masks
You can add input masks to table fields by running the input mask wizard, or by manually entering masks in a field property (the **input mask** property).

Input mask character reference

The following table lists and describes the placeholder and literal characters that you can use in an input mask.

Character	Use
0	Digit. You must enter a single digit in this position.
9	Digit. Single digits in this position are optional.
#	Enter a digit, a space, or a plus or minus sign in this positi If you skip this position, access enters a blank space.
L	Letter. You must enter a single letter in this position.
?	Letter. Single letters in this position are optional.
A	Letter or digit. You must enter a single letter or digit in thi position.
A	Letter or digit. Single letters or digits in this position are optional.
&	Any character or space. You must enter either a single character or a space in this position.
C	Any character or space. Characters or spaces in this positi are optional.
. , : ; - /	Decimal and thousands placeholders, date and time separators. The character you select depends on your Microsoft windows regional settings.
>	All characters that follow appear in uppercase.
<	All characters that follow appear in lowercase.
!	Causes the input mask to fill from left to right instead of fr right to left.
\	Forces access to display the character that immediately follows. This is the same as enclosing a character in doubl quotation marks.
"literal text"	Encloses any text that you want users to see in double quotation marks.
Password	In design view for tables or forms, setting the **input mask** property to **password** creates a password entry box. Whe users type passwords in the box, access stores the charact but displays asterisks (*).

Examples of input masks

The examples in the following table demonstrate some of the ways you can use input masks.

This input mask	Provides this type of value	Notes
(000) 000-0000	(206) 555-0199	In this case, you must must ente an area code because that secti of the mask (000, enclosed in parentheses) uses the 0 placeholder.
(999) 000-0000!	(206) 555-0199 ( ) 555-0199	In this case, the area code secti uses the 9 placeholder, so area codes are optional. Also, the exclamation point (!) Causes th mask to fill in from left to right.
(000) aaa-aaaa	(206) 555-tele	Allows you to substitute the las four digits of a u.s. Style phone number with letters. Note the u of the 0 placeholder in the area code section, which makes the a code mandatory.
#999	-20 2000	Any positive or negative numbe no more than four characters, a with no thousands separator or decimal places.
>l????L?000l0	Greengr339m3 may r 452b7	A combination of mandatory (l) and optional (?) Letters and mandatory numbers (0). The greater-than sign forces users t enter all letters in uppercase. T use an input mask of this type, y must set the data type for the ta field to **text** or **memo**.
00000-9999	98115- 98115-3007	A mandatory postal code and ar optional plus-four section.
>l<?????????????	Maria pierre	A first or last name with the firs letter automatically capitalized.

Isbn 0-&&&&&&&&&-0	Isbn 1-55615-507-7	A book number with the literal text, mandatory first and last digits, and any combination of letters and characters between those digits.
>ll00000-0000	Db51392-0493	A combination of mandatory letters and characters, all uppercase. Use this type of input mask, for example, to help users enter part numbers or other forms of inventory correctly.

Query

A Query is a database object used to request for specific type of data from a database table or combination of tables.
This is achieved through the use of query criteria

A query criterion is a rule that identifies the records that you want to include in the query result.

Use this criterion	**Query result**
"china"	Returns records where the value in the fie is set to china.
Not "mexico"	Returns records where the value in the fie is set to any other value in the field other than mexico.
Like a*	Returns records for all fields whose values start with "a", **Note** when used in an expression, the asterisk (*****) represents any string of characters — it is also called a **wildcard character**.
Like "*korea*"	Returns records for all fields that contain t string "korea".
K*and*i *d* K*or b* <>john *e or *i	
Not like u*	Returns records for all fields whose names start with a character other than "u".
Not like "*korea*"	Returns records for all fields that do not contain the string "korea".
Like "*ina"	Returns records for all fields whose names end in "ina", such as china and argentina.

Not like "*ina"	Returns records for all fields that do not end in "ina", such as china and argentina.
Is null	Returns records where there is no value in the the field.
Is not null	Returns records where the value is not missing in the field.
"" (a pair of quotes)	Returns records where the field is set to a blank (but not null) value.
Not ""	Returns records where the field has a nonblank value.
"" or is null	Returns records where there is either no value in the field, or the field is set to a blank value.
Is not null and not ""	Returns records where the field has a nonblank, non-null value.
>= "mexico"	Returns records of all fields with values beginning with mexico and continuing through the end of the alphabet.
Like "[a-d]*"	Returns records for fields whose values start with the letters "a" through "d".
"usa" or "uk"	Returns records for usa and uk.
In("france", "china", "germany", "japan")	Returns records for all fields with values specified in the list.
Right([value in the], 1) = "y"	Returns records for all fields where the last letter is "y".
Len([country/region]) > 10	Returns records for countries/regions whose name is more than 10 characters long.
Like "chi??"	Returns records for fields with values, such as china and chile, whose names are five characters long and the first three characters are "chi".

Criteria for number, currency, and autonumber fields

Use this criterion	**Query result**
100	Returns records where the value is 100.
Not 1000	Returns records where the value is not 1000.
< 100	Returns records where the value is less than 100 (<100).
<= 100	Displays records where the value is less than or equa to 100.
20 or 25	Returns records where the value is either 20 or 25.
>10 and <90	Returns records where the value is between (but not including) 10 and 90
Between 50 and 100	Returns records where the value is between (and including) 50 and 100

<50 or >100	Returns records where the value is not between 50 and 100.
In(20, 25, 30)	Returns records where the value is either 20, 25, or 30.
Like "*4.99"	Returns records where the value ends with "4.99", such as 4.99, 14.99, 24.99, and so on.
Is null	Returns records where no value is entered in the field.
Is not null	Returns records where the value is not missing in the field.

Criteria for date/time fields

Use this criterion	**Query result**
#2/2/2006#	Returns records with date set to feb 2, 2006. **Note** Remember to surround date values with the # character so that access can distinguish betwee date values and text strings.
Not #2/2/2006#	Returns records that took place on a day other tl feb 3, 2006.
5/*/* 5/10/*	Displays all records on 5th of any month of any y
/6/ */*/2012	All records with the month of june
< #2/2/2006#	Returns records that took place before feb 2, 20
> #2/2/2006#	Returns records that took place after feb 2, 200
>#2/2/2006# and <#2/4/2006#	Returns records took place between feb 2, 2006 and feb 4, 2006. You can also use the **between** operator to filter a range of values. For example, between #2/2/2006# and #2/4/2006# is the same as >#2/2/2006# and <#2/4/2006# .
<#2/2/2006# or >#2/4/2006#	Returns records took place before feb 2, 2006 or after feb 4, 2006.
#2/2/2006# or #2/3/2006#	Returns records that took place on either feb 2, 2006 or feb 3, 2006.
In (#2/1/2006#, #3/1/2006#, #4/1/2006#)	Returns records that took place on feb 1, 2006, march 1, 2006, or april 1, 2006.
Datepart("m", [salesdate]) = 12	Returns records that took place in december of a year.
Datepart("q", [salesdate]) = 1	Returns records that took place in the first quart of any year.
Date()	Returns records that took place on the current d If today's date is 2/2/2006, you see records whe the date field is set to feb 2, 2006.
Date()-1	Returns records that took place the day before tl current day. If today's date is 2/2/2006, you see records for feb 1, 2006.

Date() + 1	Returns records that took place the day after the current day. If today's date is 2/2/2006, you see records for feb 3, 2006.
< date()	Returns records that took place before today.
> date()	Returns records that will take place after today.
Is null	Returns records where the date is missing.
Is not null	Returns records where the date is known.
Datediff ("yyyy", [birthdate], date()) > 30	This criterion applies to a date/time field, such as birthdate. Only records where **the number of years between a person's birthdate and today's date is greater than 30** are included in the query result.

The database design process

The design process consists of the following steps:

- **Determine the purpose of your database**
  This helps prepare you for the remaining steps.
- **Find and organize the information required**
  Gather all of the types of information you might want to record in the database, such as product name and order number.
- **Divide the information into tables**
  Divide your information items into major entities or subjects, such as products or orders. Each subject then becomes a table.
- **Turn information items into columns**
  Decide what information you want to store in each table. Each item becomes a field, and is displayed as a column in the table. For example, an employees table might include fields such as last name and hire date.
- **Specify primary keys**
  Choose each table's primary key. The primary key is a column that is used to uniquely identify each row. An example might be product id or order id.
- **Set up the table relationships**
  Look at each table and decide how the data in one table is related to the data in other tables. Add fields to tables or create new tables to clarify the relationships, as necessary.
- **Refine your design**
  Analyze your design for errors. Create the tables and add a few records of sample data. See if you can get the results you want from your tables. Make adjustments to the design, as needed.
- **Apply the normalization rules**
  Apply the data normalization rules to see if your tables are structured correctly. Make adjustments to the tables, as needed.

Factors to consider before designing a database

- size and nature of the work that need to be entered into a database.

- number of users of the database.
- how the database will be administered.
- future needs of the organization.
- initial cost for designing.
- applicationto use (on the programming side).

Data validation

Validation - is the process of comparing the data entered with a set of predefined rules or values to check if the data is acceptable. Or validation is the name for the checks that detect incorrect data, display an error message and request another input or just reject the data.

Data validation - is the checking of input data for errors (e.g., of the correct data type) before processing.

Validation checks used in a database

- **Alphabetic check:** ensures that only alphabetic characters are entered into the field
- **Numeric checks:** ensures that only numeric data is entered into the field
- Consistency check: test checks fields to ensure data in these fields corresponds, e.g., if title = "mr.", then gender = "m".
- **Check digits:** this confirms the accuracy of a primary key value. It is usually appended to or inserted into a primary check
- **Cross-system consistency checks:** compares data in different systems to ensure it is consistent, e.g., the address for the customer with the same id is the same in both systems.
- **Data type checks**: checks the data type of the input and give an error message if the input data does not match with the chosen data type, e.g., in an input box accepting numeric data, if the letter 'o' was typed instead of the number zero, an error message would appear.
- **Range check:** checks that the data lie within a specified range of values, e.g., the month of a person's date of birth should lie between 1 and 12.
- **Spelling and grammar check**: looks for spelling and grammatical errors.

Validation rules

This prevents bad data from being saved in your table. Basically, they look like criteria in a query.

Validation rule	Validation text
<>0	Enter a nonzero value.
>=0	Value must be zero or greater.

	-or- You must enter a positive number.
0 or >100	Value must be either 0 or greater than 100.
Between 0 and 1	Enter a value with a percent sign. (for use with a field that stores number values as percentages).
<#01/01/2007#	Enter a date before 2007.
>=#01/01/2007# and <#01/01/2008#	Date must occur in 2007.
<date()	Birth date cannot be in the future.
M or f	Enter m for male or f for female.

Data validation checks

1. **Presence check** is to make sure that data is actually present.
2. **Length check** is to make sure that the number of characters entered is within the limit.
3. **Range check** is to make sure that the data entered lies within a certain range.
4. **Type check** (also known as character check or alphanumeric check) is to make sure that the data entered is of the correct data type (e.g., numeric or alphabetic).
5. **A check digit** is an extra digit appended to a code consisting of a series of numbers or characters to detect errors arising from transcription

10

SYSTEM SECURITY, ICT ETHICAL ISSUES AND EMERGING TECHNOLOGIES

Computer System Security

Computer security or cyber security
It refers to the protective measures applied to computing devices such as computers and computer networks
Or
It is the protection of computer equipment, information and services from unauthorized access, use, change or destruction. It involves ensuring data integrity, limiting access to unauthorized users, and maintaining data and information confidentiality.

Computer data integrity refers to methods and procedures of ensuring that data is real, accurate and safeguarded from unauthorized user modification in the computer.

Data confidentiality

Information security means protecting information and systems from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction.

Physical security refers to the measures put in place to protect computer systems from physical damage and other physical security risks. Physical security measures include the following:

- Locking doors and windows
- Burglar proofing.
- Constructing parameter fences
- Employing security guards
- Extra protection of server room environments also known as optimization.
- Constructing strong concrete walls
- Installing lightening conductors
- Installing fire extinguishers
- Strategic server and storage placement

Computer security risks and threats

A computer security risk is an action that causes loss of or damage to computer system**.**

Common security risks to computer information systems, private or confidential data include:

- System failure
- Information theft
- Computer viruses, worms and Trojan horses
- Unauthorized access and use
- Hardware theft
- Software theft
- Fire outbreaks
- Unauthorized alteration
- Malicious destruction of hardware software, data or network resources
- As well as sabotage and other computer crimes

Security threats to hardware and software

Some of the causes of computerized information system failure include

- Hardware failure due to improper use.
- Unstable power supply as result of brownout or blackout and vandalism.
- Network breakdown
- Natural disaster such as floods
- Program failure due to viruses, etc.
- Hardware theft is act of stealing computer equipment and components.
- Hardware vandalism is act of defacing or destroying computer equipment
- Software theft is the act of stealing or illegally copying software or intentionally erasing programs.
- Software piracy is illegal duplication of copyrighted software. To guard against software theft and piracy, product activation is used.

Product activation allows user to input product identification number online or by phone and receive unique installation identification number

A License agreement gives the right to use software. Single-user license agreement allows user to install software on one computer, make backup copy, and sell software after removing from computer.

Control measures against hardware failure

- Protect computers against brownout or blackout using surge protectors and uninterruptible power supply
- For critical systems, use a fault tolerant systems
- A fault tolerant system has redundant or duplicate storage, peripherals devices and software that provide a fail-over capability to backup components in the event of system failure.
- Ensure disaster recovery plans which involve establishing offsite storage of data so that in case of disaster or fire accidents, the company has backup copies to reconstruct lost data

Computer Crimes

A computer crime is an illegal act which involves the use of computers and information technology. It also refers to the criminal offence illegal or unauthorized use of computer technology to manipulate critical user data.

Or

It refers to any crime that is committed on, with or to a computer or network.

Computer criminals use computer systems for illegal access to a computer system intending to damage, delete or alter computer data or information and other resources.

Forms of common computer crimes

1. **Hacking** - breaking into a computer system to illegally access information stored on it. It may involve hacking of IP addresses to transact with false identity

2. **Phishing** - the act of attempting to acquire sensitive information like usernames, passwords and credit card details by disguising as a trustworthy source. It is carried out through emails or by luring the users to enter personal information through fake websites.

3. **Cyber stalking** - use of communication technology, mainly the Internet, to torture other individuals such as through false accusations, transmission of threats and damage to data and equipment.

4. **Physical theft** - breaking into an office or firm and stealing computers, hard disks and other valuable computer accessories. The reason behind this may be commercial, destruction to sensitive information or sabotage

5. **Electronic Fraud** is stealing by false pretense. Fraudsters can be either employee in a company, non-existent company that purports to offer Internet services. It also involves computerized production and use of counterfeit documents

6. **Sabotage** refers to illegal destruction of data and information with the aim of crippling services delivery, or causing great loss to an organization.

7. **Surveillance** refers to monitoring use of computer system and networks using background programs such as spyware and cookies. The information gathered may be used for further crimes such as sabotage.

8. **Identity theft** refers to the act of pretending to be someone else by using another person's identity

9. **Computer industrial espionage** involves stealing of trade secrets or spying through technology means for bribery, blackmail, etc.

10. **Software piracy**-the illegal act of duplicating copyrighted software.

11. **Phreaking** refers to the act of illegally breaking into a communication system to make calls without paying

12. **Unauthorized use** refers to the use of a computer or its data for illegal/unapproved activities.

13. **Spoofing** is a malicious practice in which communication is sent from an unknown source disguised as a source known to the receiver.

14. **Spamming** refers to the sending of unwanted e-mails.

15. **Knowingly selling** is the act of distributing and selling child pornography.

16. **Denial of service attack** is an attack designed to render the system unusable. Attackers can deny service to individual victims, such as by deliberately entering a wrong password enough consecutive times to cause the victim account to be locked or blocked or overload the capabilities of a machine or network and block all users at once

17. **Eavesdropping** is the act of secretly listening to a private conversation, typically between hosts on a network or telephone conversations. - For instance, programs such as Carnivore and Narusinsight have been used by the FBI and NSA to eavesdrop on the systems of Internet service providers.

18. **Cyber extortion** is a form of cyber terrorism in which a website, e-mail server, or computer system is subjected to repeated denial of service or other attacks by malicious hackers, who demand money in return for promising to stop the attacks.

19. **Information disclosure** (privacy breach or data leak) is a situation where information, thought to be secure, is released in an untrusted environment.

20. **Piracy** means illegal copying of software, information or data that is protected by copyright and patent laws.

21. **Developing and distributing** computer viruses
22. **Cyber terrorism**
23. **Cyber bullying**
24. **Cyber harassment**
25. **Alteration**
26. **Industrial espionage**
27. **Accidental access**

Control measures against theft

- Employ security agents to keep watch over information centers and restricted backup sites.

- Reinforce weak access points like windows, door and roofing with metallic grills and strong padlocks.
- Motivate workers so that they feel a sense of belonging to be proud and trusted custodians of the company resources.
- Insure the hardware resources with a reputable insurance firm.

Control measures against piracy

- Enforce laws that protect the owners of data and information against piracy.
- Make software cheap enough to increase affordability.
- Use licenses and certificates to identify original software.
- Set installation passwords that deter illegal installation of software.

Computer Malware

Malware (short for malicious software) is any software used to disrupt computer operation, gather sensitive information, or gain access to private computer systems.

Malware include computer viruses, worms, Trojan horses, ransom ware, spyware, adware, scare ware, and other malicious programs. Malware is often disguised as, or embedded in, non-malicious files.

Computer viruses

A computer virus is a program designed specifically to damage, infect and affect other programs, data or cause irregular behavior to the computer.
Or
A computer virus is a piece of software that can replicate itself and infect a computer, data and software without the knowledge of the user.

Symptoms of a virus infected computer

Symptoms of computer viruses

- System freezing and failure becomes very often
- A computer displays unfamiliar graphics or images on the screen
- Scary or warning and annoying messages starts popping up on the screen
- Unknown posts starts appearing on the user's pages
- There is denial of access to some system tools and files
- Files start disappearing mysteriously from the computer's memory
- The system speed reduces and the computer slows down
- There is alteration of computer files
- The computer shuts down and restarts itself without any command
- Files are corrupted and altered
- There is duplication of computer flies
- The computer creates unnecessary shortcuts

- There is unexpected anti-virus disabling
- There is loss of computer memory or disk space
- Storage disks change volumes and names
- There is change of the key stroke
- System setting are changed and access to disk drives reduces
- Programs start loading slower than usual
- Some programs start loading themselves
- The computer fails to boot normally and displays unusual error messages
- Program sizes change from those of the installed versions
- Unusual system operations such as change of the menu screens
- Unusual sounds start playing without the user's consent
- The computer reboots in the middle of a task or execution

Types of viruses

1. **A boot sector virus-**this executes when a computer starts up because it resides in the boot sector of a floppy disk or the master boot record of a hard disk.

2. **A file virus-**this attaches itself to files, and is loaded into memory when the infected is run.

3. **A macro virus** -this uses the macro language of an application (e.g., word processor or spread sheet) to hide the virus code.

4. **A logic bomb-**this is a virus that activates when it detects a certain condition.

5. **A time bomb-**this is a kind of logic bomb that activates on a particular date.

6. **A worm** -this copies itself repeatedly in memory or on a disk drive until no memory or disk space remains, which makes the computer stops working.

7. **A Trojan horse** -this is one that hides within or looks like a legitimate program, but executes when a certain condition or action is triggered.

8. **A polymorphic virus** -this modifies its code each time it attaches itself to another or file, so that even an antivirus utility has difficulty in detecting it

9. **Scare-ware** is a type of malware designed to trick victims into purchasing and downloading useless and potentially dangerous software. – scare-ware, which generates pop-ups that resemble windows system messages, usually purports to be antivirus or antispyware software, a firewall application or a registry cleaner.

10. **Adware**-the term **adware** is frequently used to describe a form of malware (malicious software), usually that which presents unwanted

advertisements to the user of a computer. The advertisements produced by adware are sometimes in the form of a pop-up.

11. **Spyware** is software that aids in gathering information about a person or organization without their knowledge and that may send such information to another individual without the consumer's consent, or that claims control over a computer without the consumer's knowledge.

12. **A blended threat** is a more sophisticated attack that combines some of the worst aspects of viruses, worms, Trojan horses and other malicious codes into one single threat.

Ways through which viruses are activated

- Opening an infected file
- Running an infected program
- Starting up the computer with an infected floppy disk, flash disk

Ways through which viruses are spread

- Through e-mail attachments.
- Rogue websites. E.g. Some adult sites, gambling sites, etc.
- Sharing infected disks.
- Through networks.
- Through infected software.
- Hackers.
- Through downloads from the Internet.
- Through software updates

Precautions to prevent virus infection

- Ensure that the e-mail is from a trusted source before opening or executing any e-mail attachment.
- Install an antivirus utility and update its virus definitions frequently for detecting and removing viruses.
- Never start up a computer with a floppy disk in the floppy drive.
- Scan all floppy disks and files for possible virus infection before opening them.
- Set the security level for macros in an application so that the user can choose whether or not to run potentially unsafe macros.
- Write-protect the recovery disk before using it.
- Back up important files regularly.
- Ensure that there is a policy of how computers are used and protected.

How to protect data from viruses in a computer system

- Make a back-up of all important files.
- Always update your software.

- Perform regular maintenance.
- Scan all disks from other computers.
- Protect your password and change it after some time.
- Use anti-virus software.

Anti-virus software

Antivirus software is a utility program that looks for and eradicates a wide range of problems, such as viruses, Trojan horses, and worms.

Examples of anti-virus software

- Avg anti-virus
- Avira anti-virus
- Norton anti-virus software
- Kaspersky anti-virus
- Avast anti-virus
- SMADAV USB anti-virus

Ways through which a computer system can be protected

- **Installing antivirus program**: - computer programs that attempt to identify, prevent and eliminate computer viruses and other malicious software (malware).

- **Installing firewall** - this serves as a gatekeeper system that protects a company's intranets and other computer networks from intrusion by providing a filter and safe transfer point for access to and from the Internet and other networks.

- **Data encryption** - this method is used to alter the information in a form that it cannot be understood or followed by other people during transmission.

- **Data backup** - frequently duplicate (copy) the information to different storage devices such as external hard disk to be able to recover their information in case of a disaster.

- **User id and passwords** - this is to restrict access to the computer systems, only allowing authorized users.

  A **password** is a secret code that combines characters and numbers that allow a user to access a computer or a network.

- **Access rights** - access rights help to protect the IT system and the data stored on the system by restricting who can do what. Most company networks will be set up so that different users have appropriate levels of

access rights. For example a manager of the company will have higher level access right than his subordinate staffs.

- **Audit trails or logs** - network managers should ensure that their system is able to create an audit log that will record every important event in an 'audit file such as who logged on to the system at what time and onto which computer, which files were opened, altered, saved or deleted or log events such as attempts to access proxy servers

  Rules for creating secure passwords

  1. Do not use your name or names of your close friends.
  2. Mix alphabetic and numeric characters. Never use an all-numeric password such as phone numbers
  3. Use long passwords to make it hard for an attacker to forge
  4. Use different passwords for the different computers or network nodes

- **Intellectual property (IP)**

  Is a legal term that refers to creations of the mind that such as software, music, literature, discoveries and inventions.

- **Intellectual property rights** are the rights given to persons over the creations of their minds. They give the creator exclusive rights over the use of their creation for a certain period of time. -

  Intellectual property rights include
  - Patent rights
  - Copyright
  - Industrial design rights
  - Trademarks
  - Trade dress
  - Trade names
  - And trade secrets

  A patent right grants an inventor the right to exclude others from making, using, selling, offering to sell, and importing an invention for a limited period of time, in exchange for the public disclosure of the invention.

  A copyright is the exclusive legal right that prohibits copying of intellectual property without permission of the copyright holder.

  A trademark is a recognizable sign, design or expression which distinguishes products or services of a particular trader from the similar products or services of other traders.

- **Data encryption/Cryptography** is the process of scrambling plaintext (ordinary text) into an unreadable format (encryption), then back again (decryption)

It includes techniques such as microdots, merging words with images, and other ways to hide information in storage or transit.

- **Use of biometrics. A Biometric device or system is** the one that identifies a person by the measurement of their biological features.

Common examples of biometric devices

- A **fingerprint scanner** captures curves and indentations of a fingerprint
- A **hand geometry system** can measure the shape and size of a person's hand
- **A face recognition system** captures a live face image and compares it with a stored image
- A **voice recognition system** compares a person's live speech with their stored voice pattern
- **A signature verification system** recognizes the shape of handwritten signature of a person
- **An iris recognition system** reads patterns in the tiny blood vessels in the back of the eye, which are as unique as a fingerprint.

Computer Ethics

These refer to a set of moral principles that regulate the use of computers. The human values and moral conduct relating to right and wrong decision made when using computers.
Or
Moral guidelines that govern use of computers and information systems

A code of conduct is a written guideline that helps determine whether a specific action is ethical or unethical.

The useful ethical principles

- An act is ethical if society benefits from the act.
- An act is ethical if people are treated as an end and not as a means to an end.
- An act is ethical if it is fair to all parties involved.

Computer ethics involves use of computers & software in morally acceptable way. Standards or guidelines are important in this industry, because technology changes are outstripping the legal system's ability to keep up

Computer ethics for computer professionals

- According to the association for computing machinery (ACM) code, a good computing professional:
- Contributes to society and human well-being.

- Always avoids harm to others.
- Should be honest and trustworthy.
- Should exercise fairness and takes action not to discriminate.
- Honors property rights, including copyrights and patents
- Gives proper credit when using the intellectual property of others.
- Respects other individuals' rights to privacy.
- Honors confidentiality.

Information privacy

It refers to the right of individuals and companies to restrict collection and use of information about them.

Private data or information should not be accessed or disclosed to any other person unless permitted by the owner.

Data held by an organization or government that should be disclosed to authorized people only is said to be **confidential**

Concerns related to collection and use of private data

- Data should not be disclosed to other people without the owner's permission.
- Data and information should be kept secured against loss or exposure
- Data and information should be kept longer than necessary
- Data and information should be accurate and up to date.
- Data and information should be collected, used and kept for specified lawful purposes.

Some ways to safeguard personal information

- Limit information you provide to web sites; fill in only required information
- Inform merchants that you do not want to distribute your personal information
- Set up a free e-mail account to use for merchant forms
- Sign up for e-mail filtering through your Internet service provider or use an anti-spam program
- Do not reply to spam for any reason
- Install a personal firewall
- Turn off file and print sharing on your Internet connection
- Surf the web anonymously with such as freedom web secure or through an anonymous web site such as anonymizer.com
- Install a cookie manager to filter cookies
- Clear your history file when you are finished browsing.

Unethical computer codes of conduct

- Modifying certain information on the Internet
- Selling information to others without the owner's permission
- Using information without authorization
- Invasion of privacy
- Involving in the stealing of software.
- All other computer crimes

Computer ethics to be put in place

- Respect the privacy of others.
- Always identify the user accurately
- Respect copyrights and licenses
- Respect the intellectual property.
- Respect the integrity of the computer system.
- Exhibit responsible and sensible use of hardware and software

EMERGING TECHNOLOGIES

These are innovations and advancements in the use of new technological tools that make technology more amazing. It covers the rapid evolution of computers and information technology with the future trends in computer and ICT

Application areas of specific emerging technologies

1. **Affective computing** - is the study and development of systems and devices that can recognize, interpret, process, and simulate human feelings and emotion. It is an interdisciplinary field spanning computer science, psychology, and cognitive science.

2. **Ambient intelligence (AMI)** refers to electronic environments that are sensitive and responsive to the presence of people.

3. **Artificial intelligence (AI)** refers to a branch of computer science that involves the development of machines that emulate human qualities such as learning, thinking, and reasoning, communication, seeing and hearing.

   There are four main application areas of artificial intelligence namely:

   - **Expert systems** are computers that are programmed to make decisions basing on the data given to them. They operate at the level of human expert in specific applications for example; medical expert systems can diagnose patient's illness basing on symptoms entered.
   - **Natural language processing systems** can understand different human languages spoken to them
   - **Artificial neural networks**

- **Robotics or perception systems**, machines are programmed to imitate man
- **Game playing systems**, computer systems developed to play against humans

Types of robots

- **Industrial or manufacturing robots** used to perform repetitive tasks in industries such as welding, assembling parts, automation
- **Carrier robots** used by the military to carry heavy loads over dangerous terrain
- **Domestic robots** used in homes to do home activities such as cooking, cleaning such as vacuuming
- **Exploration robots** used to visit and send images to and from planets such as mars

Application of robots

- Doing dangerous jobs such as disposing and defusing bombs on battlefields, spraying cars with toxic paint, cleaning up nuclear waste etc.
- Exploring extreme environments such as inside volcanoes, planets, under oceans
- Doing repetitive tasks in industries such as on production lines, packing, welding
- Moving heavy objects such as installing heavy engines, moving pallets of items
- Search and rescue operation in building destroyed by earthquakes
- In hospitals to do extensive surgery operations

Impact of robotics on everyday life

- Increased personal time since robots can do home activities
- More efficient production since robots can be used in manufacturing products such as cars more faster and cheaply
- Safer working environment such as defusing bombs in battlefields
- Loss of jobs when robots replace human labor

4. **Bioelectronics** is a technology that combines biology with electronics for example in biological fuel cells, bionics and biomaterials for information processing, information storage, electronic components and actuators.

5. **Digital forensics** refers to the science that involves the recovery and investigation of material found in digital devices often in relation to computer crime.

Main application areas of digital forensic

- Legal consideration use of digital evidence in court
- Law enforcement
- Criminal prosecution
- Military intelligence
- Insurance agencies
- Tax investigations
- Information security departments
- Police and investigation department
- Telecommunication companies to track lost or stolen devices
- Gathering evidence from crime scenes
- Application of digital forensic such as electronic discovery, intrusion etc.
- Forensic process-analysis and reporting

Branches of computer forensics include mobile device forensic and network forensic

6. Biometric devices

It is a technology where human body parts are used for identification. Biometrics is the identification of a person by the measurement of their biological features.

Types of biometric devices

- A fingerprint scanner captures curves and indentations of a fingerprint
- A hand geometry system can measure the shape and size of a person's hand
- A face recognition system captures a live face image and compares it with a stored image
- A voice recognition system compares a person's live speech with their stored voice pattern
- A signature verification system recognizes the shape of handwritten signature of a person
- An iris recognition system reads patterns in the tiny blood vessels in the back of the eye, which are as unique as a fingerprint.

Impact of biometrics on everyday life

- Better transport security for example face recognition systems are being used on airport to identify people
- Increased building security for example fingerprint and face locks are being used to identify legitimate owners of houses
- Reduced car theft, cars with fingerprint door locks are in place now
- More secure mobile phones as modern phones have face or fingerprint locks

7. **Cloud computing** refers to Internet based computing. It involves deploying groups of remote servers and software networks that allow centralized data storage and online access to computer services or resources.

8. **Future Internet.** As wireless and mobile technology advance, different types of portable devices, including laptops, smart phones and tablets are able to be connected.

9. **Virtual reality** - is the branch of computer science that involves creation of an artificial environment that users can interact with as if it is real. Virtual reality is commonly applied in computer games, simulations, etc.

   Applications of VR

   - Allowing architects to create and move around a virtual version of their design
   - Training soldiers in combat (flight simulation, battlefield simulation)
   - Training pilots for flights
   - Training surgeons, virtual patients can be operated to build experience of the trainees
   - Playing computer games such as Need4speed

   Impact of VR on our daily life

   - Improved medical workers
   - Large and stronger buildings
   - Training in dangerous situations
   - More realistic education for example in astronomy

   Equipment needed in virtual reality

   - Eye goggles that create 3d images in the real world
   - Special gloves that detect hands and finger movements into the computer for processing
   - Headphones
   - Headgears
   - Powerful computers

10. **Computer vision**-includes methods of acquiring, processing, analyzing, understanding images so as to produce symbolic information.

11. **Quantum cryptography** is the encryption of data with tiny light particles called photons. Encryption is the conversion of digital data and information into an unreadable form such that unauthorized people cannot read it.

    Impact of quantum cryptography

- Secure voting, votes can be secured such that they are not changed or altered
- Completely secure communication for example in military
- Secure bank transfers. Some banks are using this technology to have secure money transactions
- Secure personal information transfer

12. **Computer aided translation** is where a human translator uses computer software to help in the translating process

13. **3D Holographic Imaging (Holograms).** This is a techniques where images re made to appear three dimensional and to actually have depth.

Impact of 3D Holographic Imaging (Holograms)

- Improved security of documents such as certificates, credit cards, id cards, bank notes to avoid forgeries
- Better movie experience, this technology is being used to create more interesting rich-effect movies for example by the Hollywood.

Implications of emerging technologies

- Technophobia/techno stress
- Loss of jobs say for massagers in case of networking
- Health issues for eye defects, back pain.
- Fear of cost of retaining or learning new skills
- Fear of increased electricity and subscriptions costs
- Fear of computer related crimes like forging of documents
- Fear of loss of man-hours through computer games and video during working hours
- Data loss by virus and system crashing
- Computer related errors and accident
- Unemployment//redundancy//financial/family problems.
- Local businesses/economy affected
- Possible increase in crime (idle youth)
- People leaving community (to find other work)
- Opportunities for high skilled/programming jobs

THE ICT INDUSTRY

Careers in the ICT Field

Computer professionals

A computer professional is a person working in the field of information technology. A person who has undergone advance training in a computer-related field
Or

A person who has an extensive knowledge in the area of computing

1. **Computer operator**. Some of the responsibilities of a computer operator include;
   - Entering data into the computer for processing.
   - Keeping up-to-date records (log files) of all information processing activities.

2. **Computer technician**
   - Troubleshooting computer hardware and software related problems.
   - Assembling and upgrading computers and their components.
   - Ensures that all computer accessories such as printers modems, storage media devices are in good working condition.

3. **Computer engineer**
   - Design and develop computer components such as storage devices, motherboards and other electronic components.
   - Determine the electrical power requirement of each component.
   - Re-engineer computer components to enhance its functionality and efficiency.
   - Design and develop engineering and manufacturing computer controlled devices such as robots.

4. **Computer programmer**
   - Develop in house application programs or system programs.
   - Customize commercial application packages to suite the organization needs.
   - Install, test, debug, and maintain programs developed or customized for the organization.

5. **Web administrator (webmaster)**
   - Developing and testing websites.
   - Maintaining, updating and modifying information on the website to meet new demands by the users.

6. **Software engineers**
   Most software engineers analyze user needs and create application software. Software engineers usually have experience in programming, but focus on the design and development of programs using the principles of mathematics and engineering.

7. **Computer trainers**
   Computer trainers typically teach new users how to use the computer software and hardware.

8. **Network administrator**
   - Set-up a computer network.
   - Maintain and enforce security measures on the network.
   - Monitor the use of network resources.

- Maintain and troubleshoot network related problems.

9. **Database administrator (DBA)**
   Database administrator (DBA) is an IT professional responsible for installation, configuration, upgrade, administration, monitoring, maintenance, and securing of databases in an organization.

10. **Graphic designer**
    A graphic designer is a professional within the graphic design and graphic arts industry who assembles together images, typography, or motion graphics to create a piece of design.

11. System administrators

- A system admin is responsible for the upkeep, configuration, and reliable operation of computer systems; especially multi-user computers, such as servers
- A system admin may acquire, install, or upgrade computer components and software; provide routine automation; maintain security policies; troubleshoot; train or supervise staff; or offer technical support for projects.

ICTS IN SMALL AND MEDIUM ENTERPRISES (SMES)

SMEs are small businesses or ventures that operate on a small or medium scale. They can be cooperation's, universities, hospitals, local industries, companies, organizations that do not operate on an international basis. They have fewer employees and lower sales than large firms.

SMEs produce and gather a lot of information about customers,, supplies, and employee activities, which require networked computers to manage and distribute it.

Common ICTs and technologies used in SMEs are:

- Computers and networks
- Telephones and mobile phones
- Application programs (word processors, spreadsheets, desktop publishing, web browsers, and emails
- Hardware such as printers, photocopiers, telephones, etc.
- Web portals and blogs
- Data ware houses
- The Internet, intranets and extranets
- Web services, electronic data communication

Common types of SMEs

1. Retail enterprises
2. Manufacturing enterprises – create, distribute and sell goods to customers
3. Services enterprises – do not create good but provide services to consumers or other organizations. They include insurance, financial companies and restaurants
4. Whole sale enterprises – purchase and sell large quantities of goods to consumers at a lower price than retail sale.
5. .government enterprises – agencies or departments of a government
6. Educational enterprises – universities, colleges, schools
7. Transport enterprises – include airline, regional transport authorities or companies, passenger railroads, trucking firms, etc.

Information systems in SMEs

An information system is a set of hardware, software, data, users and procedures that work together to produce information. Information systems are a major ICT tool used by different sections of SMEs:

1. **Accounting and finance**
   - Accounting software manages transactions such as sales and payments
   - Billing software are used to reconcile purchases with customer payments
   - Financial software helps mangers to budget, forecast and analyze progress
   - Software with reporting tools help mangers in decision making, documentation

2. **Human resource**
   - Human resource information systems are used to maintain employee records such as bio data, attendances to determine their pay
   - Computers are used for communications between employers and employees, customers

3. **Product development**
   - Computer Aided Design uses special software to create product designs
   - Computer aided engineering uses computers to test products before they are used

4. **Manufacturing**
   - Computer aided manufacturing uses computers to control production of goods such as software controlled drilling, welding, milling
   - Computer integrated manufacturing (CIM) uses computers to integrate different manufacturing processes
   - Computers are used in material requirement planning

5. **Quality control**
   Quality control software are used to find and predict product defects and problems

6. **Marketing**
   - Market research systems are used to store and analyze data gathered from product surveys
   - Sales managers get feedback from consumers through websites
   - Marketers and sales managers can communicate with customers thru calls, SMS, emails, websites
   - Goods are advertised online through social media platforms, websites, TV, radio, etc.

7. **Sales**
   Sales software is used to manage customer contacts, schedule customer meetings, mange product information, take orders from customers, etc.

8. **Distribution**
   Distribution systems forecast inventory control, manage and track shipping products, relying on GPS

9. **Customer service**
   Customer interaction software manes day to day interactions with customers such as through calls, emails, web interactions, messaging, toll free lines, etc.

10. **Transaction systems** help transact and document money transfers
11. **Information management systems** are used to keep up-to-date information for good decision making
12. **Decision support systems** are used to analyze information and make decisions

Reasons for need of information in SMEs

- To enhance business growth
- To manage licensing and tenders
- To manage taxation and tariffs
- To analyze progress of productivity
- To ensure smooth marketing, sales and distribution of goods
- To identify potential investment opportunism and expansion
- To do market research about new products from competitors for improvement
- To analyze customer, supplier and consumer needs
- To manage viable business projects efficiently
- To find out training needs

Usually information used by SMEs is got from sources such as: the Internet, seminars, webinars, brochures, consultations, trade catalogues, visits and tours, interviews, social media, TVs and radios, etc.

The role of ICTs in SMEs is usually based on the following:

- Promote innovation and productivity
- Effective research and management of competition
- Closer links between producers and consumers, partners, etc.

Challenges facing ICT adoption (reasons for non-adoption of ICTs in SMEs)

ICTs as an innovation in businesses have not been fully adopted. The following are some of the reasons for non-adoption of ICTs in SMEs:

- Limited support to ICT staff by managers due to limited funds
- Lack of awareness of ICTs and limited training standards to use them
- Technical challenges such as maintenance services, inadequate electricity supply in rural areas
- Low economic power, limited capital to invest in and support them
- Inadequate training levels and limited skills of employees to use ICTs
- Limited access to information and consultancy services
- Use of obsolete technology, that does not support new employer needs
- High costs of Internet connectivity, slow Internet access and downtime, limited and poor bandwidth
- Lack of e-business infrastructure
- Low ICT security standards and guarantees
- Inadequate legislative framework and structure
- Managerial and administrative challenges such as corruption and primitiveness of employers and employees
- Unfair competition from large companies
- Limited sales for finished goods in the domestic market
- High taxes imposed by the government on SMEs
- Inadequate technical staff such as web admins, network admins, etc.

Electronic commerce (E-commerce) in SMEs

E-commerce refers to the buying and selling of goods and services on the web (Internet). Common e-commerce services are:

- **E-retail** – retailers use the web to sell their products and services on business web sites such as amazon
- **Online banking** – allows user to pay bills from their computer – transfer of money electronically through mobile money
- **Online trading** – users invest in stock, options, bonds, treasuries, money market, etc.
- Online advertisement

Virtualization, Cloud computing and Grid computing in businesses

Virtualization is the process of sharing computing resources such as servers and storage media

Cloud computing – is the Internet service that provides computing needs to users through the web

Grid computing – refers to combining many servers and personal computers on a network, such as the Internet to act as one large computer.

11

ELECTRONIC PRESENTATIONS

Introduction to Presentation Software

Presentation software refers to application software that is used to create content, which can communicate ideas and other information to an audience on slides.
The presentation can be viewed as a **slide show**, which usually displays on a large monitor or on a projection screen.

Some presentation software can convert an existing slide show into a format that can be accessed on the Web.

Examples of presentation software

- Microsoft Office PowerPoint
- Corel Presentations,
- Lotus Freelance Graphics,
- Apple Keynote,
- Corel Presentations,
- Custom Show,
- Ease,
- Google Docs (web-based),
- Harvard Graphics (obsolete
- Hewlett Packard Bruno (software),
- King soft Presentation
- Libre Office Impress (open source)
- Openoffice.org Impress (open source)
- Presentiafx
- Prezi
- Slide Rocket
- Slide Wiki

Functions of a presentation software

- An editor- This allows text to be inserted and formatted
- Method for inserting and manipulating graphic images or animations with these objects
- Slide show system: This allows you to display the designed slide content

The principles of a good presentation

When preparing a presentation, you must consider the following principles. This improves the quality of your presentation, makes it more effective and enjoyable and in the long run saves you time and effort.

- Use simple background
- Text should be clear and that it can be seen from a distance
- There should be no clash between text color and the background color

- Use relevant pictures, graphics and diagrams to explain complex visual ideas
- Use minimal effects
- Insert your picture in the appropriate place
- For automatic presentation rehearse the timing
- The best presentation slide should be simple, easy and to the point.
- Should be direct to the expectations and right message to the right audience.
- The content of the slides should be relevant to the topic of discussion, to capture the attention of the audience
- Make the right choice of colors, font styles, font sizes, transitions, animations, links which suit the viewers

Features of a Presentation Software

1. **Slide layout:** refers to the physical arrangement of content on a slide. It contain formatting, positioning, and placeholders for all the content that appears on a slide.
2. **Presentation** is a collection of a series of slides, audience hand-outs, speaker's notes and outline among others.
3. **A Slide** - an individual page of a presentation
4. **A template** contains layouts, theme colors, theme fonts, theme effects, background styles, and even content.
5. **Slide sorter**: a facility that enables the user to view displays all of the slides in the current presentation in thumbnail form for easy re-arranging.
6. **Slide master:** a slide that controls appearance of all slides in the presentation. It that has information about the theme, slide layouts of a presentation, including the background color, fonts, effects, placeholder sizes, and positioning.
7. **Placeholders:** are boxes with dotted borders that contain content and reside within a slide layout. All built-in slide layouts contain content placeholders.
8. **Slide transitions:** are the animation-like effects that occur in Slide Show view when you move from one slide to the next during an on-screen presentation.
9. **Action buttons**: are buttons that if clicked, leads a user to either next or previous slide.
10. **Speaker notes:** are notes added to the presentation slides as a reference for the presenter.
11. **Slide show**: is a presentation of a series of still images on a projection screen or electronic display device, typically in a prearranged sequence.
12. **Animation:** is the process of creating the continuous motion and shape change illusion by means of rapid display of a sequence of static images that minimally differ from each other.
13. **Animation**. Refers to special effects for introducing text in a slide during a slide show.
14. **Transition effects** - refers to different styles in which slides come and leave the screen during a presentation.

15. **Slide transition** is a special effect for introducing an entire slide during a slide show
16. **Graphics**. A general term used to mean pictures, images, charts, photo, tables, etc., that you can add to a presentation
17. **ClipArt**. A general term for a library of pictures in the computer.
18. **Presenter's notes**, these contain ideas you want to discuss for each slide in your presentation.
19. **Auto content wizard**. This is a presentation wizard that contains data from which one can select and edit to create a personalized or customized presentation.
20. **Master layout** is a term applied to a presentation's overall design.
21. **Slide timing**. Is a technique by which slides or text appearing on the screen during a presentation, i.e. on mouse click or automatically after a defined period

Presentation Views (PowerPoint Slide View Formats)

- **Normal view** – default view, displays the text outline of the entire presentation on the left, current slide on upper-right, and speaker's notes on the lower-right.

- **Outline view** – displays only the text on a slide in one location instead of one slide at a time. It enables one to edit and display text. It appears without the objects or images in the slide.

- **Slide view** - shows a graphic view of the current slide for editing and viewing
- **Slide sorter view** - displays the entire presentation so that one can add, delete and move slide.
- **Notes page** - provides a large area to view or type speaker's notes on a slide
- **Slide show** - a collection of slides moving in a defined sequence at a present timing that one can control and change with special effects

- An **audience handout format** - includes images of one or more slides on a page.
- A **notes page format** - shows a picture of the slide along with any notes concerning the slide.

Advantages of electronic presentations

- Presentation software usually provides a wide variety of presentation formats and layouts for the slides.
- Multimedia components such as clip art images, video clips, and audio clips can be incorporated into the slides.
- The timing of the slides can be set so that the presentation automatically displays the next slide after a predetermined period of time.

- Special transition effects can be applied between each slide.
- The presentation can normally be viewed and printed in different formats.

Disadvantages of Presentation Software

- They cannot be used to perform calculations.
- Requires technical knowledge and basic equipment to use presentation.
- Over simplification of the subject
- Difficult to take notes while presenting
- Presenters just read from the audience which is boring.
- Too easy to make a bad presentation with too many animation effects.

Areas where presentations are used

- Church – for casting the hymns
- Big shops – for showing a list of goods and other related offers.
- Advertising – for example outdoor advertising media.
- School – for teaching and learning in schools.
- Seminars and workshops – to enhance speaker's notes and speeches
- Presenting learning materials to students in schools (CAL)
- Presenting speeches and minutes in meeting
- Used in training sessions
- Used in presenting campaign manifestos
- Used in conferences and seminars
- Used in sales promotions to market products
- Used in business shows, mobile kiosks and clinics

UACE 2018 (NO. 19)

a) Give two situations under which electronic presentations would be used
b) State three advantages of using electronic presentations over traditional chalk and talk

- An electronic presentation can be save for future reference compared to traditional chalk and talk
- Makes the presentation more interesting due to use of multimedia like animations and transitions
- Visual explanations/illustrations are more clear
- An electronic presentation is more systematic and precise

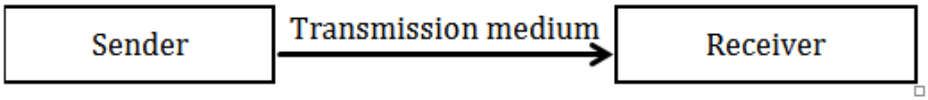
12

DATA COMMUNICATION AND NETWORKING

Data Communication

This refers to the electronic transfer of data, instructions, and information from one device to another via a transmission media.

Data communication model



Elements of Data Communication

- Sender - the computer or device that generates and sends data
- Message - the information or data to be transmitted
- Communication channel or medium
- Receiver - device or computer that receives the message
- Communication devices
- Protocol - rules that allow devices to exchange data, define the format for communication between systems

Data Communication tools

These are devices that enable the users to send and receive messages.
Data communication tools can be categorized into two: electronic and manual data communication tools.

- **Electronic data communication tools** use electric power Examples include Computers, Mobile phones and Internet.
- **Manual data communication tools** don't use electricity. Examples include drums, bells and messengers.

Examples of electronic data communication tools

Common examples are Computers, Fax machines, Radio and Television, Mobile Devices like phones and PDAs, Internet services (Email, Websites, Social networking, chartrooms Forums, etc.).

UACE 2018

a) *Give three disadvantages of electronic communication*

- Associated with unreliable networks
- Prolonged use of electronic gadgets leads to health problems like eye strain, backache, neck ache, headache, stress, wrist pain and body fatigue
- Associated with quick and widespread computer malware/viruses
- Change in technology-obsolescence
- Facilitates cyber terrorism and defamation

b) *Name any two manual communication methods*

- Ringing a bell or using a bell
- Drumming or using a drum
- Word of mouth or by a messenger
- Using gestures, signs, posture
- Postage or ordinary mailing
- Whistling or using whistles
- Making an alarm or ululation
- Use of fire throws, fireworks, smoke

Data transmission media

The term transmission media refers to any physical or non-physical link between two or more devices and in which signals flow from source to destination.

Data communication media can be divided into two:

1. Physical /Wired / Bounded/ Guided transmission media
2. Wireless / Unbounded / Unguided transmission media

Physical, Wired, Bounded or Guided transmission media

Physical media transmits data signals from the source to the destination through a restricted pathway such as a cable.

Examples of physical transmission media

- Unshielded Twisted Pair **(UTP)** Cable
- Shielded Twisted Pair **(STP)** Cable
- Coaxial Cable
- Fiber Optic Cable

Twisted pair cable

A twisted pair cable is made up of solid copper wire strands wound in pairs within a single media. The winding of the wires is meant to avoid the development of electromagnetic fields around the two wires as they transmit data. TP is commonly used to interconnect devices on a Local Area Network

There are two common types of twisted pair cabling, STP and UTP. The S stands for Shielded, the U stands for Unshielded.
The extra covering in shielded twisted pair wiring protects the transmission line from electromagnetic interference leaking into or out of the cable, but makes it more expensive.

Coaxial cables

The Coaxial cable has a single copper conductor at its center.
A plastic layer provides insulation between the center conductor and a braided metal shield. The metal shield helps to block any outside magnetic interference from fluorescent lights, motors, and other
Coaxial cables have bandwidths in Gigabits per second. Hence, they are installed in a network to form the network backbone.

Coaxial cables are difficult to install, but highly resistant to signal interference. In addition, it can support greater cable lengths between network devices than twisted pair cable. The two types of coaxial cabling are thick coaxial and thin coaxial.

Fiber Optic Cable

The fiber optic cable consists of a center glass core surrounded by several layers of protective materials. It transmits light rather than electronic signals eliminating the problem of electrical interference.
This makes it ideal for certain environments that contain a large amount of electrical interference.
It has also made it the standard for connecting networks between buildings, due to its immunity to the effects of moisture and lighting.

Fibre optic cable uses light to transmit data from one point to another on the network. The electrical signal from the source are converted to light signals, and then sent along the fiber optic cable.

Advantages of physical transmission media

- It is fast and supports high bandwidth
- Can be used in hazardous places (high flammable) because they do not generate electrical signal
- They can carry voice, data and video signal simultaneously.
- They are more resistant to radio and electromagnetic interference.
- Installation equipment are cheap and readily available.

Disadvantages of physical transmission media

- Connectivity devices and media are expensive.
- Installation is difficult because the cable must be carefully handled.
- It is relatively complex to configure

- It covers short distance since they use the physical wires
- Inconvenience due to inflexibility of restrictive cables.

Wireless, Unbounded, Unguided transmission media
Wireless or unbounded media is that is where data signals flow through the **air** In this case transmitting antenna and receivers aerial facilitates the communication
Example of wireless transmission media include:

The major wireless transmission media include radio waves, microwaves, and infrared which is part of the **electromagnetic spectrum**, which is the range of all possible frequencies of electromagnetic radiation.
Wireless media send communications signals through the air or space using radio, microwave, and infrared signals (electromagnetic waves).

Examples of wireless transmission media

- Microwaves
- Radio waves
- Infrared

1. **MICROWAVES:**

   Microwaves are high-frequency electromagnetic radiations that are sent through space to deliver telecommunications services. Microwaves are dependent on line of sight. Microwave communication systems are mainly classified into satellite and terrestrial.

   Terrestrial microwave signals are sent from one ground-based antenna to another.
   Satellite microwave signals travel from Earth to a satellite in space and then back to a station on the earth.

2. **RADIO WAVES:**

   Radio waves frequencies are easy to generate and are widely used for communication, both indoors and outdoors. Examples of communication technologies using radio waves include Bluetooth, Wireless Fidelity (Wi-Fi)

3. **Bluetooth** is a short range wireless based information transmission system which works on the basis of microchips embedded in the digital devices like mobile phones, speakers and laptops.

4. **Wireless Fidelity (Wi-Fi**) is used to create a hotspots from where information signals can be easily accessed by Wi-Fi enabled devices, forming a wireless local area network **(**WLAN).

5. **HOTSPOT**

A hotspot is a specific location that provides Internet access via a wireless local area network (WLAN). The term is generally synonymous with a Wi-Fi connection. A network that creates a hotspot primarily includes a modem and wireless router. The radio frequency (RF) waves sent by the wireless network extend in different directions from its centralized location. These signals become weaker as they travel, either further from the central location or due to interference.

6. **Wimax** stands for Worldwide Interoperability for Microwave Access. It is a telecommunication technology providing wireless data over long distances in a variety of ways from point to point links to full mobile cellular type access.

7. **Radio-frequency identification (RFID)** uses radio waves to automatically identify and track tags attached to objects. The RFID tag can be affixed to an object and used to track and manage inventory, assets, people, etc. For example, it can be affixed to cars, computer equipment, books etc.

8. **INFRARED** uses electromagnetic waves with a **smaller wavelength** than **radio**. A **TV remote control** is an example of an Infrared application. IRDA (Infrared Data Association) ports transmit data via infrared light waves. As long as the devices are within a few feet and nothing obstructs the path of the infrared light wave, data can be transferred without the use of cables

Asynchronous and Synchronous transmissions

In asynchronous transmission, transmission occurs at irregular intervals in small bits (i.e., not synchronized). Asynchronous transmission is relatively slow. With synchronous transmission, large blocks of bytes are transmitted at regular intervals without any start/stop signals.

Synchronous transmission requires that both the sending and receiving devices be synchronized before any bytes are transmitted.
Synchronous transmission requires more expensive equipment but provides greater speed and accuracy than asynchronous transmission.

Characteristics of Asynchronous Transfer Mode

- It is scalable and flexible. It can support megabit-to-gigabit transfer speeds and is not tied to a specific physical medium.
- It efficiently transmits video, audio, and data through the implementation of several adaptation layers.
- Bandwidth can be allocated as needed, lessening the impact on and by high-bandwidth users.
- It transmits data in fixed-length packets, called cells, each of which is 53 bytes long, containing 48 bytes of payload and 5 bytes of header.

- It is asynchronous in the sense that although cells are relayed synchronously, particular users need not send data at regular intervals.
- It is connection oriented, using a virtual circuit to transmit cells that share the same source and destination over the same route.

Transmission Direction

The direction in which data flows along transmission media is characterized as simplex, half-duplex, full-duplex or multiplex

- **Simplex transmission**

  Simplex transmission sends data in one direction only. Simplex transmission is used only when the sending device does not require a response from the receiving device. Examples of simplex transmission is television broadcasting and radio broad casting

- **Half-duplex transmission**

  Half-duplex transmission allows data transmission in either direction, but only one way at a time. Many fax machines, police radio calls, credit card verification systems and automatic teller machines use half-duplex transmission

- **Full-duplex transmission**

  In full-duplex transmission, data can flow in both directions at the same time. A regular telephone line, for example, supports full-duplex transmission, allowing both parties to talk at same time.

- **Multiplex transmission**

  In multiplex transmission, several different types of signals can be carried at once through the same line. E.g. during Video calls where Images

Packet Switching

When a computer sends data over the Internet, the data is divided into small pieces called packets. Each packet contains the data, as well as the recipient (destination), the origin (sender), and the sequence information used to reassemble the data at the destination.

Each packet travels along the fastest individual available path to the recipient's computer via communications devices called routers.
This technique of breaking a message into individual packets, sending the packets along the best route available, and then reassembling the data is called packet switching.

Services offered by data communication tools

Data communication tools offer services like Telephone, SMS, E-mail, Skype, Newsgroups and instant messaging.

- **Telephone voice calls** help keep people talking even when they are distant and mobile.
- **Short Messaging Services SMS** facilitate sending and receiving of brief text messages.
- **Electronic mail and fax :** An electronic mail is the message transmitted electronically over the Internet, from one user to another. A fax machine is a device that transmits and receives typed or hand written documents over telephone lines.
- **Skype** supports voice and video calls, text, instant messaging and sharing conversation with (someone) over the Internet using the software application Skype, frequently also viewing by webcam.
- **Newsgroups** are organized group of Internet users who wish to share ideas and interests through discussion forums and debates.
- **Instant messaging:** This is a more enhanced messaging service that allows two or more people to chat directly in real time.
- **Social networking** e.g. Facebook and Twitter create digital societies through linking people of common interests.

Implications of using data communication services

Positive Implications

- Have led to faster, simpler communications between people e.g.through electronic-mail, mobile phones, social networks etc.
- Communications costs have become lower e.g. Making cheap Internet calls, for example via Google talk and Skype
- Community mobilization now easier - it's now very simple to send a message to many people in one go e.g. using Mailing lists and group chats.
- Data communication tools like the Internet have facilitated emergence of the worldwide-web where there is a wealth of information, such as news, weather reports, and airline schedules.
- Data communication tools like telephones and SMS Have revolutionized the way people transact businesses e.g. access to mobile money services using phones.

Negative Implications

- **Security and privacy**: data communication services have made it easy access private information e.g. On social networks, hence posing security concern.
- Spamming is high especially by advertisers who send unwanted e-mails in bulk, such as email adverts.
- There has been emergency of new kinds of crimes facilitated by data communication services, such as cyber-bullying.

- Inaccurate information on the Internet can be misleading and lead to dire consequences to the users.
- Data communication services have facilitated the digital divide in society, hence disadvantaging the computer illiterate people when it comes to opportunities like jobs and government services

COMPUTER NETWORKS

A computer network is defined as a system of interconnected computers and devices linked together by transmission media to communicate and share resources. These resources can be hardware such as printers, software etc.

Basic requirements for setting up a computer network (components of a computer network)

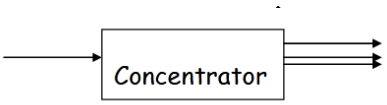
To connect to or setup a network, users need some or all of the following.

- Networking hardware such as bridges, hubs, repeaters, routers
- Networking (communication) software such as NOS, network protocols
- Communication medium such as cables, wireless medium
- Terminal nodes such and computers and peripherals
- Networks users, administrators

Networking Hardware

These include computers, peripherals and devices that enable computers to exchange and share data, instructions, and or information. These include:

- **A network interface card (NIC) -** enables a computer or device to access a network.
- **A modem** – modulates outgoing digital signals from computers into analog signals that can be sent over the phone line. It also demodulate incoming analog signal into a form the computer can use.
- A **hub** - is a device that provides a central point for cables in a network in a local area network. It accepts signals, amplifies them and puts them back to be sent to all computers on the network.
- A **Switch** works like a hub but does not broadcast the data to all the computers; it sends the data packets only to the destined computer
- **A concentrator** merges several low speed signals from different computers into one high-speed transmission that can be transmitted over a medium



- **A multiplexer** is a network device that splits a single line of data signal into various signals such that several computers can share it.

- A **Router** connects multiple networks and routs communications traffic to the appropriate network using the fastest available path. A router allows multiple computers to share a single high-speed Internet connection such as through a cable modem
- A **repeater** is a device that accepts signals from a transmission medium, amplifies it, and retransmits it over the medium. As a signal travels over a long distance, it's strength reduces, this is called **attenuation**.
- **A Server** is a very fast processor computer dedicated to providing services for other computers connected to a network.
- **Client computers** – computers sharing resources and capable of sending and receiving data signals to and from the server on a network.
- A **network bridge** is device that connects two networks making each accessible to the other. A bridge knows all of the addresses on each side of the bridge and sends information accordingly
- A **firewall** is a networking device that is installed at the entrance to a LAN, particularly when connecting a private network to a public network, such as the Internet. The firewall uses rules to filter inbound traffic into the private network, to protect the private network users and data from malevolent hackers. Unauthorized traffic is rejected, and authorized traffic passes as illustrated below.

1. **Shared peripherals** such as printer, storage media, fax machines, etc.

Communication Media:

These are referred to as communication links connecting network computers and devices. These can be physical such as cables or wireless.

Networking (Communications) Software

These are programs and applications that aid the setup and use of a network. It includes network operating.

1. **Network Operating System (NOS)** - system software that organizes and coordinates the activities on a network. It helps a user establish a connection to another computer or network, such as network drivers, and manage the transmission of data, instructions, and information.

   Examples of NOSs include: Novell NetWare, Microsoft Windows NT server 2008, 2012, 2016, Sun Solaris, etc.

2. **Network application software -** programs that provide an interface for users to communicate over computer networks. A variety of examples of application software for communications include:

    - E-mail client applications,
    - FTP programs,
    - Web browsers like Internet Explorer, Google chrome, Mozilla Firefox
    - Newsgroups/ message boards, websites, search engines
    - Social networking apps
    - Instant messaging
    - Video conferencing applications e.g. Skype, and VoIP.

Network Protocols

A **Network Protocol** refers to a set of rules and procedures governing transmission between components in a computer network

The role played by networking protocols as used in Networking

- Identifying each device in the communication path;
- Securing the attention of the other device;
- Verifying correct receipt of the transmitted message;
- Determining that a message requires retransmission if it is incomplete or has errors;
- Performing recovery when errors occur.

Common protocols as used as in networking

1. **Simple Mail Transfer Protocol (SMTP)** - an Internet protocol for transferring of e-mails.
2. **File Transfer Protocol (FTP):** It allows files containing text, programs, graphics, and numerical data, and so on to be downloaded off or uploaded onto a network.
3. **Internet Protocol (IP)** - does the packet forwarding and routing.
4. **Transmission Control Protocol/Internet Protocol (TCP/IP)** is a network standard that defines how messages (data) are routed from one end of a network to the other, ensuring the data arrives correctly.
5. **Transmission Control Protocol (TCP):** responsible for delivery of data over the network.
6. **Hypertext Transfer Protocol (HTTP):** It allows Web browsers and servers to send and receive Web pages.
7. **Simple Network Management Protocol (SNMP**): It allows the management of networked nodes to be managed from a single point.
8. **Telnet Protocol**: It provides terminal emulation that allows a personal computer or workstation to act as a terminal, or access device, for a server.

9. **Sequential Packet Exchange (IPX/SPX**):works with the Novell's Internet work' packet / sequential exchange; responsible for delivery of sequential data over the network

Reasons for networking computers

- To allow user to share data and information
- To allow sharing of software and hardware (peripherals)
- To enable communication among users through tools like emails
- To share databases among users
- To enable security of data and information by setting network controls on a network

Advantages of using networks over standalone computers

- It facilitates easy communication for example through emails
- It reduces on the costs of buying and sharing hardware such as printers
- It allows control over who can access data in the system
- It enables sharing of data and information on computers connected to a network
- Enables online research and education
- Allows access to common databases on databanks
- Software can be easily updated on a network
- Computer networks allow centralized administration, control and monitoring of users
- Enable workgroup computing in an institution or company
- It enables flexible access. Users can log on and access data from any computer on a network

Disadvantages of networking computers

- High cost of purchasing and installing network software and hardware
- Networking may require expensive trained personnel who attract extra expenses
- High cost on network administration and maintenance – require a network admin
- Time can be wasted on social networks instead of doing meaningful work
- In case the server fails, the entire network fails hence risk of losing data
- high risk of data corruption since networks can be accessed by many people
- increased exposure to hackers which puts private data at risk
- greater risk of viruses over networks
- a break in the communication channel fails the network hence delays
- abuse of data such as deletion of data and exposure to pornography

Types of Networks

Computer networks fall into different types usually according to their span or area of coverage.

1. **Personal Area Network**
   A PAN is a network of computers and devices within the range of an individual person, typically within a range of 10 meters.

2. **Local Area Network**
   A LAN connects computers in a small geographic area such as a building like a computer lab, or an office. Nodes are connected to the LAN via cables. A wireless LAN (WLAN) is a LAN that does not use physical wires, but uses wireless media such as radio waves.

   Types of Local Area Networks

   (a) Peer-to Peer LAN
   This is a type of network in which computers communicate directly with one another without a server. Each computer stores files on its own storage devices and contains both the network operating system and application software.

   Advantages of Peer-to Peer Network

   - it is simple to setup, does not require too much configuring
   - It is cheap to set up and maintain
   - No need for a server to control the network
   - Appropriate for few computers (small networks)
   - So flexible, can be moved to a new location
   - It is perfect for home and small business users.

   Disadvantages of a Peer to Peer Network

   - The system is not centralized, making administration difficult
   - Lack of security, files can be accessed by any one on the network
   - Inappropriate for big networks

   (b) Client-Server LAN

   It is a network with one or more computers acting as a server from where other computers or devices (clients) can request services

   A **Client computer** is a computer that can access resources on a network while a **Server** is a computer that provides a centralized storage, administration and control to others on a network.

A dedicated server is a server that performs a specific task. Examples of dedicated Servers include: file server, print server, database server, and a network server

Roles of dedicated Servers

- A **file server** stores and manages files on a network, avails them to users
- A **print server** manages printers and print jobs.
- A **database server** stores and provides access to a database
- A **network server** (e.g., a DNS) manages network traffic.
- **An application server** stores network application software
- **Web server** allows users to access external networks such as the Internet
- **Mail server** manages mails on a network
- **Proxy server** filters requests and restricts access to data, placed between a LAN and external network

Prerequisites (requirements) of a server computer

- It needs a very high speed and powerful processor
- It needs high RAM capacity
- It needs a very big storage capacity
- It needs a very fast Network interface card
- It needs network operating system such as Novell Netware, Windows NT Server or Apple Share
- Expansion abilities

Advantages of Client-Server Network

- All Resources are centralized and easier to access.
- Easy management and administration of the network.
- More data security since all network access is controlled through the server.
- The network is flexible, because changes and new technology can be easily included into system.
- Client /Server network is faster than P2P since data and resources are handled by a dedicated machine
- It is to Backup all data stored centrally on the server.
- Client Server network can support many computers as compared to a P2P network

Disadvantages of a Client /Server Network

- It is expensive to set up as compared to a P2P network.
- It requires an extra computer to serve as a dedicated server.
- Maintenance – large networks will require an administrator staff to ensure efficient operation

- Dependence – When the server goes down, operations will cease across the network
- Server can get overloaded since all the processing is controlled at one point.

3. **A Campus Area Network (CAN)**

   It is a network that connects two or more LANs but limited to a specific and small geographical area such as a college campus, industrial complex, a military base. It spans multiple LANs but smaller than a MAN.

4. **A metropolitan area network (MAN)**

   It is a large computer network that usually spans a city or a large campus. A MAN covers a smaller geographic area than a WAN.

5. **A wide Area Network (WAN)** is a network that covers a large geographic area such as continents, countries or the whole world. An example of a WAN is a network that connects the district office computers of a company across the country or across several counties in the world. Computers are often connected to a WAN via public networks such as the telephone system or by dedicated lines or satellites.

   A virtual private network (VPN) extends a private network across a public network, and enables users to send and receive data across shared or public networks as if their computing devices were directly connected to the private network. Applications running across the VPN may therefore benefit from the functionality, security, and management of the private network.

VPNs may allow employees to securely access a corporate intranet while located outside the office. They are used to securely connect geographically separated offices of an organization, creating one cohesive network.

Wired Vs. Wireless Networks

A wired network is one in which the networked devices are interconnected with a physical medium such as a cable while a wireless network has no physical medium, data is directly routed through air or wireless means

Advantages of wireless networks:

- Mobility - With a laptop computer or mobile device, access can be available throughout a school, at the mall, on an airplane, etc.
- Fast setup - If your computer has a wireless adapter, locating a wireless network can be as simple as clicking "Connect to a Network" -in some cases, you will connect automatically to networks within range.
- Cost - Setting up a wireless network can be much more cost effective than buying and installing cables.

- Expandability - Adding new computers to a wireless network is as easy as turning the computer on (as long as you do not exceed the maximum number of devices).
- Speed - The transmission speed of wireless networks is improving; however, faster options (such as gigabit Ethernet) are available via cables. If you are also moving large amounts of data around a private network, a cabled connection will enable that work to proceed much faster.

Disadvantages of wireless networks:

- Security - Be careful. Be vigilant. Protect your sensitive data with backups, isolate private networks, provide strong encryption and passwords, and monitor network access traffic to and from your wireless network.
- Interference - Because wireless networks use radio signals and similar techniques for transmission, they are susceptible to interference from lights and electronic devices.
- Inconsistent connections - Wireless connections are not nearly as stable as those through a dedicated cable.

NETWORK TOPOLOGIES

Network Topology
A network topology refers to the physical arrangement of local Area Network devices (nodes) in a communication network.

There are two methods of connecting:

- physical topology and
- Logical topology

Physical topology is the Arrangement of cables, computer, and other peripheral devices in relation to each other on a network.

Logical topology is the method used to pass information between workstation on a network

There are several physical network topology set ups:
- Star topology
- Bus topology
- Ring topology
- Mesh topology
- Tree (Hierarchical) topology
- Hybrid topology
- Point to Point topology

Bus Topology
It consists of a single central cable that connects all computers and other devices together called a **backbone** or **Bus**

Advantages of Bus Network:

- Cheap and easy to install
- Computers can be attached and detached without disturbing the rest of the network.
- Failure of one device cannot affect the network.
- It's good for smaller networks not requiring higher speeds
- Requires less cable length than a star topology
- Easy to add new workstations on the network
- Easy to connect a computer or peripheral
- It has high transmission speed if coaxial cable is used

Disadvantages of Bus Network

- If the bus itself fails, the entire network will not work.
- If more data flows, the network slows down.
- Its Limited in size and speed
- Its less secure since all data is transmitted by only one main cable
- The transmission slows down as more workstation are added

Ring Network

A ring topology consists of a cable forming a closed ring or loop. (Ring/cycle shaped). Topology where all devices on the network are connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices, one on each side of it to form a ring. Each data packet is sent around the ring until it reaches its final destination.

Advantages of Ring Network

- It can cover a large distance.
- The speed of data transmission is high since each workstation can boast the signal
- No collision of data occurs as data travels in one direction only.
- Its orderly network where every device has access to the token and the opportunity to transmit
- Its Performs better than a star topology under heavy network load
- Cheap to install since there is only one cable between each workstation.

Disadvantages of Ring Network

- More difficult to install.
- If the cable fails, the whole network goes down
- Network adapter card are expensive

- Moves, additions and changes of devices affect the entire network.

Star Network:

All computers and devices connect to a central Hub / switch. Data transmitted passes through the hub

Advantages of Star Network

- Easy to install and maintain.
- Devices can be added and removed without disruption.
- Reliable because each device connects directly to the hub
- Its best for large networks
- If one cable or station fails, the entire network is not affected
- High speed transmission is possible since each station has a dedicated cable
- Greater security as connection from one station to server is unique.
- No disruptions to the network when connecting or removing devices

Disadvantages of Star Networks

If the hub fails, the entire network will fail.-Expensive to install.
Requires more cable length than a bus topology
If the cable fails the workstation cannot receive data via any other route
if the hub or switch fails, attached are disabled

Tree topology
A tree topology combines characteristics of bus and star topologies;

Advantages of Tree topology

- Allows for point-to-point wiring for individual segments.
- Supported by (compatible with).several hardware and software .

Disadvantages of tree topology

- Overall length of each segment is limited by the type of cabling used.
- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

Hierarchical topology

It is like the extended star topology, except computer controls traffic instead of a hub or switch

Mesh topology

This is a network where each device has its own connections to all other devices on the network.
It provides each device with a point- to- point connection to every other device in the network.

Advantages of mesh topology

-If there are other possible routes through the network, the damage of one or several cables or computers may not have vital impact except the involved computers -
Mesh networks provide redundancy, in the event of a link failure, meshed networks enables data to be routed through any other site connected to the network.

Disadvantages of mesh topology

It's the most expensive and difficult to maintain because each device has a point-to-point connection to every other device. The damage of at least one cable or device may damage the network seriously if there are only few cables in the network.

Hybrid Networks:

These are a combination of Star, Ring and Bus networks.

Considerations when choosing a topology:

- Money.
- Length of cable needed.
- Future growth.
- Cable types

Intranet, Extranet & Internet

Intranet refers to a connection of private computer networks within an organization**.**
An intranet has tools to facilitate communication between organization's employees or workgroups to improve the knowledge and data sharing capability.

Advantages of Installing an Intranet

- Sharing resources such as laser printers, fax machines, modems, scanners, etc. Is simplified
- Electronic Mail: Electronic mail on a LAN can enable students to communicate with teachers and peers at their own school.

- Flexible Access: School networks allow students to access their files from computers throughout the school. Students can also work cooperatively through the network.

Disadvantages of Installing a School Network

- Expensive to Install. Although a network will generally save money over time, the initial costs of installation can be prohibitive.
- Requires Administrative Time. Proper maintenance of a network requires considerable time and expertise.
- Must Monitor Security Issues. Wireless networks are becoming increasingly common; however, security can be an issue with wireless networks

Extranet is a computer network that allows controlled access from the outside for specific business or educational purposes. Extranets are extensions to, or segments of, private intranet networks that have been built in many corporations for information sharing.

An extranet is a computer network that allows controlled access from the outside for specific business or educational purposes. Extranets are extensions to, or segments of, private intranet networks that have been built in many corporations for information sharing.
Most extranets use the Internet as the entry point for outsiders, a firewall configuration to limit access and a secure protocol for authenticating users

Advantages of extranet

- Exchange large volumes of data using Electronic Data Interchange (EDI)
- Share product catalogs exclusively with trade partners
- Collaborate with other companies on joint development efforts
- Jointly develop and use training programs with other companies
- Provide or access services provided by one company to a group of other companies, such as an online banking application managed by one company on behalf of affiliated banks.
- Share news of common interest exclusively

Disadvantages of extranet

- Extranets can be expensive to implement and maintain within an organization (e.g., hardware, software, employee training costs)
- Security of extranets can be a concern when hosting valuable or proprietary information.

The Internet is a global connection of computer networks. The Internet links together millions of computers, to exchange and share information all over the world.

Benefits of installing an intranet in a school

- Facilitates internal emails
- Provides access to company contacts information, procedure manual and other frequently updated documents
- Used for posting and updating employee forms
- Posting internal job listings
- Provides electronic catalogs for ordering supplies
- Facilitates collaborative computing
- Scheduling meeting and appointments.
- Posting financial statements and other types of corporate information
- Maintains shared calendars, projects timelines and other project documents
- Provides access to company databases and other systems
- For monitoring internal security.

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ELCTRONIC PUBLICATION

Desktop Publishing

Electronic Publishing refers to the use of digital resources and equipment to create and disseminate information by electronic means.

Desktop publishing refers to the process of producing publications like cards, newsletters, brochures, etc., by designing their texts and graphics layout and inserting editing ,formatting and printing of text and graphical objects using publishing software installed on the computer or

Publishing is the process of producing publications like newspapers, cards, calendars, etc. that has special texts and graphic layouts and designs

Desktop Publishing Software

This refers to application software that is used in the production and designing publications with advanced features and graphics by use of the computers

Examples of Electronic Publishing Software

- Microsoft Office Publisher
- Adobe InDesign
- Adobe Illustrator
- Corel Draw
- Prince XML
- PUB HTML5
- QuarkXPress
- Quick silver
- Rag-Time
- Flip B
- InHouse Digital Publishing Software.
- Frame maker
- HTML5 Page Flip
- Hyphen
- Inpage
- Maul Publisher
- Page Plus
- Page Stream

Examples of publications that can be produced by DTP

- Business cards
- Brochures
- Identity cards
- Flyers
- Invitation cards
- Certificates
- Greeting cards
- Banners
- Post Cards
- Labels
- Newsletters
- Calendars
- Menus
- Letterheads
- Catalogs

Features of desktop publishing software

- **Page layout:** The ability to define the layout of a page using frames to place text and pictures.
- **Font and styles:** A wide range of fonts and styles.
- **Drawing facilities:** Some drawing facilities, although they may be limited.
- **Importing pictures and text:** The ability to incorporate pictures and text from other packages into a document.
- **Clip art**: A library of pictures for you to include in your document**.**
- **Accurate positioning**: The ability to position objects extremely accurately on the page using guidelines or a grid.
- **Frame-**This contains a variety of objects such as graphics, tables, text boxes which can be resized, moved and manipulated to suite the user needs.
- **Handles-**They enable you resize your frame by clicking and dragging around them.
- **Template**-These are pre-defined and pre-chosen design styles and formats that you can use.

Characteristics of Desktop Publishing Software

- They have color libraries.
- They have drawing and picture editing tools.
- They allow for color separation.
- They do high quality graphics work.

Advantages of electronic publishing

- It is speedy and easily searchable.
- Rapid communication between the participants on the network.
- Electronic interaction with the buyer or user of an e-publication where the producer can collect valuable market research data very cheaply.
- Lower costs of review to changes and additions.
- E-publishing is accessible to all users regardless of a geographical location.
- Saves time and storage as more information can be stored electronically than on paper

Disadvantages of electronic publishing

- Computers may not be available everywhere.
- Many people will need training to use the resource.
- It requires computing equipment to use.
- Publications may experience inconsistency of appearance between different computer architecture.
- Update is not of all pages.

Applications of electronic publishing software

- Used in designing email publishing content.
- Producing electronic books
- Producing electronic journals
- Used in web publishing
- Developing digital content

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Wishes you all the best!